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REVISITING THE EFFICACY OF COGNITIVE-BEHAVIOURAL THERAPY FOR DEPRESSION AND ANXIETY IN OLD AGE: PRELIMINARY FINDINGS ON THE EXTRAVERSION-NEUROTICISM CONFOUNDING EFFECTS.

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ABSTRACT

Previous works states that Cognitive Behavioural Therapy (CBT) is an effective treatment for both anxiety and depression across the lifespan. Studies found the effect of CBT to be respectively large and moderate when compared with waitlist conditions and other control groups. However, given that personality is an individual's unique genetic composition, enduring and generally resistant to sudden changes, this preliminary study addressed these questions: (a) Is CBT effective for the management of depression and anxiety among a sample of community older adults? and (b) If so, is the effectiveness maintained after excluding extraversion, neuroticism, perception of social support, physical health problems and self-rated health (SRH)? Three independent models were examined using one-way MANCOVA. In the initial model, CBT was effectively compared to the waitlist condition after excluding depression/anxiety baseline scores. This effectiveness was lost after excluding anxiety and depression in the second model. However, CBT regained its efficacy by excluding the perception of social support, physical health problems and SRH in the third model. Preliminary findings suggest that extraversion and neuroticism may substantially confound, or account for, the apparent effect of CBT on depression and anxiety in this population. These findings, however, are largely exploratory. Future studies can employ randomized controlled trials with larger sample sizes to replicate outcomes.

Keywords: CBT; Anxiety; Depression; Extraversion; Neuroticism

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INTRODUCTION

Depression is a leading cause of disability worldwide (Liua et al., 2019; Friedrich, 2017) and one of the most frequently diagnosed mental disorders among older adults (World Health Organisation, 2025). From 1990 to 2017, the global figure reported for the incident cases of depression increased from 172 million to 258 million, representing almost a 50% increase (Liua et al., 2019). WHO (2017) estimated a prevalence rate of 7% for depression among the geriatric population; however, this rate could be up to 40% among older people in clinical settings and nursing homes (Royal College of Psychiatrists & British Geriatric Society, 2018; Padayacheya, Ramlalla, & Chipp, 2017). Unmanaged geriatric depression poses a higher risk of diabetes, heart disease, stroke, back pain, shortness of breath, visual impairments and dizziness (Niles & O'Donovan, 2019). In addition, depression increases the vulnerability to earlier mortality in later life (Lo et al., 2025).

As a highly comorbid disorder of depression (Liu et al., 2025), anxiety poses a significant danger to cognition and health in later life (Margoni et al., 2023). It is primarily diagnosed in community older adult samples compared to depression (Singleton et al., cited in Bryant et al., 2013). Across several studies, Remes et al. (2016) reported a prevalence of 3.8-25% for anxiety disorder in the general population, while WHO (2017) specifically estimated a global prevalence of 3.8% among older adults. Fifteen per cent of oldest-old adults (age 82+ years) suffer from symptoms related to anxiety (Welzel et al., 2019). Similar to depression, anxiety lowers the physical and mental quality of life of older people (Gerino et al., 2017). Compared to the general population, increased mortality risk caused by both unnatural and natural sources was significantly higher among people diagnosed with anxiety disorders (Meier et al., 2016).

Over the years, the treatment of both anxiety and depression has been largely successful through the utilisation of cognitive behavioural therapy (CBT), as evident in thousands of randomised control trials (Fordham et al., 2018). For instance, in a systematic literature review, Cunningham and Shapiro (2018) demonstrated that CBT was effective in managing depression comorbid with insomnia. Similarly, Dear et al. (2018) indicated that CBT delivered via the Internet yielded a larger reduction in symptoms of depression and anxiety in a

sample of adults (aged 18-24). Luik et al. (2017) obtained a recovery rate of 68% among patients diagnosed with both anxiety and depression after delivering CBT-based psychological therapies, while Montero-Marin, Garcia-Campayo, López-Montoyo, Zabaleta-del- Olmo and Cuijpers (2018) demonstrated the effectiveness of CBT over relaxation therapy in the management of anxiety disorders. Similar to the general population, CBT-based therapies are also found to be equally effective in the treatment of comorbid anxiety and depression in the older adult sample (Wuthrich & Rapee, 2013; Titov et al., 2016).

The Present Study

Although numerous studies have shown the efficacy of CBT in the reduction of depression and anxiety in both clinical and non-clinical populations, the current study aims to examine whether CBT effectiveness go beyond the influence of personality traits with specific reference to extraversion and neuroticism traits. It is substantially evident in the research literature that psychological disorders and negative emotions are strongly dependent on personality traits (Alizadeh et al. 2018). For example, neuroticism is shown to be a strong predictor of symptoms of depression and anxiety (e.g. Chen et al., 2020). Higher neuroticism is associated with increased rates of depression and negative affects (Elliot et al., 2019; Liao et al., 2019). In a longitudinal study by Lee et al. (2018), the predictive ability of neuroticism on depression and anxiety symptoms was found to surpass the effect of seizure occurrence among patients diagnosed with epilepsy.

Like neuroticism, the role of extraversion in depression and anxiety is underscored in the research literature. Unlike neuroticism, extraversion is protective against both depression and anxiety symptoms (Alizadeh et al., 2018). Klinger-König et al., (2018) showed that extraversion formed a negative association with depression scores while also attenuating the association between neuroticism and depressive symptoms. Lower extraversion predicts both higher anxiety-depression scores, although this predictive ability is lesser compared to that of neuroticism (Lee et al., 2018).

Given that personality traits are strongly implicated in manifestations of depression and anxiety symptoms, and that these traits have substantial or at least partly genetic components (Røysamb et al., 2018), enduring and "generally resistant to sudden changes" (Schultz & Schultz, 2005, p.10) with a high level of predictability and

stability throughout the lifespan (McCrae and Costa, 1996), and most especially at young adulthood (Lönnqvist et al., 2009) and old age (Mottus et al., 2012), it is important test whether their influences goes beyond the efficacy of CBT in the treatment of both depression and anxiety.

We already know that extraversion and neuroticism have a significant role in CBT and pharmacotherapy (PHT) outcomes. For instance, in a two-randomized trial study, Bagby et al. (2008) showed that patients diagnosed with depression with higher levels of neuroticism had lower potentials of responding to CBT compared with pharmacotherapy (PHT). The authors explained that because patients with high scores of neuroticism are genetically predisposed to be emotionally deregulated, they had lower psychological resources required to propel the cognitive strategies needed for CBT. Thus, these patients may need PHT to directly target neural systems associated with emotional deregulation in order to circumvent "the cognitive requirements for response to CBT" (p. 7). In addition, patients with high scores on extraversion, characterised by positive emotions and excitement seeking, had lower scores on depression at CBT completion. In a more recent study, neuroticism was even found to moderate PHT outcomes where patients with high neuroticism and stress vulnerability scores were found to be less likely to have remission on later-life depression after completion of sertraline doses (Steffens et al., 2018). Zinbarg et al. (2008) also emphasised the role of personality in the treatment of anxiety and depression using psychotherapy.

Based on the roles of extraversion and neuroticism on therapy efficacy and more specifically on CBT outcomes, these research questions are raised:

1. Are there remissions for depression and anxiety at post-treatment with the use of CBT after controlling for depression and anxiety base-line scores?
2. If so, are these remissions maintained or not after controlling for primary covariates of extraversion and neuroticism?
3. Still, are these remissions maintained or not after controlling for secondary covariates of physical health burdens, self-rated health and perception of social support?

Previously, literature has demonstrated that physical health problems, self-rated health (Atkins et al., 2013; Olawa et al., 2020) and social support (Sharpley et

al., 2015) have significant roles to play in depression and anxiety manifestations. The roles of these secondary covariates are examined to determine their importance relative to extraversion and neuroticism. However, these secondary covariates are not expected to exert the same influence as the primary covariates since they are temporary states and do not constitute genetic vulnerability in the manifestation of depression and anxiety symptoms.

This study would add to the literature by examining whether the effect of CBT goes beyond the influences of personality variables. To our knowledge, this is the first study to focus on such an aim. In addition, this study will demonstrate the usefulness of CBT in managing depression and anxiety among a sample of older adults in Nigeria. There is relatively scarce published data demonstrating CBT efficacy among older adults within the Nigerian context.

METHOD

Design

This study used a pretest-posttest control-group design. Participants were randomly assigned to two groups (CBT treatment and waitlist control) and underwent both the pre-test and post-test procedures. Hence, this study was a randomized controlled trial.

Sample and Procedure

This was the second phase of a larger study that recruited 465 community-dwelling older adults from 14 rural/semi-urban towns in Ekiti State, Nigeria (Olawa, 2020). All the thirty (30) participants from the towns with the highest mean scores on the Five-Item Geriatric Depression Scale (GDS: Rinaldi et al., 2003) and the Geriatric Anxiety Inventory – Short Form (GAI-SF: Byrne Pachana, 2011) as obtained in the larger study were recruited for the present study (Olawa et al., 2020). The mean and standard deviation scores of the towns compared with that of the overall sample of older adults in the larger study with effect sizes are GDS (subsample = 2.00 ± 1.18; overall sample = 1.09 ± .94, Cohen's d = .95), GAI-SF (Subsample = 2.30 ± 1.64; overall sample = 1.76 ± 1.64, *Cohen's d* = .33). According to the interpretation of Wolf (1986) these effect sizes are practically or clinically significant which may warrant psychotherapeutic intervention.

However, of the 30 older adults recruited, 21 were found eligible, as their GDS and GAI-SF scores were above the overall

sample mean. Other eligibility criteria include the absence of cognitive confusion as determined during an initial rapport. Based on the 21 eligible cases, 11 and 10 older adults were randomly assigned to the Cognitive Behavioural Therapy (CBT) and waitlist control groups, respectively. After the sessions, only 8 participants completed CBT sessions, while 6 remained in the waitlist control condition. The sample sizes for both the CBT group and the waitlist control condition are consistent with the recommended range (5-10/12) for group psychotherapy, as shown in various studies (e.g., Wuthrich & Rapee, 2013; Thorn & Kuhajda, 2006; Weis, 2003, etc.). Figure 1 displays the flow of participants through the study.

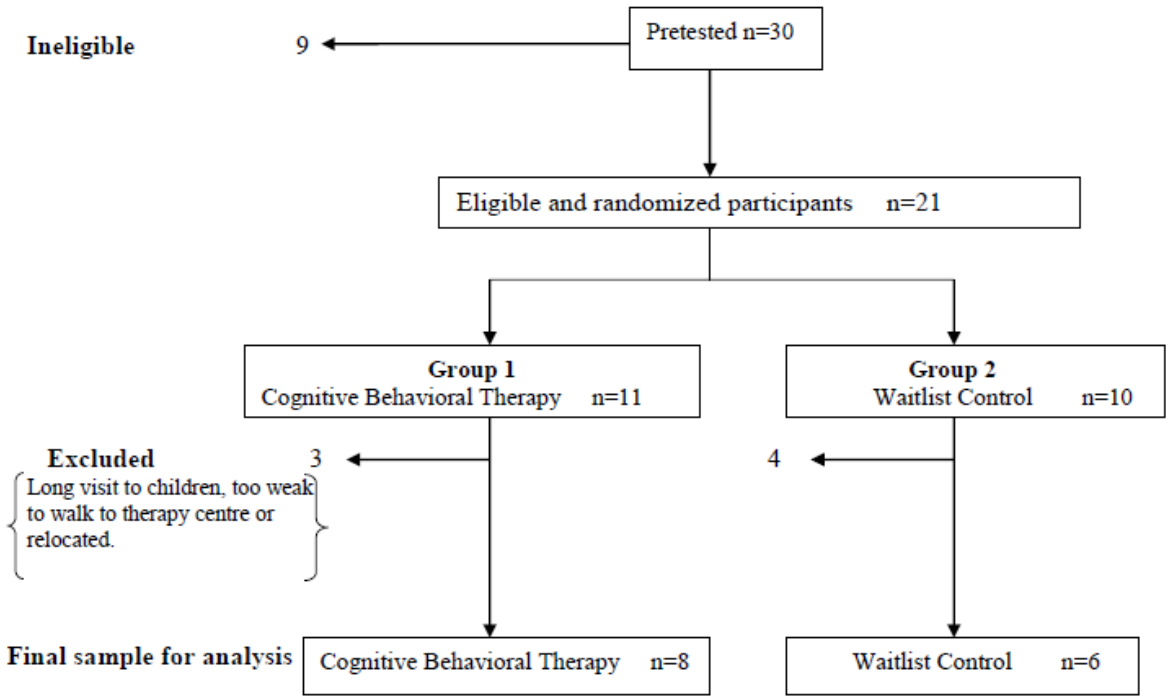

Figure 1: Flow of participants through the intervention phase

Treatment Protocol

There were eight face-to-face group CBT sessions spanning 8 weeks, 1 hour and 30minutes per session, following an adaptation of the CBT manual developed by Cully and Teten (2008), "A Therapist's Guide to Brief Cognitive Behavioural Therapy". The outline of sessions is presented in Table 1. The CBT sessions were conducted in conjunction with an experienced clinical psychologist practising in a tertiary mental health setting who was highly skilled in the use of CBT in the treatment of anxiety and depression.

Also, three research assistants ran logistics during the therapy session. The logistics involved going to participants' homes to remind and call them for therapy sessions, buying and serving refreshments, and tape recording the CBT sessions based on the informed consent of participants.

Throughout the 8 weeks of CBT sessions, the research assistants monitored the waitlist control group's activities to ensure they were not exposed to any therapy. At the end of the 8 weeks, all participants in the CBT group and waitlist condition again completed post-treatment assessments, including the GDS and GAI-SF.

Table 1: CBT sessions' outline

Session	Session content
1	Establish Relationship Present Ground Rules for Group Therapy Assessment of problems/communicating the result of assessment to participant Psycho-education about depressive disorder, Introduction to the cognitive Behavioral Model of Depression and Anxiety Describe Problem in Context of Model. Set Goals: Establishment of Treatment Plan /Setting an agenda (Problem list is generated) Receive Feedback from Participants
2	Check Mood Introduce Behavioral Activation, and Explore Potential Activities to Improve Mood. Set Homework: Mood and Activity Tracking Receive Feedback from Participants
3	Check Mood Goal Setting Identifying and Challenging Maladaptive Thoughts and Beliefs: Introduce Three-Column Thought Record and Idea of "Hot Thought." Practice Three Column With Event From Past Week. Use Tracking Sheet to Plan Where and What Behavioral Activation Will Be Employed Assign Homework: Behavioral-Activation Exercise. Receive Feedback From Participants
4	Check Mood Review Homework Introduce Cognitive Distortions. Complete Three-Column in Session, and have Participants Identify Hot Thought. Introduce Concept of Challenging Hot Thought Homework: Behavioral activation, Three-column thought record Receive Feedback from Participants
5	Check Mood. Discuss Progress of Therapy and Termination. Review Homework. Cognitive Distortions (Continuation) Introduce challenging thoughts and seven-column thought record. Complete seven-column in session. Homework: Relaxation techniques, Behavioral Activation, Three-column thought record Receive feedback from Participants
6	Check Mood. Review Homework. Continue with the Completion of the Seven-Column in Session Homework: Behavioral activation, Seven-column thought record Receive Feedback From Participants

7-8	Check Mood. Review Homework Review the Progress of Treatment. Complete Seven-Column in Session Schema Focus and Relapse Prevention. Schedule Self-Management Sessions. Homework: Self-Management Session

Ethical approval: This was granted by the Research and Ethics Committee of the Postgraduate Board of Ekiti State University Ado-Ekiti, Nigeria. Informed consent was obtained from the participants and the King of the town where the research occurred. In fact, the King permitted us to use his Palace Hall for all of the CBT sessions. Participants were also assured of confidentiality and the right to withdraw from the sessions if they deemed so.

Measures

Geriatric Anxiety Inventory- Short Form (GAI-SF): The GAI-SF is a 5-item measure derived from the Geriatric Anxiety Inventory (Pachana et al., 2007) to assess generalised anxiety disorder (GAD) among older persons and has been found to effectively distinguish individuals diagnosed with or without GAD (Byrne & Pachana, 2011). Sample items include "Little things bother me" and "I worry a lot of the time." The validity and reliability of this scale for the Nigerian sample have been demonstrated in previous studies (Olawa et al., 2020). The GAI-SF is assessed on the "disagree" (0) and "agreed" (1) item response format. Higher scores reflect an increased level of GAD.

Five-Item Geriatric Depression Scale (GDS): This scale assesses depression among cognitively intact older adults in hospital settings, nursing homes and those living in the community and is effective in screening for depression as the 15-item GDS (Rinaldi et al., 2003). Sample items include "Do you often get bored?" and "Do you often feel hopeless?" The five-item GDS also has good test-retest and inter-rater reliability (Rinaldi et al., 2003). Similarly, the scale is reliable and valid in measuring geriatric depression in the Nigerian context (Olawa et al., 2020). The five-item GDS is measured in a Yes/No response format. "Yes" response in items 2-5 is scored, and "No" in items 1 is scored 1. Higher scores reflect increased levels of depressive symptoms.

Big Five Inventory (BFI-10): Extracted from the 44-item Big Five Inventory (John & Srivastava, 1999), the BFI-10 (Rammstedt & John, 2007) measures five domains of personality which include agreeableness, extraversion, openness,

conscientiousness and neuroticism. The BFI has a concurrent validity of .67 with the 44-item BFI and a test-retest reliability coefficient of .75 (Rammstedt & John, 2007). The test-retest reliability and the construct validity of the BFI-10 in the Nigerian context are demonstrated in previous work (Olawa & Idemudia, 2019a).

Duke Social Support and Stress Scale (DUSOCS): The DUSOCS is a 24-item multidimensional measure developed to assess the perceptions of support received and stress induced by family and non-family members (Parkerson et al., 1989). However, this study utilised only the DUSOCS social support subscale. This consists of 12 items rated on a 3-point Likert scale format ranging from "0" (none) to "2" (a lot). Parkerson et al. (1991) reported a convergent validity of .43 between Olson's Family Strength Scale and the DUSOCS family support score. Two-week test-retest reliability coefficients of .67 and .76 were also obtained for the non-family and family support, respectively. The DUSOCS support subscale is a reliable measure of social support among older adults (Olawa et al., 2019b). Higher scores reflect the greater perception of support received from family and non-family members.

Physical health problems: Following the method of assessing physical health burden in Korten et al. (1999) participants were asked dichotomised questions (no = 0; yes = 1) about having any of the eight frequently occurring diagnoses at old age which include osteoporosis, diabetes, cardiac infarction, stroke, musculoskeletal ailments, chronic lung disease, cancer and angina. The addition of responses from each category of disease diagnosis gives a maximum score of eight for physical health burden (Atkins et al., 2013).

Self-rated health (SRH): In line with Korten et al. (1999), we measured SRH by asking participants to rate the global state of their health as either poor (1), fair (2), good (3) or excellent (4). Assessing SRH in this manner effectively predicts disease diagnosis (Wu et al., 2013) and mortality (Schnittker & Bacak, 2014). High scores reflect positive subjective health.

All measures were administered in the participants' native language. In translating instruments from English to the Yoruba language, we followed the judgmental and statistical designs (International Test Commission, 2005).

Statistical Analysis

IBM SPSS Statistics, version 21.0 for Windows, was used to analyse data. Comparisons of socio-demographic

characteristics between the CBT and waitlist conditions were done by utilizing Pearson's chi-square test. Group differences on all continuous variables were assessed using an independent sample t-test. Three independent models were calculated using a one-way multivariate analysis of covariance (MANCOVA) where group (CBT/waitlist control) was specified as the independent variable and post-treatment anxiety and depression scores as combined dependent variables (DV). The first model tested the group effect on the combined DV with pre-treatment anxiety and depression scores as covariates. The second model assessed the group effect on the combined DV with extraversion and neuroticism scores as primary covariates. The final model included only scores on social support, physical health burdens and SRH as covariates. Skewness scores on pre-and-post anxiety and depression, primary and secondary covariates were between -.46 to .81. This range falls within moderate normality required for multivariate tests (Blanca et al., 2013). Also, there was a positive correlation between the combined DVs ($r = .78$, $p = .001$), which did not exceed .90 (Brace et al., 2006). Wilks's Lambda was chosen as multivariate test statistic, given that the homogeneity test indicated non-significant p-values for the three models (Mertler & Vannatta, 2005). There were no missing scores in data distribution.

RESULTS

Baseline Assessments

As shown in Table 2, the group (i.e. the CBT and waitlist control) did not significantly differ in all demographic characteristics, which include sex, age, marital status, education and bereavement status. Also, there was no significant group difference in GDS and GAI-SF baseline scores and primary and secondary covariates. The mean score on GAI-SF (2.93 ± 1.39) was almost equal to the cut-off (M = 3) recommended for the detection of GAD among community samples using DSM-IV criteria (Bryne & Pachana, 2011), while the GDS mean score (2.29 ± .91) is slightly above the cut-off (M = 2) to become positive on depression (Rinaldi et al., 2003).

Table 2: Social-demographics data and baseline mean difference on continuous variables

	n or M ± SD				
	Total	CBT	Waitlist	χ^2/t	p-value
Variables	N = 14	n = 8	N = 6		
Sex				.12	.73
Male	4	2	2		
Female	10	6	4		
Age (in years)	75.14±7.19	75.13±5.94	75.17±9.22	-.01	
Marital status				.12	.73
Married	4	2	2		
Widowed	10	6	4		
Family type				.12	.73
Monogamy	4	2	2		
Polygamy	10	6	4		
Education				.42	.42
Primary certificate	12	6	6		
Modern school certificate	1	1	0		
Adult education	1	1	0		
Employment status				5.44	.14
Self-employed	3	2	1		
Unemployed	7	5	2		
Retired	1	1	0		
Subsistence farming	3	0	3		
Bereavement				.27	.53
Yes	6	4	2		
No	8	4	4	.53	
Depression	2.29 ± .91	2.25 ± .89	2.33 ± 1.03	-.16	.87
Anxiety	2.93 ± 1.39	2.88 ± 1.46	3.00 ± 1.41	-.16	.88
Extraversion	8.00 ± 1.75	7.38 ± 1.77	8.83 ± 1.47	-1.63	.13
Neuroticism	5.14 ± 2.14	4.38 ± 1.77	6.17 ± 2.32	-1.65	.13
Social support	8.71 ± 5.55	9.50 ± 6.33	7.67 ± 4.68	.60	.56
Diagnoses	1.14 ± 1.10	1.13 ± 1.24	1.17 ± .98	-.07	.94
SRH	2.21 ± .58	2.25 ± .71	2.17 ± 41	.25	.80

Group effect

Table 3 indicates the multivariate group effect on post-treatment GDS and GAI-SF scores while adjusting for baseline scores on GDS, GAI-SF, personality traits, social support, diagnoses and SRH in three independent models. Controlling only for GDS and GAI-SF baselines scores, model 1 outcomes showed that the group effect was significant on the combined DVs, Wilks' ^ = .57, F(2, 9) = 6.02, p = .02, multivariate η2 = .57. Table 4 presents the follow-up ANOVA summary. There were group differences in the post-treatment scores for GDS, F (1, 10) = 7.86, p = .019, partial η2 = .44; and GAI-SF, F (1, 10) = 11.28, p = .007, partial η2 = .53. Comparison of estimated marginal means indicated that the CBT group (M = .66) had significant lower score on GDS than the waitlist control (M = 2.12). Similarly, the CBT group (M = 1.29) had significant lower score on GAI-SF than the waitlist control (M = 3.47). These suggest that there was remission of depression and anxiety in the CBT group but not in the waitlist condition.

Calculation of the recovery rate showed that 75% of participants in the CBT condition improved from the GDS baseline to post-treatment, while 87.5% was recorded on the GAI-SF. In the waitlist control, 16.6% of participants' condition worsened on the GDS, while 50% was obtained on the GAI-SF.

Table 3: Group effect on post-treatment scores controlling for baseline GDS, GAI-SF, primary and secondary covariates

Model	Variables	Wilks' Lambda	F	df	Error df	η2
1	Baseline GDS	.79	1.17	2	9	.21
	Baseline GAI-SF	.68	2.15	2	9	.32
	Group	.43	6.02*	2	9	.57
2	Extraversion	.11	.54	2	9	.10
	Neuroticism	.18	.98	2	9	.18
	Group	.32	2.13	2	9	.32
3	Social support	.98	.10	2	8	.02
	Diagnoses	.89	.52	2	8	.12
	SRH	.53	3.56	2	8	.47
	Group	.37	6.90*	2	8	.63

*$p < .05$

Controlling for primary and secondary covariates

In the second model we removed both pre-treatment scores on GDS and GAI-SF and entered traits of extraversion and neuroticism as covariates. Results showed that group effects on the combined DVs became insignificant, Wilks' ^ = .68, F (2, 9) = 2.13, p = .18, multivariate η2 = .32. However, the primary covariates of extraversion [Wilks' ^ = .89, F (2, 9) = .54, p = .59, multivariate η2 = .11] and neuroticism [Wilks' ^ = .82, F (2, 9) = .98, p = .41, multivariate η2 = .18] were also not significant.

Table 4: Significant univariate group effect on post-treatment

Dependent Variable	df	df error	F	Group	Estimated marginal Means
Post-treatment GDS scores	1	10	7.86*	CBT	.66
				Waitlist	2.12
Post-treatment GAI-SF scores	1	10	11.28**	CBT	1.29
				Waitlist	3.45

** $P < .01$, *$p < .05$

With exclusion of the primary covariates and inclusion of the secondary covariates of social support, diagnosis and SRH in model 3, group effect became significant, Wilks' ^ = .36, F (2, 9) = 6.90, p = .018, multivariate η2 = .63. The covariates of social support [Wilks' ^ = .98, F (2, 8) = .52, p = .91, multivariate η^2 = .02], diagnosis [Wilks' ^ = .89, F (2, 8) = .52, p = .61, multivariate η2 = .12] and SRH [Wilks' ^ = .53, F (2, 8) = 3.56, p = .08, multivariate η2 = .47] were not significant in the model.

DISCUSSION

It is known that CBT is effective in managing both anxiety and depression across life span and that the traits of extraversion and neuroticism have significant roles to play in this effectiveness (Bagby et al., 2008). Based on this finding, the current study examined whether the CBT effect would be retained or not after controlling for both extraversion and neuroticism in a sample of community older adults with positive depression and anxiety scores. We also examined whether controlling for other important covariates, including social support, physical health burden and self-rated health, would yield the same outcome. This enables us to confirm or disconfirm the relative importance of personality traits with these other covariates in weakening the impact of CBT outcomes.

Compared to waitlist control, we found that older adults who received CBT showed significant improvement in depression and anxiety severity at post-treatment. There was a 75% recovery rate for depression and an 87.5% recovery rate for anxiety. These findings corroborate the outcomes of previous works demonstrating the effectiveness of CBT in mitigating subclinical anxiety and depression in older adults (e.g. Wuthrich & Rapee, 2013) and other younger age groups (e.g. Dear et al., 2018; Luik et al., 2017). Results also suggest that CBT may be useful for older adults in Nigeria, especially those residing in rural areas.

However, the initial CBT effect was lost at the exclusion of the primary covariates of extraversion and neuroticism. In other words, CBT lost its efficacy in the remission of anxiety and depression after the influence of extraversion and neuroticism were controlled. However, still, the influence of these traits was not significant on both anxiety and depression. There was a change in outcome when the secondary covariates of social support, physical health burdens and self-rated health were excluded. We found a significant effect of CBT on both anxiety and depression. Results imply that personality factors may utterly confound the CBT effect found in most studies. Although it is demonstrated that personality traits can moderate CBT outcomes (Bagby et al., 2008), our findings extend existing knowledge by suggesting that extraversion and neuroticism may entirely confound the effect of CBT in mitigating the symptoms of anxiety and depression. In other words, the effectiveness of CBT may be absolutely dependent on the personality of individuals. Given the outcomes of a previous study (Bagby et al., 2008) on the different moderating roles of extraversion and neuroticism, it is recommended that there may be a need to develop interventions which

mitigate the effects of low extraversion and high neuroticism in clients for the effectiveness of CBT.

Although the outcome portends some significant contribution to existing knowledge, it is important to note that the validity of our results may be affected by some limitations. First is our sample size. Using small sample sizes of 8 and 6, respectively, for the CBT and waitlist conditions in only one randomised trial may have resulted in low statistical power in this study.

Using G*Power and following the procedure of Dattalo (2008) to assess the power for MANCOVA with 2 response variables and error probability of .05, we obtained a posthoc power of .73 for model 1[1], .45 for model 2[2] and .59 for model 3[3]. With an effect size of .40, a minimum sample size of 30 would have been more appropriate to achieve the traditional recommended statistical power of .80 in the models. However, Dorey (2010) noted that it is a myth that power must be at least 80% or greater especially when clinical study does not constitute great inconvenience or high risk to patients.

For the univariate effect, we obtained a posthoc power of .86 and an effect size of .88 for the CBT effect on depression while a power of .95 and an effect size of 1.06 for anxiety. Notwithstanding the excellent posthoc powers and large effect sizes for univariate outcomes, prospective studies may employ larger sample sizes to achieve higher statistical power and generalizability. Second, almost all of our participants did not study up to the tertiary education level. Hence, it is unclear whether results can be extended to educated adults, given that there is personality variation in the level of educational attainment (Mõttus et al., 2017). Third, scores on personality traits, depression and anxiety were based on self-report of symptoms and not on formal diagnostic interviews. This may limit the generalisation of results to a sample of older adults in clinical settings. Lastly, it is uncertain that the present outcomes showing that personality traits entirely confounded CBT outcomes would be maintained beyond post-treatment given that follow-up data were not collected in this study. It is expected that future studies will improve on these limitations.

Conclusion

Despite the enumerated limitations and exploratory nature of findings, this study demonstrates that traits of extraversion and neuroticism may entirely confound CBT's

[1] Model 1 (effect size = .57, number of groups = number of cells [2] * number of covariates [2] = 4).
[2] Model 2 (effect size = .32, number of groups = number of cells [2] * number of covariates [2] = 4).
[3] Model 3 (effect size = .63, number of groups = number of cells [2] * number of covariates [3] = 8).

effect in mitigating anxiety and depression among older adults. Outcomes showed that after controlling for these personality traits, the impact of CBT on anxiety and depression scores disappeared. However, after controlling for other covariates, such as social support, physical health burdens, and self-rated health, we found that CBT maintained its efficacy. However, given the small sample size, low statistical power, and limited generalizability, the findings are exploratory and preliminary. Prospective research can replicate findings by employing a much larger sample and increasing generalizability to diverse populations, including clinical samples and those from Western countries.

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Declaration of Originality

We declare that this manuscript is our original work and has not been submitted or published elsewhere. We have reviewed and approved the final version of the manuscript.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

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