

Single Case Experimental Design Examining Cognitive Behavioural Therapy for Post-Stroke Depression

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ABSTRACT



Background. Post-stroke depression (PSD) is common in older-age adults and is typically treated with cognitive-behavioural therapy (CBT). However, research has ascertained mixed findings regarding the efficacy of CBT for PSD in older-age adults, with limited evidence in people from global majority backgrounds. **Materials and Methods.** This case study used single case experimental design methodology to examine the effectiveness of CBT for PSD in a black, older-age man. The effects of health conditions, cohort beliefs, transitions in role investments, socio-cultural context and early experiences on the client's thoughts, emotions, physical sensations and behaviours were formulated, before behavioural activation was used to increase engagement in meaningful and pleasurable activities. **Results.** Throughout therapy, the client's mood, motivation and optimism for the future improved, and their depression and anxiety symptoms reduced. **Conclusions.** This case study offers tentative evidence that CBT for PSD may be effective in black older-age adults.

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Introduction

'Stroke' refers to neurological damage consequential to a blockage in blood supply and/or a burst artery in the brain. Approximately 100,000 British people have a stroke each year [1], with many survivors being older-aged and experiencing mental health difficulties.

Depression refers to distressing low mood and reduced interest in and/or pleasure when engaging in activities (APA, 2013) [2]; it is typically accompanied by insomnia, reduced motivation, feeling worthless, difficulty concentrating and/or thoughts of death. Importantly, research indicates that psychiatric diagnoses, including depression, entail poor validity and reliability [3-5]. Where psychiatric diagnoses are used, they should be regarded as succinct labels for the phenomenology described in the formulation.

Several systematic reviews reported post-stroke depression (PSD) prevalence rates as high as 50% in older-age adults [6-9], often lasting years after stroke. Depression can have a multitude of consequences, including reduced quality of life [10], physical ill-health [11] and risk of

harming oneself [12], underscoring the necessity to develop effective interventions for PSD in older-age adults.

Whilst several psychological models conceptualize depression, the cognitive-behavioural model has garnered notable support [13]. Beck (1979) argued that individuals develop core beliefs based on early experiences, and these beliefs lead to the development of conditional assumptions about one's life; life events can increase the salience of some core beliefs over others [14]. Beck posited that individuals with depression develop maladaptive beliefs about themselves, the world and their future, resulting in negative automatic thoughts, which have a reciprocal effect on their emotions, physiological sensations and behaviours [14,15].

Several authors have revised Beck's (1979) model to account for facets relevant to older-age adults, to improve the efficacy of cognitive-behavioural therapy (CBT) in older-age adults [16]. For older-age adults, Laidlaw et al. (2004) argued it is necessary to consider their cohort beliefs (ideas typically held by people born during similar time periods), transitions in role investments (changes an individual makes to continue engaging in meaningful activities), health conditions, intergenerational linkages

(the importance of transmitting cultural and familial values across generations) and socio-cultural contexts (internalization of cultural attitudes towards ageing) [17].

NICE (2022) guidelines advise using eight, hour-long sessions of CBT for depression in older-age adults [18]. Cognitive-behavioural therapy aims to attenuate depression by altering clients' thoughts, emotions, physical sensations and/or behaviours, in part by supporting them to realize thoughts are not necessarily factual [19]. Meta-analyses suggest CBT is an effective intervention for depression in older-age adults, with larger effect sizes than treatment as usual or remaining on waitlists [20-23].

Furthermore, researchers have emphasized the importance of adapting Beck's model to account for factors relevant to stroke in people with PSD. Kootker et al. (2015) advocated the importance of conceptualizing the impact of grief over any losses of independence, mobility, psychological abilities and emotional control on mood [24]. Relatedly, Kootker et al. (2012) highlight the necessity to adapt therapy for cognitive difficulties arising as a consequence of the stroke [25]. Whilst these recommendations are for people with PSD irrespective of age, the current case study concerns a client with PSD who is older-aged.

Unfortunately, the literature lacks a well-evidenced CBT model that conceptualize PSD in older-age adults. Nevertheless, NICE (2013) guidelines advise using CBT for post-stroke depression (PSD) in older-age adults [26]. However, whilst tentative evidence suggests CBT is helpful for older-age adults with PSD [27,28], several studies reported no effect of CBT on PSD in older-age adults [29,30]. Also, these studies have included samples of predominantly white people, with limited representation of older-age adults from global majority backgrounds. Further research is required to determine whether CBT represents an effective intervention for PSD in older-age adults [31,32], particularly in those from global majority backgrounds. Accordingly, this case study reports the outcomes of CBT for PSD in a black older-age man.

Case Presentation

Assessment

History and Referral

Nicholas (pseudonym) was a 67-year-old Black heterosexual man from the West Indies who moved to England as a child. He suffered a left posterior cerebral infarct, culminating in right-sided hemianopia, fatigue and pain, and difficulty with memory, reading, writing, sleeping and concentrating. After discharge from hospital, Nicholas received support from the Stroke Recovery Team, where he received speech and language, physio, occupational, and psychological therapy. Nicholas had eight compassion-focused therapy sessions, where he learnt self-soothing mindfulness skills and reflected on the importance of accepting support from others; he was

subsequently discharged from the psychology team. Three months later, Nicholas was diagnosed with PSD and referred to the psychology team for further therapy.

Initial Assessment

Over a two-hour assessment, Nicholas reported "feeling depressed," experiencing "low motivation" to do activities he previously enjoyed and feeling "pessimistic about the future, hopeless that life will improve." A detailed risk assessment concluded that risk to self, to others, from others and of falling was low.

Goals

Nicholas described two goals for therapy which were made specific, measurable, achievable, realistic and time-limited through discussion [13]. First, Nicholas wished to "better-understand (his) difficulties" by co-developing a psychological formulation of his problems. Second, he wanted to "learn strategies to improve (his) depression, low motivation and pessimism by the end of therapy." When asked how to determine when he had achieved the latter goal, Nicholas said his scores on outcome measures would improve to a consistently acceptable point.

Formulation

Whilst post-stroke neurological damage can directly increase emotional lability, such effects typically resolve within six months [33]. As Nicholas' stroke was six months prior to the assessment, a psychological approach was used to formulate and treat his PSD. Laidlaw et al.'s (2004) longitudinal CBT formulation for older-age adults was used to collaboratively conceptualize Nicholas' difficulties. Figure 1 provides a visual depiction of this formulation [17].

When Nicholas was a child, he said that "many West Indian parents maintained very high standards (*cohort belief*) and beat their children if they failed to meet their standards." For example, if house chores were not "completed impeccably," Nicholas' "mother would beat" him. In addition, he described excruciating experiences of interpersonal and systemic racism. In school, Nicholas "felt like an outsider," often being excluded from parties because of his ethnicity. He "grew to resent (his) ethnicity" and sought guidance from two white friends on "how to be accepted in a white world." Nicholas described feeling pressured to act "perfectly white," fearing any lapse in this would culminate in social rejection. When entering the police, Nicholas said it "was necessary to be racist to be accepted," citing his involvement in racial profiling as being underpinned by a desire to be accepted. These experiences culminated in "shame for (his) ethnicity" and the *conditional assumption* that he "must maintain high standards" to differentiate himself from the dehumanizing racism towards black people, fearing that not doing so would result in him becoming a "socially rejected failure" (*core belief*). Accordingly, he "always worked extremely hard," conceptualized as a *compensatory strategy* to avoid "failing."

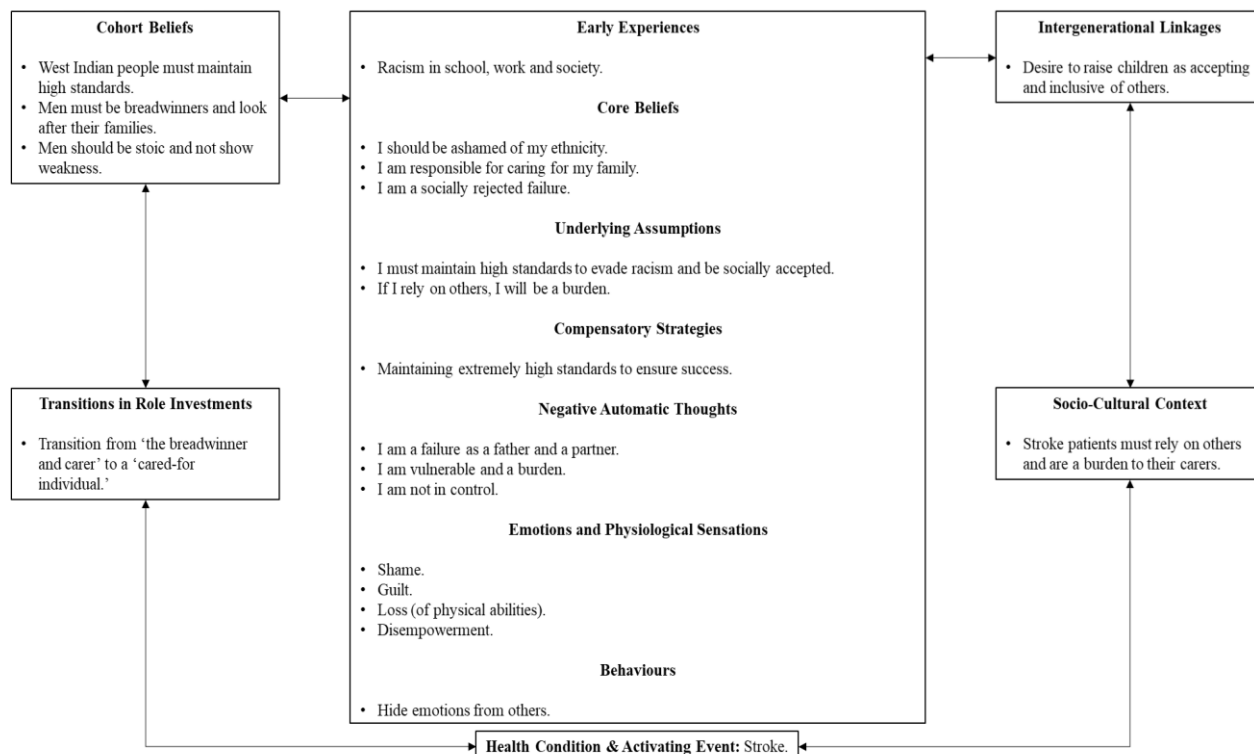


Figure 1. Visual Formulation

After his stroke (*health condition*), Nicholas was unable to do some activities to as high a standard as he previously would, activating the core belief that he is a “socially rejected failure.” This culminated in *negative automatic thoughts* that he “is a failure as a father and a partner” and corresponding *feelings* of guilt. However, he “hid these emotions from others” because of the *cohort belief* that “men should be stoic and not show weakness.”

Nicholas described another *cohort belief* that “men must be breadwinners and look after their families.” Indeed, Nicholas had always been the primary financial earner in his family and described himself as “someone everyone could rely on.” These cultural beliefs appeared to have instilled the *conditional assumption* that “if (he) relied on others, (he) would be a burden.” However, his stroke led to a *transition in role investment* from ‘the breadwinner and carer’ to a ‘cared-for individual.’ Relatedly, Nicholas discussed beliefs that “stroke patients must rely on others” (*socio-cultural context*) [34], leading to him *feeling* guilty as his stroke required him to rely on others. Furthermore, Nicholas described *feeling* a sense of “disempowerment” and “loss” of his previous abilities that allowed him to be “the breadwinner,” which led to *negative automatic thoughts* that he “is not in control.” Indeed, low perceived control is common in depression [35], and has been posited to contribute to its maintenance [36].

As an example of a distressing scenario, Nicholas discussed a situation where his daughter was returning from traveling. He agreed to care for her garden whilst she

was on holiday, but forgot until the day of her return. This contrasted his *conditional assumption* that he “must maintain high standards” and the *core belief* that he “is responsible for caring for (his) family.” As the stroke left him physically unable to attend to the garden in time for his daughter’s return, he was reminded of his *socio-culturally* informed belief that “stroke patients are dependent on others” and his recent *transition in role* from ‘the carer’ to ‘a cared for person.’ Being unable to use his *compensatory strategy* of maintaining high standards led to *negative automatic thoughts* that he “is a failure as a father” and “a burden.” He felt “ashamed and guilty” for “not keeping (his) promise” and a sense of loss for his physical abilities prior to the stroke. However, he ‘hid’ these emotions from his family due to the *cohort belief* that “men should not show emotions.”

Outcome Measures

Several idiographic measures were collaboratively devised to monitor Nicholas’ progression towards his goals [37]. Nicholas rated his mood, motivation and optimism at the end of each session on scales of 1-10. Mood was defined as the valence of his emotional state, motivation was defined as his desire to engage in daily activities, and optimism was defined as his confidence that the upcoming week would be positive. Ratings of ‘1’ corresponded to extreme low mood, avolition and hopelessness, whereas ratings of ‘10’ corresponded to extremely high mood, motivation and hopefulness; this rating system was

unambiguously defined in an endeavor to standardize the idiographic measures. The direct relevance of these variables to Nicholas' difficulties substantiates their criterion validity. Also, the test-retest reliability of these measures is supported by their stability during the baseline phase, as discussed below. Critically, this stability is not readily attributable to lack of measurement sensitivity, as his scores changed following the introduction of the intervention.

In accordance with the Neurorehabilitation Service's protocols, the Patient Health Questionnaire 9 (PHQ-9) [38] and Generalized Anxiety Disorder Assessment 7 (GAD-7) [39] were used to examine depression and anxiety symptoms, respectively. Research has ascertained support for both the validity and reliability of the PHQ-9 and GAD-7. Both measures have high sensitivity and specificity when determining whether people meet criteria for depression and anxiety, respectively [38,39]. Also, both are correlated with theoretically relevant variables, such as functioning in day-to-day life, suggesting they represent valid measures of mental health difficulties. Moreover, the PHQ-9 and GAD-7 maintain high internal consistency across numerous populations [38,39], suggesting they represent reliable measures of depression and anxiety, respectively.

During the initial assessment sessions, Nicholas scored 1 on each of the idiographic measures, indicating extreme low mood, avolition and hopelessness. He scored 10/27 and 11/21 on the PHQ-9 and GAD-7, respectively, indicating 'moderate' symptoms of both depression and anxiety. Of note, the discrepancy between the 'extreme' and 'moderate' scores on the idiographic and standardized measures, respectively, may cast doubt reliability and/or validity of the idiographic measures. Whilst moderate anxiety symptoms suggest Nicholas may have benefited from an anxiety-based formulation and intervention, he said these scores reflected his "concern about an upcoming knee operation." As this was a transient concern and PSD reflected a long-standing issue, he focused on improving his mood, motivation and optimism.

Design

An interrupted time series single case experimental design (SCED) was used, including 'baseline' and 'intervention' phases. Weekly measures of Nicholas' mood, motivation and optimism were obtained in every session. The PHQ-9 and GAD-7 were not administered in each session, as Nicholas took approximately 20 minutes to complete these measures; completing these measures every session would significantly reduce the time available for therapy to an unhelpful extent. The baseline phase lasted three weeks, spanning both assessment sessions and session 1. As measures were taken at the beginning of each session, it was considered appropriate to include session 1 in the baseline phase, as participants had not yet commenced psychoeducation at the point of data collection. Figure 2 details Nicholas' mood, motivation and optimism ratings in each session. Visual inspection of Figure

2 suggests that Nicholas' motivation and optimism scores were stable during baseline, as he scored '1' during each measurement point. Whilst visual inspection of the data indicates that his mood scores increased from '1' during the assessment sessions to '3' in session 1, this fluctuation in scores is relatively small (2 points) and Nicholas' mood scores remained relatively low. Therefore, baseline scores were considered relatively stable. In the intervention phase, Nicholas engaged in psychological therapy aimed at improving his mood, motivation and optimism for seven weeks.

As Nicholas' scores were relatively stable during the baseline phase, any sizeable changes observed during the intervention phase were not readily attributable to measurement variance, regression to the mean, spontaneous remission, or changes in measurement sensitivity over time and/or with repeated use, at least over a period of weeks [37]. To minimize the impact of demand characteristics and placebo effects on ratings, Nicholas was told he was "unlikely to experience improvements until the end of therapy." These controls endeavored to increase the likelihood that any sizeable changes observed during the intervention phase were the consequence of therapy rather than confounding variables. Extra-therapy events, such as changes in medication, were monitored to identify any relevant confounds.

Hypotheses

Consistent with his goals, it was hypothesized that Nicholas' mood, motivation and optimism scores would improve to a stable score and his PHQ-9 and GAD-7 scores would reduce by 6 and 4 points, respectively, by the end of therapy, surpassing 'reliable change thresholds' [40-44].

Intervention

Consistent with NICE (2022) guidelines [18], Nicholas was offered eight, hour-long CBT sessions for depression, following Laidlaw et al.'s (2003) CBT for older-adults protocol [45]. Due to mobility difficulties, sessions were conducted at Nicholas' home.

Session 1: Psychoeducation

Nicholas was socialized to the CBT model, emphasizing its collaborative and time-limited nature [45]. As an example, differences in the thoughts, emotions, physical sensations and behaviours experienced by people when encountering dogs were discussed. Then, the CBT model was used to collaboratively formulate a recent distressing situation in Nicholas' life; for homework, he completed another CBT formulation concerning a recent situation.

Session 2: Formulation

Consistent with Nicholas' goal of "better-understanding (his) difficulties," two sessions involved co-developing the formulation. Importantly, Nicholas reported feeling disempowered by the stroke and by his family's endeavor to reduce his responsibilities. As bolstering empowerment is associated with attenuations in depression [46,47],

collaboration was emphasized, and both Socratic questioning and downward arrowing were used to support Nicholas to devise his own formulation through guided discovery [48]. As he struggled to describe why he “must” uphold high standards, Nicholas critically examined the origin and implications of his high standards for homework.

Session 3: Formulation and Racism

After reflecting on his high standards, Nicholas suggested “exploring the impact of racism on (his) problems.” Whilst somewhat deviating from Laidlaw et al.’s (2003) protocol [45], this was prioritized, as research suggests that discussing racism improves CBT efficacy [49,50]. Discussing the origin and utility of his high standards was described as “validating,” perhaps because it cast doubt on his assumption that he was responsible for his difficulties by externalizing the responsibility for his (now maladaptive) high standards to systemic racism [51,52]; this appeared to reduce self-blame and promote self-compassion 9 [53].

Sessions 4-6: Behavioural Activation

In line with Nicholas’ goals, behavioural activation (BA) bolster’s mood, empowerment and motivation [54-56]. Session 4 provided psychoeducation about BA and he completed an activity schedule for homework, recording daily activities and rating both his mood and motivation during each activity.

In session 5, Nicholas reflected on the activity schedule. Socratic questioning supported him to identify the facets influencing his mood and motivation, and link these facets to his formulation. He identified that his mood and motivation were better when he was doing meaningful activities. Following this, Nicholas planned daily activities for the following week and was encouraged to include a mix of activities that improved his mood and motivation.

Session 6 was used to reflect on BA, which Nicholas described as “extremely helpful.” Moreover, whilst he previously “felt like a failure” during periods of rest, Nicholas “no longer felt (he) was failing by resting” because he was adhering to his plan.

Nicholas tended to have highly active days, accompanied by high mood and motivation, followed by inactive days, accompanied by pain and low mood and motivation; this is known as ‘booming and busting’ [13]. Nicholas described ‘busting’ as “frustrating” because it made him “feel like a failure.” Whilst Nicholas initially considered ‘booming and busting’ “unavoidable” and necessary to continue meaningful activities, thought challenging techniques were used to evaluate this proposition. After co-creating a cost-benefit matrix, Nicholas decided to try avoid ‘booming and busting.’ An idiographic scale was collaboratively devised to determine when he was physically exerting himself to the extent that he was likely to ‘bust,’ and Nicholas decided to stay within a range that circumvented ‘busting.’ Across subsequent

sessions, Nicholas reduced ‘booming and busting’ to a satisfactory extent and voiced increasing acceptance that “activities may take longer than they did prior to the stroke.”

Session 7: Emotional Expression

The *cohort belief* that “men should be stoic and not show weakness” contributed to Nicholas feeling ashamed and emasculated when thinking he “is a failure.” Session 7 explored sociocultural narratives about ‘masculinity’ and used thought challenging techniques to question their validity. Whilst not an explicit goal, Nicholas reported feeling “safer to explore (his) emotions.”

Session 8: Ending Therapy

A letter recounting the therapeutic work and relapse prevention plan was shared with Nicholas in the final session. To empower him, he added his reflections on therapy to the letter.

Feedback

After each session, Nicholas was asked for feedback and improvement suggestions on the content and process of therapy.

Results

By session 8, Nicholas reported “better-understand (his) difficulties” and said his “mood, motivation and optimism had improved to a consistently acceptable point.” Regarding quantitative results, Figure 2 details Nicholas’ mood, motivation and optimism ratings in each session. The results indicate that his scores were relatively stable during baseline and increased after introducing the intervention to a consistently high score. Moreover, Figures 3 and 4 display Nicholas’ pre- and post-therapy PHQ-9 and GAD-7 scores, respectively. The results suggest Nicholas’ depression and anxiety symptoms declined across therapy, indicating minimal symptoms of depression and mild anxiety post-therapy. Reductions in scores on both the PHQ-9 and GAD-7 surpassed ‘reliable change thresholds,’ reducing by at least 6 and 4 points, respectively [40-44], suggesting Nicholas showed significant reductions in depression and anxiety symptoms. No notable extra-therapy events were recorded during the baseline or intervention phases.

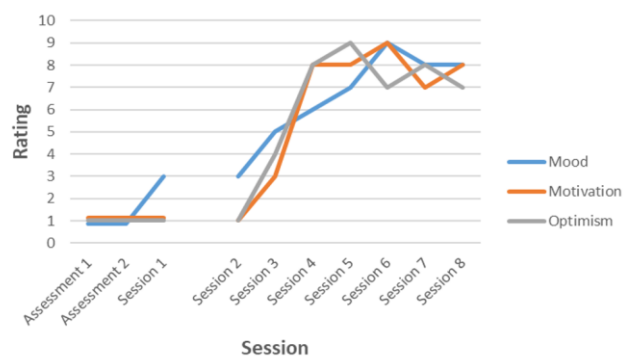


Figure 2. Mood, Motivation and Optimism Scores Across Therapy

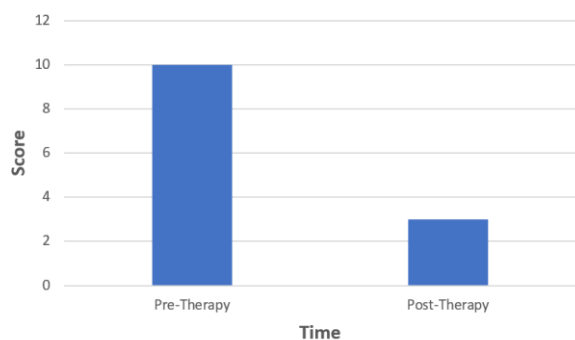


Figure 3. PHQ-9 Scores

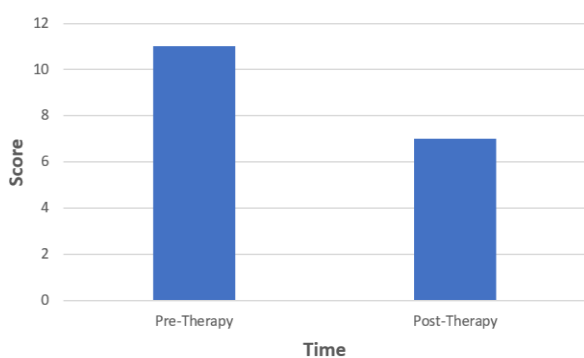


Figure 4. GAD-7 Scores

Discussion

This case study reports the outcomes of CBT for PSD in a black, older-age man. The results suggest CBT enhanced Nicholas' understanding of his difficulties, improved his mood, motivation and optimism, and reduced his depression and anxiety symptoms.

Consistent with his goals, Nicholas' depression symptoms, including low mood, avolition, and hopelessness, reduced across therapy. These findings accord with demonstrations that CBT attenuates PSD in older-age adults [20-23,27,28] and contrast reports that CBT is an ineffective intervention for PSD [29,30]. Extending previous studies, which were largely conducted with white people, the current results tentatively suggest CBT may attenuate PSD in older-age West Indian men; however, it would be premature to generalize these findings.

The results corroborate Beck's theory [14] that individuals with depression develop maladaptive views about themselves, the world and their future. For example, Nicholas reported thoughts that he "is and always will be a failure because of the stroke," and that he "will be racially excluded if (he) does not maintain high standards." Furthermore, this case study underscores the utility of Laidlaw et al.'s (2004) longitudinal formulation for older-age adults [17]. Indeed, consistent with his goals, Nicholas said that discussing his "cohort beliefs, transitions in role investments and socio-cultural context helped (him)

understand (his) difficulties." In addition, these findings corroborate the proposition that CBT attenuates PSD by altering clients' thoughts, emotions, physical sensations and/or behaviours [19,45], as challenging his thoughts through formulation and altering his behaviour through BA improved Nicholas' mood, motivation and optimism. Moreover, Nicholas' rate of progress is consistent with the theory that clients can experience a 'head-heart lag' [55,57], as Nicholas' motivation and optimism increased more rapidly than his mood following introducing BA.

Changes in mood, motivation and optimism are not readily attributable to significant changes in the sensitivity of the idiographic measures or measurement error because scores were stable at baseline and towards the end of therapy, showing larger changes only after introducing the intervention. Also, Nicholas showed improvements relatively early in therapy, despite being told he was unlikely to experience improvements until the end of therapy. Accordingly, changes in scores are not readily attributable to demand characteristics and/or placebo effects [37].

However, there are alternative explanations of the results. Formulating racism may have externalized the responsibility of Nicholas' difficulties to prejudicial, subjugating racist societal narratives [51,58], promoting self-compassion [53]. Consistent with this, Nicholas showed improvements in idiographic measures following session 3, during which the effect of racism was formulated. Alternatively, BA may have increased Nicholas' sense of control by elevating the perceived contingency between his actions and outcomes [56,59], attenuating his sense of hopelessness and thus bolstering motivation. Indeed, Nicholas reported feeling "disempowered" during the assessment but said therapy helped him "to feel empowered." Further research examining the 'active components' of CBT is necessary to elucidate the cognitive and behavioural mechanisms underpinning change.

Consistent with reports that CBT for PSD also attenuates anxiety [60], Nicholas showed reliable reductions in anxiety symptoms. Whilst there are several explanations, these results may reflect the significant overlap in the symptoms of 'depression' and 'anxiety' [3,5]; this is corroborated by the strong correlation between PHQ-9 and GAD-7 scores [61]. Accordingly, reductions in GAD-7 scores may reflect improvements already accounted for by reductions in PHQ-9 scores. Of note, Nicholas remained in the mild anxiety category, suggesting he had some anxiety symptoms when ending therapy. Whilst it is unclear why his scores remained higher, Nicholas voiced concern over an upcoming knee operation, potentially accounting for these results. Nevertheless, by session 8, Nicholas voiced feeling able to move on from therapy and declined further support for anxiety.

Limitations and Future Research

Despite relative stability, the baseline was brief. This stability may reflect chance, and subsequent changes may be attributable to regression to the mean and/or spontaneous remission; mood scores began improving in session 1, consistent with this proposition. Larger-scale, controlled research is necessary to establish whether CBT represents an effective and generalizable intervention for PSD in older-age black men.

Also, Nicholas' understanding of idiographic variables may have changed over time, confounding the results. However, Nicholas was regularly reminded of the definitions of the variables to minimize this threat to validity. Nevertheless, future studies should use empirically-supported standardized measures in every session of mood, motivation and optimism, such as Kroenke et al.'s (2001) PHQ-9 and Beck et al.'s (1974) Hopelessness Scale [38,62].

Whilst SCED methodology affords greater clarity on the causes of changes in dependent variables during treatment, through establishing stable baselines, various issues with SCED methodology limit this case study. As the presence of the intervention phase was not systematically manipulated, as in ABAB designs, other variables may account for the results, such as unmeasured external events occurring before improvements in measures. Replication of this case study using controlled SCED methodology is necessary to elucidate the generalizability of these findings.

Finally, due to time constraints, limited time was spent discussing intergenerational linkages. This may have impeded the efficacy of CBT [17] and future case studies should evaluate the effect formulating intergenerational linkages on CBT efficacy.

Conclusions

This case study offers tentative evidence that CBT for PSD is effective in black, older-age men. Also, these results accord with previous demonstrations that CBT for PSD can also attenuate anxiety. Despite this, larger-scale research is necessary before generalizing findings to others.

Compliance with ethical standards

Any aspect of the work covered in this manuscript has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript. Informed consent was obtained from all subjects involved in the study.

Conflict of interest disclosure

There are no known conflicts of interest in the publication of this article. The manuscript was read and approved by all authors.

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