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Personality traits and alcohol consumption: Secondary analysis of the Self-Match Study

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Abstract

Background: This secondary analysis of the Self-Match Study explores whether personality traits affect the treatment outcome for alcohol use disorders (AUD). We designed the Self-Match Study to investigate whether clients choosing between treatment options improves treatment outcomes. The primary outcome report revealed no difference in the outcome, whether treatment allocation was based on clinician matching or self-matching. Because willingness to choose, choice of treatment method, and compliance with treatment may be related to personality, this exploratory sub-study investigated the influence of personality traits on treatment outcome.

Method: We enrolled 402 consecutive clients (female 46.7%, mean age 47.4) seeking treatment at the outpatient alcohol treatment center in Odense, Denmark. Clients were randomized to treatment by expert-match or self-matching. Data on alcohol consumption (Timeline Follow Back), personality traits (NEO-FFI-3), and retention in care were collected at baseline and 6-month follow-up. Outcomes were compliance, sensible drinking (alcohol intake below National Recommendations), and the number of heavy drinking days at follow-up.

Results: A high neuroticism score was negatively associated with treatment completion. Further, clients with a high score on neuroticism, openness, and extraversion, or a low score on conscientiousness were less likely to reduce their drinking to a sensible level at follow-up. We also found that low scores on conscientiousness were associated with having more heavy drinking days at follow-up. The personality traits neuroticism and openness were associated with treatment preferences.

Conclusions: Personality traits influence 6 months drinking outcomes for people receiving AUD treatment.

KEYWORDS
alcohol use disorder, personality traits, psychotherapy, retention in care, treatment planning

INTRODUCTION

Alcohol use disorder (AUD) is one of the most prevalent addictions, impacting millions of lives globally and not only affecting individuals and families; it also putting strain on healthcare services through several complications (World Health Organization, 2018). It has been difficult to identify one single treatment approach that secured a higher level of treatment success than others did; likewise, premature dropouts from treatment aimed at AUD are common (Hansen et al., 2020; Schwarz et al., 2018).

In an attempt to improve the outcome of treatment of AUD in general, research turned toward the idea of matching treatment to clients rather than concentrating on finding the only treatment offer that might be effective for all clients. The hypothesis was that different client profiles would benefit from different treatment options and that the overall outcome of treatment, thus, would be improved if a matching strategy were developed. Two large studies, Project MATCH (Project MATCH Research Group, 1997b) and the United Kingdom Alcohol Treatment Trial (UKATT) (UKATT Research Team, 2005), conducted within the alcohol field to test the hypothesis were, however, inconclusive. Only a few of the expert-based matching hypotheses in Project MATCH were supported (Allen et al., 1997; Babor, 2008). UKATT also found that the clients improved to the same extent whether they were matched to treatment according to the preformulated hypothesis or not, and the UKATT even failed to confirm the few findings from Project MATCH (Heather et al., 2008). In other words, theory-driven expert-matching client to treatment options does not seem to improve treatment outcomes (Hesse et al., 2017; Project MATCH Research Group, 1997a).

In contrast to expert-matching or clinician-led treatment matching, the Self-Match Study (Hell et al., 2018) therefore aimed to investigate if the outcome of treatment was improved when clients themselves were offered to freely choose treatment strategy from among five options. The findings from the Self-Match Study (Hell et al., 2021) showed that clients who chose their treatment from among options faired just as well as those allocated to treatment using an evidence-based algorithm (Nielsen & Nielsen, 2018). The study also showed that the clients in the self-match group chose differently among the five treatment options than what the algorithm would have proposed, leading to an overrepresentation of some therapies and under-representation of others, compared to the group of clients who received expert-based matched treatment. Hence, individual differences and personality traits seem to influence treatment choice.

Personality, being a set of relatively stable dispositions, is hypothesized to exert influence on the development of mental disorders, with certain traits being risk factors and others being protective factors (Andersen & Bienvenu, 2011). Furthermore, traits are thought to exert influence on how humans approach the world, affecting the choices taken by the individual; besides, situational aspects will also exert influence on the expression of the traits, leading to a complex trait–situation interaction (McCrae &

Sutin, 2018). When it comes to treatment for AUD, however, little is known about the impact of personality traits, and the scarce evidence even seems to be somewhat contradictory (Bucher et al., 2019; Foulds et al., 2017a).

However, associations between the personality of the individual and the outcome of psychosocial intervention have been a subject of investigation throughout recent years. It seems that potential gain from psychotherapy and psychosocial approaches, to some extent, is related to personality traits (Gerlach et al., 2015). In Project MATCH, the California Psychological Inventory Socialization Scale (Gough, 1956) was used to measure personality traits. An association between impulsivity and worse outcome in the early follow-up period was found; however, at later follow-ups of the participants, this association was not confirmed. In UKATT, only therapists' personality traits were studied to investigate an association between therapists' styles and clients' treatment outcomes, but no association was found (UKATT Research Team, 2005).

During the last 20 years, the Five-Factor Model has become the dominant framework for trait theory research, and it has been extensively validated in the NEO inventories (Andersen & Bienvenu, 2011; Costa & McCrae, 2008). The NEO measures of personality comprise neuroticism, conscientiousness, agreeableness, extraversion, and openness to experience. Personality traits seem to have an impact on both drinking patterns, development of AUD, treatment-seeking, and dropout from treatment. It appears that neuroticism predicts AUD, while a high level of conscientiousness and agreeableness seems to protect against the development of addiction (Malouff et al., 2007). Furthermore, a high extraversion score is associated with elevated alcohol consumption (Hakulinen et al., 2015). Various studies have investigated the relationship between different personality trait inventories (Aluja et al., 2002, 2003; Gocłowska et al., 2019; Haapasalo, 1990; Zuckerman et al., 1978) and found a relationship between facets of sensation-seeking and facets of the NEO scales extraversion and openness to experience. Further, Foulds and colleagues found that a high score on novelty-seeking at the age of 16 was associated with an increase in substance use disorder at the age of 18–35 (Foulds et al., 2017b). Similarly, a systematic review and meta-analysis of personality traits and alcohol treatment outcomes showed that higher novelty-seeking, lower persistence, lower reward dependence, and lower cooperativeness were associated with relapse (Foulds et al., 2017a). A more recent meta-analysis (Lui et al., 2022) showed that both conscientiousness and agreeableness were negatively correlated with alcohol consumption, heavy drinking, and negative drinking-related consequences. Facet-level analyses indicated that the conscientiousness facets deliberation and dutifulness were associated with alcohol consumption, and the agreeableness facets compliance and straightforwardness were associated with alcohol consumption. Further, extraversion, particularly the excitement-seeking facet, was correlated with alcohol consumption, whereas the neuroticism facets impulsiveness and angry hostility correlated with negative drinking-related consequences.

Based on the few studies that have been performed thus far, it may tentatively be assumed that high neuroticism, high extraversion,

and low conscientiousness may be associated with higher alcohol consumption at the treatment start. It may also be hypothesized that a high level of agreeableness predicts the positive outcome of treatment and retention in care. Further, it may be expected that clients with a low level of agreeableness or high level of conscientiousness prefer to choose their treatment method themselves. In contrast, clients with high neuroticism might prefer to have an expert choose their treatment method for them. However, the relationship between personality traits, preferred treatment methods, and outcome of treatment for AUD is understudied, and little is known so far.

This led us to perform the present secondary, explorative analysis of the data from the Self-Match Study (Hell et al., 2018), hypothesizing that personality traits may affect the outcome of treatment, compliance with treatment, and which treatment is preferred.

The aim is, thus, to investigate in an explorative fashion whether and how personality traits affect the outcome of treatment and clients' choice of treatment.

MATERIALS AND METHODS

Study design

The Self-Match Study was conducted as a randomized controlled trial. Clients were randomized to either Informed Choice (the experimental condition), where they chose their psychotherapy method, or treatment as usual (TAU), where they were allocated to treatment through a paternalistic approach, using an expert-developed algorithm (Nielsen & Nielsen, 2018). The algorithm is based on follow-up studies from locally performed trials (Nielsen & Nielsen, 2015; Nielsen et al., 1998). The algorithm is found to increase the overall outcome of treatment, compared to a historical control group, where clients were allocated to treatment based on the expertise of a clinician (Nielsen & Nielsen, 2018). This is in line with the decision-making literature (Kahneman & Egan, 2011), which argues that systematic evidence-based algorithms outperform expert decisions. The algorithm is based on a composite score from the seven problem areas derived from the Addiction Severity Index (ASI) (Meyers et al., 1995) and then clients are matched to the degree of structure of the treatment options.

Setting

The study was performed at the outpatient alcohol treatment center, Alkoholbehandlingen, in Odense, Denmark. Every year, about 350 clients start treatment at Alkoholbehandlingen. The clinic is driven by the municipality, according to the Danish Health law, and funded by taxes. Treatment in the clinic is free of charge for the client, and no referral is needed. The treatment center offers these five treatment options: cognitive therapy, family therapy, contract treatment, supportive therapy, and environment therapy. The treatment options were manualized (Nielsen & Nielsen, 2015; Nielsen et al., 2000) and the main difference between treatment options was the strictness of the treatment courses and the structure of the sessions. Contract treatment was the strictest and most structured, followed by cognitive therapy, family therapy, environment therapy, and supportive therapy is the least strict and structured treatment options. Description of the treatments options in more detail is available elsewhere (Hell et al., 2018; Nielsen & Nielsen, 2015; Nielsen et al., 2000).

Participants

All consecutive clients ($n = 440$) were approached for participation after the initiation of the study, and $n = 402$ (91%) were enrolled. The participants were followed for 6 months after treatment started. $N = 6$ was later removed from the analysis due to incomplete data; hence, the analysis in the present study is based on 396 participants, see Figure 1. There were no significant differences between the participants randomized to the TAU group and the Informed Choice group.

Procedure

When seeking treatment at the alcohol treatment center, all clients were offered pharmaceutical treatment for withdrawal symptoms if needed and had 1–3 sessions of motivational interviewing before assessment before initiation of a psychosocial treatment course, consisting of one out of five possible treatment options. At this point, after the assessment procedure, but before being allocated a treatment option, a research assistant invited clients to participate in the study. If they agreed to participate, they were randomized to either Informed Choice or allocation to treatment option by an algorithm (TAU).

After randomization, the clients in the TAU group were allocated to treatment options following the usual procedure. The research staff showed the clients in the Informed-Choice group a video presentation of the five treatment options. Based on that information, the clients chose the treatment they preferred. The focus of the video presentation was on providing information on the structure of the treatment options because the algorithm matches clients' characteristics to the structure of the treatment. The treatment options were shown in random sequence to avoid selection bias. To make sure that others did not affect the clients' decisions, the clients had to choose their treatment after having seen the videos and before they left. The vast majority of clients chose immediately after having seen the videos, and only a few had additional questions, wished to see the videos once more, or needed to think for some minutes before choosing their treatment.
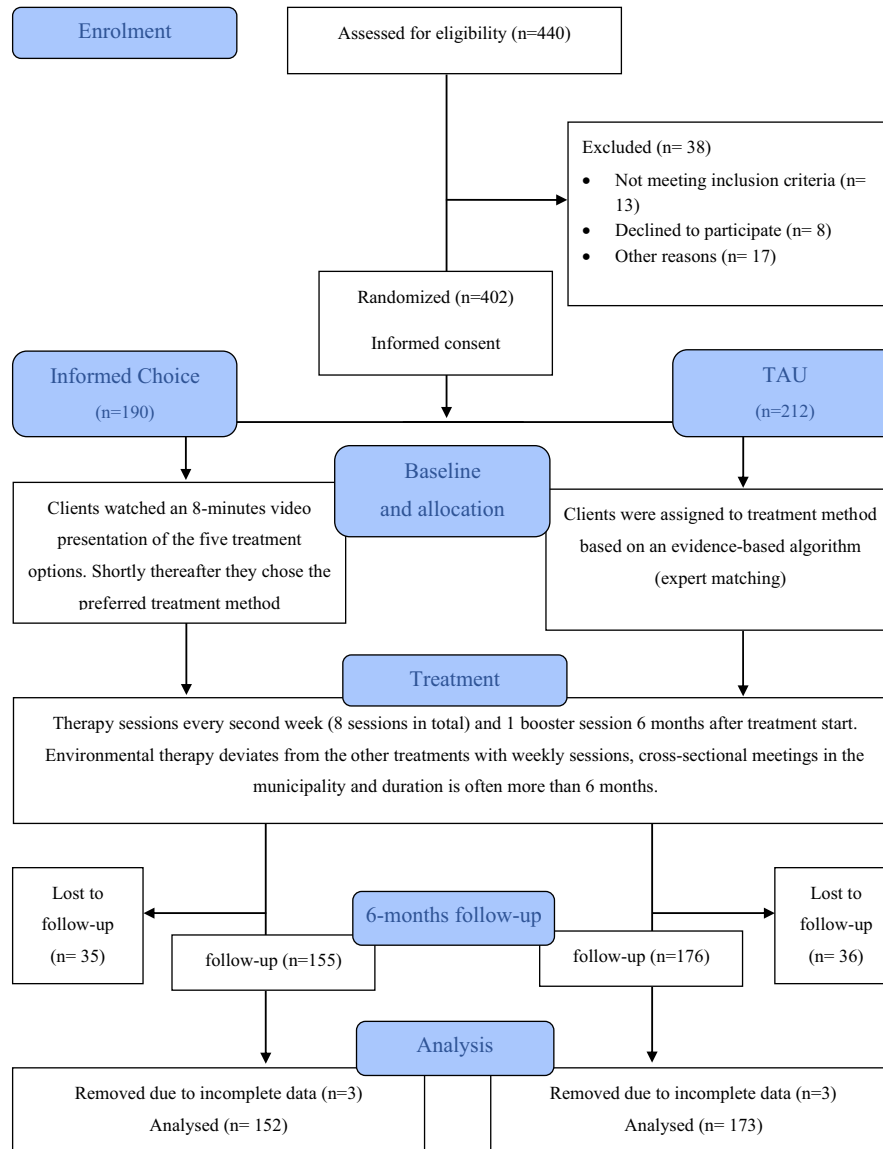
FIGURE 1 CONSORT flowchart

Data

At the time for assessment before treatment (baseline), the following instruments were used to collect data:

- Addiction Severity Index (ASI) (Meyers et al., 1995).
- Timeline Follow Back (TLFB) (Sobell & Sobell, 1992).
- NEO-FFI-3 (McCrae, 1991)

ASI was used to collect sociodemographic information, information on the number of years with excessive drinking, years with co-occurring substance use, and pharmacological treatment currently received. TLFB was used to collect the number of drinking days and heavy drinking days (<4 standard drinks of 12 g of alcohol) during the last 30 days before treatment started and before a follow-up interview, and the number of standard drinks per drinking day.

NEO-FFI-3 was used to collect data and calculate scores on each of the five personality traits: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. NEO-FFI-3 is a short version of NEO-PI-3 consisting of 60 questions. Based on the answers, a sum score of each of the personality traits is calculated using the official NEO-FFI computer program.

For the present analysis, three categories in our dataset were calculated for each personality trait, based on the official NEO-PI-3 norm scores (Costa & McCrae, 2008). First, the reference group scoring between mean norm score ± 2 standard deviations (SD). Clients scoring higher or lower than the norm score ± 2SD were considered high and low in this particular personality trait, respectively. Clients with a score corresponding to the mean and norm score ± 2SD were considered to belong to the reference group.

Outcome measures

The drinking outcome was measured as alcohol consumption each day the previous 30 days to baseline and follow-up. Excessive (heavy) drinking was assessed when the client had five drinks or more in 1 day. In the present study, we calculated an outcome measure reflecting sensible drinking, that is, being abstinent or drinking below the limits recommended by the Danish National Health Authorities (no heavy drinking days and drinking no more than 14 standard drinks for women and 21 standard drinks for men per week) during the last 30 days before the 6-month follow-up interview. Sensible drinking was considered a treatment success.

Retention in care was measured as not dropping prematurely out of treatment, that is, stopping treatment before the agreed-upon time. As a part of standard clinical practice, the treatment staff reported every second month in the case notes if clients were still in treatment. Planned and successful treatment conclusion typically took place after 3 months of treatment and in an agreement between client and staff. If clients had their treatment period extended, they were still considered compliant with treatment.

Statistical analyses

At baseline, we examined categorical variables using Pearson's χ^2-test and Wilcoxon rank-sum test for continuous variables. Pearson's χ^2-test was conducted on both sensible drinking and retention in care.

We investigated the differences in baseline variables between those participants who completed the follow-up interview ($n = 325$) and those who were lost to follow-up ($n = 71$), using Pearson's χ^2-test and Wilcoxon rank-sum test for continuous variables. A thorough description of baseline statistics and descriptive analyses can be found in the primary outcome report (Hell et al., 2021). All analyses are available by request to the first author.

Logistic regression was performed on both retention in care and sensible drinking, and linear regression was performed on the number of heavy drinking days per month. Independent variables were personality traits scores and personality traits categorized according to scores in the normal population (low: −2SD from the mean of the normal population, normal: within the range of ±2SD from the mean of the normal population, and high: +2SD from the mean of the normal population). The analyses were adjusted for randomization (Informed choice vs. TAU) and treatment methods received. Further, Spearman correlations were performed to measure the pairwise correlations between each personality trait and treatment options. Fisher's exact tests were used to analyze associations between treatment choice and the categorized personality traits, while Kruskal–Wallis tests were performed to analyze associations between treatment choice and each personality trait score.

Missing information due to participants being lost to follow-up was assumed to be missing at random and was addressed by multivariate imputation by chained equations. Age, sex, cohabiting status, level of education, and employment status were included as auxiliary variables in the imputation model. The auxiliary variables were chosen if they either correlated with the variables to be imputed or explained the mechanism leading to missing data. Twenty imputed datasets were generated and analyzed separately, and results were combined using the rules of Rubin.

All analyses were conducted in Stata version 16. A two-tailed alternative was used, and due to multiple testing, a significance level of $p = 0.01$ was chosen. However, all results with a significance level of $p = 0.05$ are described.

See the primary outcome report (Hell et al., 2021) for further description of randomization. A thorough description of power calculation is available in the protocol article (Hell et al., 2018). Reporting of both the primary outcome (Hell et al., 2021) and the present secondary analysis follow the guidelines provided by Witkiewitz et al. (2015).

RESULTS

Table 1 shows that the client characteristics at treatment start (baseline) in regards to personality traits were not distributed as in the normal population. Especially the level of neuroticism and openness were relatively higher among the clients in the present study, compared to the normal population.

Retention in care

Table 2 shows the impact of personality traits on retention in care. It can be seen from the table that the odds of completing treatment tended to be lower for clients high in neuroticism than in the reference group (OR 0.52 $p = 0.04$). No other personality traits were found to have an impact. Furthermore, when analyzing personality traits as continuous variables, no significant impact on the completion of treatment was found, and, thus, none of the personality traits had a significant impact on the completion of treatment as such.

Sensible drinking

Table 3 shows the impact of personality traits on whether or not sensible drinking habits were achieved 6 months after treatment start (i.e., at follow-up), and on the number of drinking days during the month prior to 6-month follow-up. The unadjusted analysis of the relation between personality traits, and a sensible drinking pattern 6 months after enrolment, showed that clients with high openness (OR 0.41, $p = 0.017$), extraversion (OR 0.39, $p = 0.045$), and neuroticism (OR 0.48 $p = 0.024$) tended to do worse at follow-up (Table 3).

TABLE 1 Sociodemographic characteristics of clients at baseline

Factor	
N	396
Sex, female	185 (46.7%)
Age at baseline, years mean (SD)	47.41 (13.69)
Cohabiting	161 (40.7%)
Level of education	
None	96 (24.2%)
Undergraduate	189 (47.7%)
Graduate	87 (22.0%)
Employment status[a]	
Employed	184 (46.5%)
Unemployed	76 (19.2%)
Other	136 (34.4%)
Personality traits	
Agreeableness	
Score, mean (SD)	42.88 (6.35)
More than 2 SD lower than the mean score of the normal population	N = 16 (4.04%)
Within the range of ±2SD of the mean of the normal population	N = 341 (86.11%)
More than 2 SD higher than the mean score of the normal population	N = 39 (9.85%)
Conscientiousness	
Score, mean (SD)	42.66 (7.22)
More than 2 SD lower than the mean score of the normal population	N = 21 (5.30%)
Within the range of ±2 SD of the mean of the normal population	N = 344 (86.87%)
More than 2 SD higher than the mean score of the normal population	N = 31 (7.83%)
Extraversion	
Score, mean (SD)	38.16 (7.32)
More than 2 SD lower than the mean score of the normal population	N = 49 (12.37%)
Within the range of ±2 SD of the mean of the normal population	N = 323 (81.57%)
More than 2 SD higher than the mean score of the normal population	N = 24 (6.06%)
Neuroticism	
Score, mean (SD)	37.97 (9.43)
More than 2 SD lower than the mean score of the normal population	N = 5 (1.26%)
Within the range of ±2 SD of the mean of the normal population	N = 336 (84.85%)
More than 2 SD higher than the mean score of the normal population	N = 55 (13.89%)
Openness	
Score, mean (SD)	40.29 (7.06)
More than 2 SD lower than the mean score of the normal population	N = 6 (1.52%)

(Continues)

TABLE 1 (Continued)

Factor	
Within the range of ±2 SD of the mean of the normal population	N = 348 (87.88%)
More than being 2 SD higher than the mean score of the normal population	N = 42 (10.61%)
AUD characteristics at treatment start (time of inclusion)	
Age at drinking debut, <16	221 (55.8%)
Years with excessive drinking, <10	151 (38.1%)
Cooccurring substance use, yes	59 (14.9%)
Pharmaceutical treatment[b], yes	80 (20.2%)
Number of drinking days the last 30 days prior to treatment start, mean (SD)	18.68 (10.44)
Number of heavy drinking days[c] the last 30 days prior to treatment start, mean (SD)	16.24 (10.77)
Drinks per drinking day[d] the last 30 days prior to treatment start, mean (SD)	11.74 (8.40)

[a]Unemployed (out of work but available for the job market), where the category "other" includes ordinary retirement, premature retirement, or other circumstances that categorize clients as not available to the job market. Full-time students were also categorized as other.
[b]Currently in treatment with either Naltrexone, Disulfiram, or Acamprosate
[c]Minimum 5 drinks per drinking day.
[d]One drink equivalent to 12 g of pure alcohol.

This picture did not change when the method of referral (informed choice or TAU) and treatment method were adjusted for, resulting in an odds ratio of 0.37 ($p = 0.009$) for high on openness, (OR 0.47 $p = 0.027$) on neuroticism, and (OR 0.32, $p = 0.027$) on extraversion (Table 3). The adjusted analysis showed that clients scoring high on openness had significantly lower odds of reaching sensible drinking 6 months after treatment started. When exploring personality traits as continuous variables, conscientiousness was significantly associated with reaching sensible drinking ($p = 0.002$ in the unadjusted analysis and $p = 0.009$ in the adjusted analysis). Further, openness tended to be associated with sensible drinking in the adjusted analysis at $p < 0.05$.

Number of heavy drinking days

As can also be seen from Table 3, the adjusted analysis showed that neither scoring high nor low on any personality traits had a significant impact on the number of heavy drinking during the month prior to follow-up, 6 months after treatment started. However, the unadjusted analysis showed that low extraversion tended to be related to heavy drinking and low conscientiousness was significantly related to heavy drinking. Further, higher scores on conscientiousness predicted fewer days of heavy drinking per month with a coefficient B=−1.01 p=0.005 (unadjusted analysis) and coefficient $B = −0.78$ $p = 0.035$ (adjusted analysis).

TABLE 2 Odds ratio for retention in care, depending on the personality trait

Factor	Completed treatment (N = 244)	
	Unadjusted	**Adjusted**[a]
	OR (95% CI)	OR (95% CI)
Agreeableness		
As continuous variable[b]	1.21 (0.99–1.47)	1.17 (0.69–1.44)
As categories of normal population		
Low[c]	0.62 (0.23–1.72)	0.80 (0.26–2.46)
Normal[d]	Reference	Reference
High[e]	0.60 (0.30–1.21)	0.68 (0.32–1.43)
Conscientiousness		
As continuous variable[b]	1.11 (0.90–1.36)	1.06 (0.85–1.31)
As categories of normal population		
Low[c]	0.48 (0.19–1.19)	0.46 (0.18–1.15)
Normal[d]	Reference	Reference
High[e]	0.64 (0.29–1.41)	0.69 (0.30–1.60)
Extraversion		
As continuous variable[b]	1.08 (0.89–1.32)	1.03 (0.84–1.27)
As categories of normal population		
Low[c]	0.73 (0.39–1.36)	0.77 (0.40–1.48)
Normal[d]	Reference	Reference
High[e]	0.48 (0.20–1.13)	0.53 (0.21–1.33)
Neuroticism		
As continuous variable[b]	0.87 (0.70–1.07)	0.89 (0.71–1.11)
As categories of normal population		
Low[c]	Omitted	Omitted
Normal[d]	Reference	Reference
High[e]	0.47 (0.26–0.86)[**]	0.52 (0.28–0.97)[*]
Openness		
As continuous variable[b]	1.09 (0.88–1.35)	1.02 (0.81–1.28)
As categories of normal population		
Low[c]	0.49 (0.10–2.47)	0.56 (0.09–2.89)
Normal[d]	Reference	Reference
High[e]	0.66 (0.34–1.30)	0.66 (0.33–1.33)

[a]Adjusted for the method of referral and treatment.
[b]One unit on the score of the particular personality trait
[c]Lower than −2SD from the mean of the normal population
[d]Scoring within the range of ±2SD from the mean of the normal population (±2SD from the mean included)
[e]Higher than +2SD from the mean of the normal population
*Significantly different from reference group ($p < 0.05$); **Significantly different from reference group ($p < 0.01$).

Higher extraversion tended to predict fewer heavy drinking days ($B = −0.73$ $p < 0.05$) Further, Spearman's analysis showed a negative correlation between conscientiousness and heavy drinking days ($−0.178$, $p = 0.002$) and a positive correlation between neuroticism and heavy drinking days (0.131, $p = 0.023$). None of the other personality traits seemed to have an impact.

Treatment in the self-match group

The personality trait scores of neuroticism and openness were associated with treatment preferences; however, there was no indication that treatment choice differed between clients scoring high, low, or as the mean of normal population ±2SD any of the personality traits (Table 4).

DISCUSSION

First, this secondary analysis of the Self-Match Study showed that none of the personality traits had a significant association with compliance in treatment, that is, risk of dropout. The only exception was that higher scores on neuroticism tended to be associated with higher dropout rates. Although this finding should be interpreted with caution due to the multi-testing design of the present study, the trend is consistent with existing evidence; hence, from a clinical point of view, it might be valuable to be aware of clients for whom this personality trait is pronounced.

We also found an association between high scores on extraversion, openness to experience, and neuroticism compared to the normal population, and failing to reach sensible drinking 6 months after initiation of planned treatment. Except for openness, these findings were, however, not significant when adjusting for the method of referral and treatment method received, and due to the multi-testing design in the present study, the finding should only be considered a trend. Nonetheless, the finding is in line with previous studies showing that higher novelty-seeking and higher sensation-seeking are associated with both increase in substance use and lower retention in care (Foulds et al., 2017a, 2017b). Since a relation between the facets of novelty-seeking, sensation-seeking, extraversion, and openness to experience has been shown (Gocłowska et al., 2019), we consider the findings valid. Further, we found an association between higher conscientiousness scores and increased odds of reaching sensible drinking. Although it was not possible to detect such an association in the categorical analysis, this finding is also consistent with the existing literature (Malouff et al., 2007).

Personality traits also had an impact on the risk of heavy drinking at follow-up. Higher extraversion tended to predict fewer heavy drinking days and clients low on conscientiousness had a significantly higher risk of worse outcomes at follow-up, a finding that was still present when controlling for the method of referral and treatment received. Although the findings should be interpreted with caution due to the multi-testing design, the Spearman analysis supports the negative correlation between conscientiousness and heavy drinking. Overall, conscientiousness, openness to experience, neuroticism, and extraversion should be taken into account when

TABLE 3 The impact of personality traits on the probability of reaching sensible drinking, and the relation between personality traits and the number of heavy drinking days per month, 6 months after treatment starts

Factor	Sensible drinking[a]		Number of heavy drinking days[c]	
	Unadjusted	Adjusted[**]	Unadjusted	Adjusted[**]
	OR (95% CI)	OR (95% CI)	Coefficient B (95% CI)	Coefficient B (95% CI)
Agreeableness				
As continuous variable	1.04 (0.85 to 1.28)	1.04 (0.84 to 1.29)	−0.01 (−0.70 to 0.69)	0.00 (−0.72 to 0.72)
As categories of normal population				
Low[b]	3.51 (0.76 to 16.12)	3.12 (0.66 to 14.80)	−3.23 (−7.11 to 0.66)	−2.57 (−7.52 to 2.39)
Normal[c]	Reference	Reference	Reference	Reference
High[d]	0.72 (0.35 to 1.51)	0.70 (0.32 to 1.64)	0.33 (−2.23 to 2.88)	−1.33 (−4.79 to 2.12)
Conscientiousness				
As continuous variable	1.42 (1.14 to 1.77)[**]	1.36 (1.08 to 1.71)[**]	−1.01 (−1.71 to −0.31)[**]	−0.78 (−1.51 to −0.06)[*]
As categories of normal population				
Low[b]	0.41 (0.16 to 1.06)	0.44 (0.17 to 1.14)	4.60 (1.38 to 7.82)[**]	1.65 (−3.25 to 6.55)
Normal[c]	Reference	Reference	Reference	Reference
High[d]	0.53 (0.23 to 1.20)	0.47 (0.20 to 1.11)	0.65 (−2.19 to 3.49)	−2.32 (−6.38 to 1.73)
Extraversion				
As continuous variable	1.15 (0.94 to 1.41)	1.11 (0.89 to 1.38)	−0.73 (−1.42 to −0.04)[*]	−0.61 (−1.34 to 0.11)
As categories of normal population				
Low[b]	0.80 (0.40 to 1.59)	0.81 (0.40 to 1.64)	2.72 (0.35 to 5.08)[*]	−0.21 (−3.47 to 3.06)
Normal[c]	Reference	Reference	Reference	Reference
High[d]	0.39 (0.15 to 0.98)[*]	0.32 (0.12 to 0.88)[*]	1.08 (−2.09 to 4.24)	−1.55 (−6.20 to 3.09)
Neuroticism				
As continuous variable	0.79 (0.63 to 0.98)[*]	0.85 (0.67 to 1.07)	0.84 (0.10 to 1.58)[*]	0.52 (−0.25 to 1.29)
As categories of normal population				
Low[b]	1.72 (0.18 to 16.77)	1.53 (0.15 to 15.23)	−0.28 (−7.18 to 6.62)	−2.96 (−16.61– 10.70)
Normal[c]	Reference	Reference	Reference	Reference
High[d]	0.48 (0.25–0.91)[*]	0.47 (0.24 to 0.92)[*]	1.72 (−0.51 to 3.94)	−0.94 (−4.44 to 2.55)
Openness				
As continuous variable	0.86 (0.69 to 1.07)	0.78 (0.61 to 0.997)[*]	−0.14 (−0.89 to 0.60)	0.00 (−0.77 to 0.77)
As categories of normal population				
Low[b]	Omitted	Omitted	−3.52 (−9.18 to 2.14)	−2.36 (−10.35 to 5.63)
Normal[c]	Reference	Reference	Reference	Reference
High[d]	0.41 (0.20 to 0.86)[*]	0.37 (0.17 to 0.78)[**]	0.57 (−1.92 to 3.06)	−0.34 (−4.04 to 3.41)

Note: Continuous outcome data (number of heavy drinking days) is analyzed using linear regression analyses, hence presented with coefficients and not odds ratio. Binary outcomes are measured using logistic regression analysis and presented with odds ratio.

[a]Sensible drinking = previous 30 days with no drinking days with five or more drinks and no more than 14 drinks for women and 21 for men per week.

[b]Adjusted for the method of referral and treatment.

[c]A heavy drinking day = 5 or more drinks.

[d]One unit on the score of the particular personality trait.

[e]Lower than −2SD from the mean of the normal population.

[f]Scoring within the range of ±2SD from the mean of the normal population (±2SD from the mean included).

[g]Higher than +2SD from the mean of the normal population.

*Significant difference from reference group (*p* < 0.05).; **Significant difference from reference group (*p* < 0.01).

planning AUD treatment. This is in line with a meta-analysis on associations between personality traits and mental health, and substance use (Kotov et al., 2010).

It thus seems that personality traits have an impact on AUD treatment outcomes. In this study, we used NEO-FFI-3, which, like other NEO instruments, requires a licensed psychologist to administer.

TABLE 4 Choice of treatment method in the Informed-Choice group (self-match) by score on each personality trait, relative to the scores of the normal population

Factor	Contract treatment	Cognitive therapy	Family therapy	Supportive therapy	Environ-mental therapy	p-value
N	27	80	9	51	11	
Agreeableness						
Continuous, mean (SD)	−0.22 (1.03)	0.12 (1.14)	0.06 (0.62)	0.26 (0.89)	0.52 (1.28)	0.33
Groups cf. Background population, N (%)						
Low[e]	2 (7%)	2 (3%)	0 (0%)	0 (0%)	2 (18%)	0.07
Normal[e]	24 (89%)	73 (91%)	8 (89%)	45 (88%)	7 (64%)	
High[e]	1 (4%)	5 (6%)	1 (11%)	6 (12%)	2 (18%)	
Conscientiousness						
Continuous, mean (SD)	−0.36 (1.18)	−0.16 (1.13)	0.15 (0.77)	0.02 (1.09)	−0.59 (1.73)	0.49
Groups cf. background population, N (%)						
Low	2 (7%)	5 (6%)	0 (0%)	3 (6%)	2 (18%)	0.41
Normal	23 (85%)	71 (89%)	8 (89%)	42 (82%)	7 (64%)	
High	2 (7%)	4 (5%)	1 (11%)	6 (12%)	2 (18%)	
Extraversion						
Continuous, mean (SD)	−0.64 (1.21)	−0.50 (1.20)	0.28 (0.89)	−0.69 (1.14)	−0.56 (1.32)	0.32
Groups cf. background population, N (%)						
Low	4 (15%)	11 (14%)	0 (0%)	6 (12%)	0 (0%)	0.46
Normal	22 (81%)	66 (83%)	8 (89%)	40 (78%)	9 (82%)	
High	1 (4%)	3 (4%)	1 (11%)	5 (10%)	2 (18%)	
Neuroticism						
Continuous, mean (SD)	0.80 (1.11)	0.60 (1.17)	−0.38 (0.58)	0.47 (0.98)	1.12 (1.40)	0.03[*]
Groups cf. background population, N (%)						
Low	0 (0%)	3 (4%)	0 (0%)	0 (0%)	0 (0%)	0.40
Normal	22 (81%)	64 (80%)	8 (89%)	42 (82%)	6 (55%)	
High	5 (19%)	13 (16%)	1 (11%)	9 (18%)	5 (45%)	
Openness						
Continuous, mean (SD)	0.19 (0.92)	0.48 (1.09)	0.06 (0.80)	−0.22 (0.87)	−0.19 (1.29)	0.01[**]
Groups cf. background population, N (%)						
Low	1 (4%)	1 (1%)	0 (0%)	0 (0%)	1 (9%)	0.52
Normal	24 (89%)	69 (86%)	8 (89%)	45 (88%)	8 (73%)	
High	2 (7%)	10 (13%)	1 (11%)	6 (12%)	2 (18%)	

[a]Mean and SD based on the background population. Normal corresponds to study patients with scores between mean −2 SD and mean +2 SD of the background population.

*Significantly different from reference group ($p < 0.05$).; **Significance different from reference group ($p < 0.01$).

Since measuring personality traits might be a huge task, especially for small treatment centers, other more feasible instruments are available at The International Item Pool, such as the 100-item PID-5-SF (Thimm et al., 2016).

This study only investigated personality traits at the domain level; hence, future research should focus on the facet or aspect level of personality traits. For example, DeYoung et al. (2007) support the existence of two distinct yet correlated aspects within each of the Big Five, representing an intermediate level of personality structure between facets and domains. DeYoung et al. (2007) have developed The Big Five Aspect Scale (BFAS), which

is a comprehensive, open-source 100-item personality measure. It is an easy-access tool and gives information about the five major personality traits and their ten aspects. The use of BFAS could improve the identification of individuals at risk of alcohol abuse, relapse, and treatment dropout. A project by Kotov et al. (2021) is already investigating the correlation between certain structures of personality and specific psychopathology. The same could be done concerning alcohol treatment and compliance. In this study, we used a short version of NEO-PI-3, which does not measure the two aspects of each trait; therefore, we have no further recommendation on that matter.

The treatment was chosen in the Informed-Choice group (self-match) varied significantly from the TAU group on contract treatment ($p < 0.009$) and supportive therapy ($p < 0.000$) (Hell et al., 2021). In the present study, we found that the level of openness and neuroticism varied among clients choosing the different treatment methods, but we found no indication that the choice of treatment was related to whether clients scored particularly high or low in a personality trait. Hence, our study does not indicate that personality measures can be used for allocating clients to treatments, that is, as a matching variable on high/low openness; nevertheless, the association between openness and neuroticism to treatment choice should be investigated further. Moreover, knowledge of pitfalls for clients due to their personality traits should be used to discuss potential obstacles with clients and modify treatment to be more client-centered.

In general, the Self-Match Study did not find that allowing clients to choose the treatment methods themselves (Informed Choice), rather than allocating clients to treatment methods by means of expert matching, led to different treatment outcomes. The present secondary analysis on the impact of high or low levels of personality traits does not change this conclusion. Despite the fact that personality traits have some impact on the chance of reaching a sensible drinking pattern following treatment, this impact does not seem to be related to whether or not the clients are allowed to choose a treatment method, nor related to the treatment methods received. Detecting clients with a high score on neuroticism, extraversion, openness to experience, novelty-seeking, sensation-seeking, or low score on conscientiousness may be worthwhile, but further research on what specific treatment to offer them is still needed.

So far, an Informed Choice approach to treatment planning is not common in the field of treatment of AUD, but shared decision making is gaining more and more attention (Hell & Nielsen, 2019). Future studies should focus on a shared decision-making approach and measure personality traits. A 5-year follow-up study from the Self-Match Study is currently being planned and will show if there are any long-term effects of an Informed Choice approach and if personality traits have an impact.

CONCLUSION

Personality traits influence the likelihood of reaching sensible drinking in a 6-month perspective. We found that clients scoring high on extraversion, neuroticism, and openness tended to fare worse in regard to reaching sensible drinking just as a low score on conscientiousness was associated with less sensible drinking. Further, there was an association between an increase in the conscientiousness score and a decrease in the number of heavy drinking days. Consequently, we conclude that personality traits influence 6-month drinking outcomes for clients receiving AUD treatment.

Limitations

There are some limitations to this secondary analysis. First, the power calculation is omitted because it is based on the primary outcome measure, heavy drinking days; hence, there is a risk that the study is underpowered to detect a significant difference in the secondary analysis of personality traits. Further, the large number of tests may lead to problems with multiple testing. To address this, we used a conservative significance level of $p = 0.01$.

AUTHOR CONTRIBUTIONS

Anette Søgaard Nielsen, Morten Ellegaard Hell, Anders Müller, and Christina Gehling Horn have contributed to all sections of the manuscript. Anette Søgaard Nielsen, Morten Ellegaard Hell, Bent Nielsen, and William R. Miller have designed the study. Anders Müller and Morten Ellegaard Hell performed statistical analyses.

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REFERENCES

Allen, J.P., Mattson, M.E., Miller, W.R., Tonigan, J.S., Connors, G.J., Rychtarik, R.G. et al. (1997) Matching alcoholism treatments to client heterogeneity: Project MATCH posttreatment drinking outcomes. *Journal of Studies on Alcohol*, 58, 7–29.

Aluja, A., García, Ó. & García, L.F. (2002) A comparative study of Zuckerman's three structural models for personality through the NEO-PI-R, ZKPQ-III-R, EPQ-RS and Goldberg's 50-bipolar adjectives. *Personality Individual Differences*, 33, 713–725.

Aluja, A., García, O. & García, L.F. (2003) Relationships among extraversion, openness to experience, and sensation seeking. *Personality Individual Differences*, 35, 671–680.

Andersen, A.M. & Bienvenu, O.J. (2011) Personality and psychopathology. *International Review of Psychiatry*, 23, 234–247.

Babor, T.F. (2008) Treatment for persons with substance use disorders: mediators, moderators, and the need for a new research approach. *International Journal of Methods in Psychiatric Research*, 17(Suppl 1), S45–S49.

Bucher, M.A., Suzuki, T. & Samuel, D.B. (2019) A meta-analytic review of personality traits and their associations with mental health treatment outcomes. *Clinical Psychology Review*, 70, 51–63.

Costa, P.T. Jr., & McCrae, R.R. (2008) The Revised NEO Personality Inventory (NEO-PI-R). In: Boyle, G.J., Matthews, G. & Saklofske, D.H. (Eds.) *The SAGE handbook of personality theory and assessment: volume 2 – personality measurement and testing*. (pp. 179–197). SAGE Publications Ltd.

Deyoung, C.G., Quilty, L.C. & Peterson, J.B. (2007) Between facets and domains: 10 aspects of the Big Five. *Journal of Personality and Social Psychology*, 93, 880.

Foulds, J.A., Boden, J.M., Newton-Howes, G.M., Mulder, R.T. & Horwood, L.J. (2017b) The role of novelty seeking as a predictor of substance use disorder outcomes in early adulthood. *Journal of Addiction*, 112, 1629–1637.

Foulds, J., Newton-Howes, G., Guy, N.H., Boden, J.M. & Mulder, R.T. (2017a) Dimensional personality traits and alcohol treatment outcome: a systematic review and meta-analysis. *Journal of Addiction*, 112, 1345–1357.

Gerlach, G., Herpertz, S. & Loeber, S.J.O.R. (2015) Personality traits and obesity: a systematic review. *Obesity Reviews*, 16, 32–63.

Gocłowska, M.A., Ritter, S.M., Elliot, A.J. & Baas, M. (2019) Novelty seeking is linked to openness and extraversion, and can lead to greater creative performance. *Journal of Personality*, 87, 252–266.

Gough, H.G. (1956) *California psychological inventory*. Palo Alto, CA: Consulting Psychologists Press.

Haapasalo, J. (1990) The Eysenck personality questionnaire and Zuckerman's sensation seeking scale (form v) in Finland: age differences. *Personality Individual Differences*, 11, 503–508.

Hakulinen, C., Elovainio, M., Batty, G.D., Virtanen, M., Kivimäki, M. & Jokela, M. (2015) Personality and alcohol consumption: Pooled analysis of 72,949 adults from eight cohort studies. *Drug and Alcohol Dependence*, 151, 110–114.

Hansen, E.M., Mejldal, A. & Nielsen, A.S. (2020) Predictors of readmission following outpatient treatment for alcohol use disorder. *Alcohol and Alcoholism*, 55, 291–298.

Heather, N., Copello, A., Godfrey, C., Heather, N., Orford, J., Raistrick, D. et al. (2008) UK Alcohol Treatment Trial: client-treatment matching effects. *Addiction*, 103, 228–238.

Hell, M.E., Miller, W.R., Nielsen, B. & Nielsen, A.S. (2018) Is treatment outcome improved if patients match themselves to treatment options? Study protocol for a randomized controlled trial. *Trials*, 19, 219.

Hell, M.E., Miller, W.R., Nielsen, B., Mejldal, A. & Nielsen, A.S. (2021) The impact of free choice in alcohol treatment. Primary outcomes of the Self-Match study. *Drug and Alcohol Dependence*, 221, 108587.

Hell, M. & Nielsen, A.S. (2019) Does patient involvement in treatment planning improve adherence, enrollment and other treatment outcome in alcohol addiction treatment? A systematic review. *Addiction Research & Theory*, 28(6), 537–545.

Hesse, M., Thylstrup, B. & Nielsen, A.S. (2017) Matching patients to treatments or matching interventions to needs. In: Kolind, T., Thom, B. & Hunt, G. (Eds.) *Handbook of drug and alcohol studies – social science perspectives*. (pp. 287–301). London, UK: SAGE Publications.

Kahneman, D. & Egan, P. (2011) *Thinking, fast and slow*. New York, NY: Farrar, Straus and Giroux.

Kotov, R., Gamez, W., Schmidt, F. & Watson, D. (2010) Linking "big" personality traits to anxiety, depressive, and substance use disorders: a meta-analysis. *Psychological Bulletin*, 136, 768.

Kotov, R., Krueger, R.F., Watson, D., Cicero, D.C., Conway, C.C., Deyoung, C.G. et al. (2021) The Hierarchical Taxonomy of Psychopathology (HiTOP): A quantitative nosology based on consensus of evidence. *Annual Review of Clinical Psychology*, 17, 83–108.

Lui, P.P., Chmielewski, M., Trujillo, M., Morris, J. & Pigott, T.D. (2022) Linking big five personality domains and facets to alcohol (mis) use: a systematic review and meta-analysis. *Alcohol and Alcoholism*, 57, 58–73.

Malouff, J.M., Thorsteinsson, E.B., Rooke, S.E. & Schutte, N.S. (2007) Alcohol involvement and the five-factor model of personality: a meta-analysis. *Journal of Drug Education*, 37, 277–294.

McCrae, R.R. (1991) The five-factor model and its assessment in clinical settings. *Journal of Personality Assessment*, 57, 399–414.

McCrae, R.R. & Sutin, A.R. (2018) A five-factor theory perspective on causal analysis. *European Journal of Personality*, 32, 151–166.

Meyers, K., McLellan, A., Jaeger, J.L. & Pettinati, H.M. (1995) The development of the comprehensive addiction severity index for adolescents (CASI-A): an interview for assessing multiple problems of adolescents. *Journal of Substance Abuse Treatment*, 12, 181–193.

Nielsen, A.S. & Nielsen, B. (2015) Implementation of a clinical pathway may improve alcohol treatment outcome. *Addiction Science & Clinical Practice*, 10, 1–7.

Nielsen, A.S. & Nielsen, B. (2018) Improving outpatient alcohol treatment systems: integrating focus on motivation and actuarial matching. *Alcoholism Treatment Quarterly*, 36, 373–386.

Nielsen, B., Nielsen, A.S. & Wraae, O. (1998) Patient-treatment matching improves compliance of alcoholics in outpatient treatment. *Journal of Nervous and Mental Disease*, 186, 752–760.

Nielsen, B., Nielsen, A.S. & Wraae, O. (2000) Factors associated with compliance of alcoholics in outpatient treatment. *The Journal of Nervous and Mental Disease*, 188, 101–107.

Project Match Research Group (1997a) Project MATCH secondary a priori hypotheses. *Addiction*, 92, 1671–1698.

Project MATCH Research Group (1997b) Matching alcoholism treatments to client heterogeneity: Project MATCH posttreatment drinking outcomes. *Journal of Studies on Alcohol*, 58, 7–29.

Schwarz, A.S., Nielsen, B. & Nielsen, A.S. (2018) Changes in profile of patients seeking alcohol treatment and treatment outcomes following policy changes. *Zeitschrift für Gesundheitswissenschaften*, 26, 59–67.

Sobell, L.C. & Sobell, M.B. (1992) Timeline follow-back. In: Allen, J.P. & Litten, R.Z. (Eds.) *Measuring alcohol consumption*. (pp. 41–72). Springer, Humana Press.

Thimm, J.C., Jordan, S. & Bach, B. (2016) The Personality Inventory for DSM-5 Short Form (PID-5-SF): psychometric properties and association with big five traits and pathological beliefs in a Norwegian population. *BMC Psychology*, 4, 1–11.

Ukatt Research Team (2005) Effectiveness of treatment for alcohol problems: findings of the randomised UK alcohol treatment trial (UKATT). *BMJ*, 331, 541.

Witkiewitz, K., Finney, J.W., Harris, A.H., Kivlahan, D.R., & Kranzler, H.R.J.A.C. (2015) Guidelines for the reporting of treatment trials for alcohol use disorders. *Alcoholism, Clinical and Experimental Research*, 39, 1571–1581.

World Health Organization. (2018) *Global status report on alcohol and health 2018*. Geneva, Switzerland: World Health Organization.

Zuckerman, M., Eysenck, S.B. & Eysenck, H. (1978) Sensation seeking in England and America: cross-cultural, age, and sex comparisons. *Journal of Consulting Clinical Psychology: Science and Practice*, 46, 139.