The Effect of Age on the Underlying Abilities of Mindfulness Practice

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THESIS DECLIRATION FORM

UCL Doctorate in Clinical Psychology

Thesis declaration form

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signature:

Name: Noor Habib

Date: 20.06.16

Overview

This thesis examines the diagnostic accuracy of the non-English versions of Addenbrooke's Cognitive Examination - Revised and III. It also investigates the effect of age on the underlying abilities of mindfulness practice. This thesis is part of a wider ongoing PhD project and joint with another D.Clin.Psy. thesis.

Part 1 is a systematic review investigating the evidence for the diagnostic accuracy of the non-English updated versions of Addenbrooke's Cognitive Examination (ACE) - the ACE-Revised (ACE-R) and the ACE-III - in the diagnosis of dementia. In total, 15 studies were included in the current review. The results indicate that despite the evidence of diagnostic accuracy, the quality assessment suggests that various sources of bias have compromised the validity of the evidence.

Part 2 is an empirical paper that reveals the findings of a study investigating the effect of age on the underlying abilities of mindfulness practice. A total of 55 older adults and 55 younger adults completed the mindfulness measures alongside measures of executive functioning and mood. The results suggest that older adults perform better in mindfulness measures of cognitive control/awareness whereas younger adults perform better in mindfulness measures of emotion regulation/acceptance. Clinical implications and limitations are discussed with reference to future research.

Part 3 is a critical appraisal that provides a reflection on the process of conducting the current project. It discusses wider clinical implications of conducting research with older people and some of the challenges and issues encountered during the process.

Acknowledgment

I would like to dedicate this research project to everyone who made this possible. I am grateful to all participants who took the time to participate in this study. I would like to express my gratitude to my supervisors Dr. Joshua Stott and Dr. Georgina Charlsworth who have gone the extra mile with guidance and encouragement through this journey. I am sincerely thankful to my parents and siblings for supporting me with great compassion. I am thankful to our hard working research assistant Maya Patel for her help with data collection, and to my co-researcher Catherine Bousfield for her help with checking the data. Finally, thank you to all my fellow trainees and dear friends for their kindness.

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Abstract

Objectives: To review the evidence for the diagnostic accuracy of the non-English updated versions of Addenbrooke's Cognitive Examination (ACE)—the ACE-Revised (ACE-R) and the ACE-III—in the diagnosis of dementia.

Design: A systematic search was conducted on PsychINFO, MEDLINE, and EMBASE. Studies that met the inclusion criteria were evaluated using a systematic appraisal tool.

Results: The systematic search resulted in 15 studies that were eligible for the current review (14 on the ACE-R and one on the ACE-III). Excellent diagnostic accuracy presented across the non-English versions of the ACE-R and the ACE-III. However, the ability of the studies was likely compromised in drawing conclusions about sensitivity and specificity.

Conclusion: Despite the measures' ability to distinguish between people with and without dementia, the quality assessment of the studies revealed various sources of bias that influenced the validity of the evidence.

Introduction

Dementia

Dementia is an umbrella term for neurological, chronic, and progressive brain disorders that primarily affect older people around the age of 65 and older (World Health Organisation, 2012). It is a syndrome that leads to deterioration in cognitive functioning, which differs from normal age-related decline in cognition. Alzheimer's Society estimated prevalence of dementia in the United Kingdom in 2015 was 850,000 people (Prince et al., 2014). Different types of dementia exist and have distinct neuropsychological profiles (Salmon & Bondi, 1999). Alzheimer's disease is the most common cause of dementia. The estimated number of older people diagnosed with Alzheimer's disease is 520,000 in the United Kingdom (Prince et al., 2014). Other common subtypes of dementia are vascular dementia, dementia with Lewy bodies, and frontotemporal dementia. Some older people have only one type of dementia, but some may present with more than one type of dementia. An accurate clinical diagnosis of dementia at an early stage and an early intervention that slows the progression of the disease can lead to a better prognosis (National Institute for Health and Clinical Excellence, 2006).

Screening Tools for Dementia

Neuropsychological assessment is a major component of the clinical process of diagnosing dementia and of developing an appropriate intervention plan. It is a reliable diagnostic method that does not rely just on self-report of cognitive functioning, which can lack validity, especially if the individual has cognitive problems, but also relies on a battery of valid and reliable tests that give quantitative and qualitative information on the different neuropsychological profiles that can indicate cognitive impairment (Salmon & Bondi, 2009).

Screening tools for dementia are used as diagnostic instruments in the context of clinical interviews to identify patients who might have the condition. Ideally, the tools are developed to be used for people who are at increased risk of developing this specific condition and are used as an initial step to determine the need for a full neuropsychological assessment, or as diagnostic tools in themselves when a full neuropsychological assessment is not feasible because of client-related factors (Cherbuin, Anstey, & Lipnicki, 2008). However, they are often used in clinical practice as a diagnostic tool combined with a clinical interview.

Addenbrooke's Cognitive Examination

Addenbrooke's Cognitive Examination (ACE) is a brief (15-minute) screening tool that is widely used in research and clinical settings to detect signs of dementia. It is a 100-point test, and the United Kingdom version has a high cutoff point of 88 for dementia with 93% sensitivity and 71% specificity and a low cutoff point of 83 with 82% sensitivity and 96% specificity (Mathuranath et al., 2000). This screening tool aims to evaluate five cognitive domains to enable detection and monitoring of deterioration in cognitive functioning (Mathuranath et al., 2000) and to aid detection of different subtypes of dementia that may present with different profiles of impairment. ACE and ACE-R but not ACE-III incorporate the Mini Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975) and provides sub-scale scores for the cognitive domains of language, functioning memory, and verbal fluency. While the five sub-scale scores have remained, the ACE has developed over time to address weaknesses identified through research and clinical practice. In 2006, a revised version of the ACE (ACE-R) was published to make the measure easier to administer, and in 2013 the ACE-III was published. In both cases, the content was modified to increase sensitivity and to facilitate cross-

cultural adaptation (Hsieh et al., 2013; Mioshi et al., 2006), cutoff points remain the same for newer versions.

Diagnostic Accuracy

Diagnostic tests are objective measures used clinically to detect or predict a particular condition. In studies of the clinical or diagnostic accuracy of a psychometric test, authors have aimed to evaluate the association between the results of the test under evaluation and the condition status of a certain population sample (Guyatt, Tugwell, Feeny, Haynes, & Drummond, 1986). Sensitivity and specificity are statistical measures of an instrument's performance in detecting the target condition in those with the condition and its absence in those without. A good diagnostic tool has both high sensitivity and high specificity.

Sensitivity refers to the ability of the test to accurately identify those with the target condition. A test with a high sensitivity (100%) can be used to correctly detect all people with the target condition. Negative results indicate the absence of the target condition, and positive results indicate the presence of the condition (Altman & Bland, 1994). Statistically, sensitivity can be reported as the following:

$$\text{Sensitivity} = \frac{\text{Number of True Positives}}{\text{Number of True Positives} + \text{Number of False Positives}}$$

Specificity refers to the tool's ability to detect people who are without the target condition. A test with a high level of specificity (100%) can be used to accurately show that healthy people do not have the condition (Altman & Bland, 1994). Mathematically specificity can be reported as the following:

$$\text{Specificity} = \frac{\text{Number of True Negatives}}{\text{Number of True Negatives} + \text{Number of False Negatives}}$$

For any diagnostic tool on an interval or ordinal scale, there will be a number of possible thresholds or cutoff scores at which a decision is made that a person has a condition or not. Rarely will any of these cutoff scores completely separate people with or without the target condition. Some individuals with the target condition will score positive (TP= True Positive), but some individuals with the target condition will score negative (FN= False Negative). By contrast, some individuals without the target condition will correctly be classified as negative (TN= True Negative), but some individuals without the target condition will score positive (FP= False Positive) (Altman & Bland, 1994). The distributions of the scores will overlap, as shown in the graph below (Figure 1).

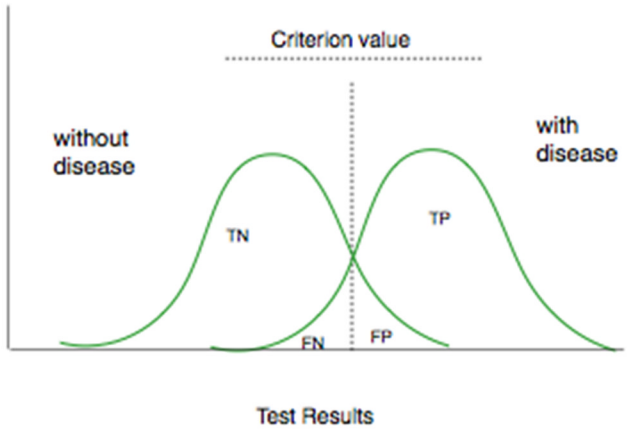

Figure 1. Sensitivity and Specificity.

In order to determine the best cutoff for identifying a particular condition, the relationship between sensitivity and specificity at different cutoff points is represented through use of receiver operating characteristic (ROC) curve analysis (Metz, 1978). The ROC curve represents the association between sensitivity and specificity for tests at different cutoff points. It plots the true positive values

(sensitivity) against the false positive value (1-specificity) at different cutoff scores. Every plotted point on the ROC curve represents the relationship between sensitivity and 1-specificity at a particular cutoff point. The decision regarding where to set the cutoff on a tool for identifying a condition is made on the basis of the value of a cutoff that maximises sensitivity and specificity. The area under the curve (AUC) of the ROC illustrates generally how well the instrument is able to distinguish between people with or without the target condition (Zweig & Campbell, 1993). A perfect test with sensitivity = 100% and specificity = 100% has a ROC curve that looks like the normal line on Figure 2 below and has an AUC of 1 where the entire area of the chart is contained within the curve. If the AUC is equal to 0.5, then the test is useless, and this is illustrated by the dotted line below (Zweig & Campbell, 1993).

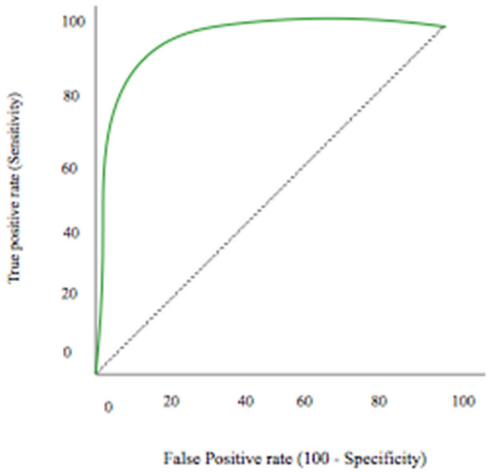

Figure 2. Receiving operative characteristic (ROC) curve.

The likelihood ratio (LR) for a positive or negative test provides an indication of the diagnostic accuracy of the tool (Simel, Samsa, & Matcher, 1991). The LR of a positive test is calculated using the probability that a person with the target condition will have a positive result, divided by the probability of a person without the condition having a positive result on the measure. The quality of the tool

increases the more the LR increases from 1. The diagnostic odds ratio (OR) is another measurement of diagnostic accuracy. It refers to the ability of the tool to discriminate between people with or without the target condition. The higher the OR score is, the better the screening tool performance (Glas, Lijmer, Prins, Bonsel, & Bossuyt, 2003). Youden's index (Youden's J statistic) is another statistical test used occasionally in conjunction with ROC analysis to evaluate diagnostic accuracy. The maximum value of the index indicates the optimal cutoff point of a diagnostic test. It is illustrated graphically as the highest point that is equivalent to the area under the ROC (J = Sensitivity + Specificity - 1) (Youden, 1950).

Studies on diagnostic accuracy need to have a group of people who are healthy and a group of people who have a target condition as defined by a reference standard. The index test is then used on both those with and those without the condition with true positive, false positive, true negative, and false negative determined with reference to the standard (Knottnerus & Muris, 2002).

Diagnostic Accuracy of the ACE-R and the ACE-III

The diagnostic accuracy of English versions of the ACE-R and the ACE-III have been investigated in previous studies (Crawford, Whitnall, Robertson, & Evans, 2012; Larner & Mitchell, 2014). Authors of a recently published meta-analysis reviewed the clinical accuracy of the ACE and the ACE-R in detecting people with or without dementia (Larner & Mitchell, 2014). The meta-analysis included five studies on the ACE-R with a total of 560 cases of dementia out of a sample of 1,156. The data from these studies show that 514 individuals out of 560 were positively identified using the ACE-R, which reflects 91.8% sensitivity. Similarly, 383 individuals were correctly eliminated from a comparison sample of 596 to give 87.5% specificity. The reference standard for four of the five studies

included in the meta-analysis was the *Diagnostic and Statistical Manual* (*DSM*) (usually version IV) at given cutoffs.

In 2013, the updated version, the ACE-III was published (Hsieh et al., 2013), improving on the weaknesses in certain domains in the ACE-R. To date, there has been no published systematic review or meta-analysis on the clinical utility and diagnostic accuracy of the ACE-III. During its evaluation, the ACE-III was compared with standardised neuropsychological tests commonly used to assess cognitive functioning, focusing on attention, language, memory, and others. A comparison of the ACE-III with the ACE-R showed a significant level of correlation ($r = 0.99$, $p < 0.01$). The ACE-III has also shown high sensitivity and specificity at the recommended cutoff points, which are 88 cutoff (sensitivity = 1.0, specificity = 0.96) and 82 cutoff (sensitivity = 0.93, specificity = 1.0) (Hsieh et al., 2013).

Current Literature Review

The diagnostic accuracy of the English version of the ACE-R was evaluated in a recently published systematic review (Crawford, Whitnall, Robertson, & Evans, 2012) and in a meta-analysis (Larner & Mitchell, 2014). However, no systematic review was identified that has specifically investigated the literature on the clinical accuracy of the non-English versions of the ACE-R and the ACE-III in diagnosing dementia, despite there being a number of published non-English versions. In light of this, the aim of the current review is to review the diagnostic accuracy of the non-English versions of the ACE-R and the ACE-III in diagnosing dementia with reference to sensitivity, specificity, ROC curve and LR and OR analysis.

Methods

Search Strategy

The search was conducted in December 2015, which involved searching three electronic databases: PsychINFO, MEDLINE, and EMBASE. The following search words were used: *Addenbrooke's Cognitive Examination-Revised*, *Addenbrooke's Cognitive Examination- III*, *ACE-R*, *ACE-III*, and *foreign language translation*. Terms were combined using Boolean operators *OR* and *AND*. Because the ACE-R and the ACE-III—published in 2006 and 2013, respectively—were updated versions of the ACE (Mathuranath et al., 2000), only studies published from 2006 to the present were included in the search. Titles, abstracts, and full articles were reviewed to assess their eligibility in light of the inclusion and exclusion criteria of the current literature review. Reference lists of included studies were reviewed to identify further articles.

Inclusion Criteria

1. Studies investigating the diagnostic accuracy of non-English versions of the ACE-R and the ACE-III
2. If more than one study translated the ACE-R and the ACE-III to the same language, all different versions were included

Exclusion Criteria

1. Studies not in English
2. Studies on the English versions of the ACE-R and the ACE-III
3. Studies that used non-English versions of the ACE-R or the ACE-III to track changes in cognitive functioning over time rather than diagnostic accuracy

4. Studies that used non-English versions of the ACE-R or the ACE-III as part of a wider cognitive assessment without providing information on the screening tool

5. Abstracts, response letters, reviews and guides

Data Extraction

All eligible articles were read, and data were extracted on demographic information such as gender, age in years, education in years as well as reference standards used, cutoff scores, sensitivity, specificity, ROC curve, LR, positive predictive value (PPV), negative predictive value (NPV), and the Youden index.

Quality Assessment

The Standards for Reporting of Diagnostic Accuracy Studies (STARD) checklist (Bossuyt et al., 2015) was used to assess the quality of the studies of diagnostic accuracy. STARD is a 30-item checklist divided into sections that follow the IMRAD (Introduction, Methods, Results, and Discussion) structure of scientific papers. STARD was developed in 2003 and is widely used to evaluate the quality of the studies on diagnostic accuracy (Bossuyt et al., 2003). The 2015 version is the most recent update. A Score of two indicate that the information is well presented and detailed, scores of one indicate that information is present but without adequate details, and scores of 0 indicate the absence of information. The overall score is 62.

In line with the recommendations of National Institute for Clinical Excellence (NICE, 2014), quality assessment consisted of critical appraisal and an overall rating of high quality (++) indicating detailed and adequate information was reported, medium quality (+) indicating information was reported but with insufficient details or low quality (-)indicating information was not reported, with

reference to STARD rating and critical appraisal of how likely identified issues were to alter the conclusion of the study.

Results

Study Selection

Study selection involved systematic review of the available literature on the translated versions of the ACE-R and the ACE-III. It resulted in 15 articles that met the eligibility criteria. During the search process, 721 articles were initially identified among the three databases that were searched: PsychINFO, MEDLINE, and EMBASE. Figure 3 provides a flow chart of the systematic screening process.

Summary of Results

A summary of the study characteristics of all eligible studies is reported in Table 1. It contains the diagnoses of participants, gender, age in years, and education in years. It also includes the mean score of the ACE-R and the ACE-III as the index test and lists all the reference gold-standard tests that were used to identify participants with or without the target condition. Information about diagnostic accuracy includes cutoff points, sensitivity, specificity, and the ROC curve. LR, PPV, NPV, and the Youden index are shown in Table 2. Details about the quality assessment and the critical appraisal of the included studies are reported in Table 3.

Figure 3. Flowchart of search process.

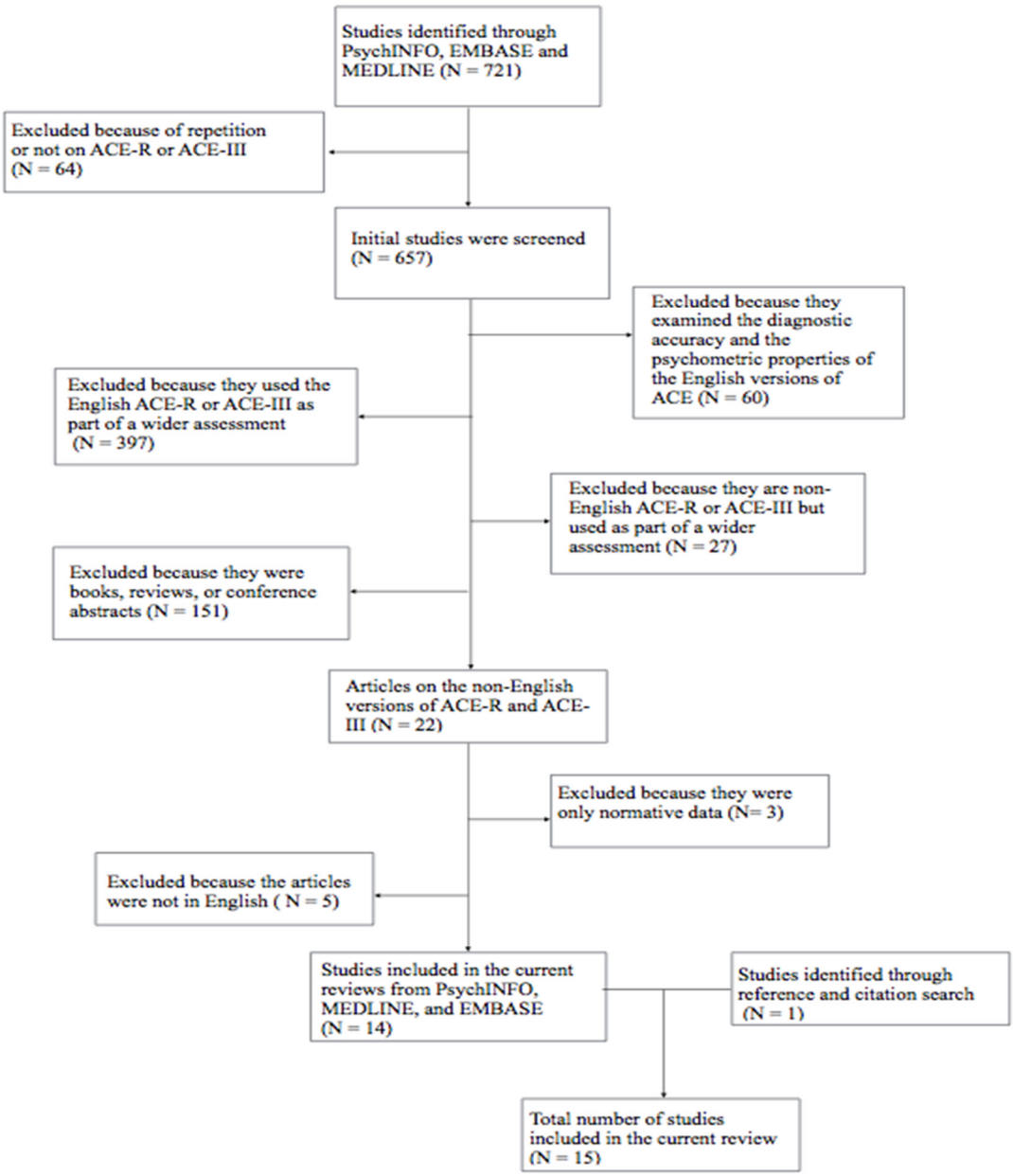

Table 1 *Study Characteristics*

Language	Author (year)	ACE-R/ ACE-III	Participants type	Gender male: female	Age in years Mean ± SD	Years of Education Mean ± SD	ACE-R/ACE-III Mean ± SD
Brazilian	(Carvalho et al., 2010)	ACE-R	Alzheimer (n= 31) Healthy (n= 62)	13:18 22:40	78.03 ± 6.74 77.82 ± 6.58	9.97 ± 5.19 10.05 ± 4.98	63.10 ± 10.22 83.63 ± 7.90
Brazilian	(Sobreira et al., 2015)	ACE-R	Dementia (n= 17) MCI (n= 32) Healthy (n= 30)	3:13 16:15 10:20	72.5 (53-81)* 57 (37-77) 61 (28-79)	5.50 (2-18)* 10 (0-20) 4 (1-20)	67 (32-85)* 80 (41-98) 80.5 (53-95)
Chinese	(Fang et al., 2014)	ACE-R	AD (n= 25) MCI (n= 75) Healthy (n= 51)	11:14 37:38 23:28	73.32 ± 8.13 69.52 ± 9.69 68.16 ± 8.18	9.68 ± 5.01 10.07 ± 4.41 11.77 ± 3.46	55.72 ± 9.20 76.56 ± 10.31 87.59 ± 7.68
Chinese	(Wong et al., 2013)	ACE-R	Dementia (n= 54) MCI (n= 50) Healthy (n= 43)	19:35 21:29 21:29	79.2 ± 6.6 76.9 ± 7.3 72.8 ± 7.5	3.7± 4.2 4.2 ± 4.2 5.6± 4.3	50.8 ± 15.4 68.2 ± 15.7 86.4 ± 8.9

Language	Author (year)	ACE-R/ ACE-III	Participants type	Gender male: female	Age in years Mean ± SD	Years of Education Mean ± SD	ACE-R/ACE-III Mean ± SD
French	(Bastide et al., 2012)	ACE-R	Dementia (n= 128) MCI (n= 118) Healthy (n= 73)	47:81 47:71 17:56	75 ±11 72 ±9 68 ±11	18 ± 4 18 ± 4 20 ± 4	70 ± 10 83 ± 8 93 ± 4
German	(Alexopoulos et al., 2010)	ACE-R	Alzheimer (n= 56) (FTLD) (n= 22) MCI (n= 75) Healthy (n= 76)	20:36 13:9 45:30 29:47	72.00 ± 8.18 69.64 ± 6.18 67.83 ± 8.01 69.64 ± 7.53	11.02 ± 2.63 11.70 ± 3.52 12.00 ± 3.27 11.78 ± 2.51	64.80 ± 11.32 64.50 ± 17.82 81.34 ± 9.09 90.37 ± 4.99
Greek	(Konstantinopoulou et al., 2011)	ACE-R	Alzheimer (n= 16) FTD (n= 19) Healthy (n= 60)	8: 8 6:13 30:30	71.69 ± 5.50 67.47 ± 6.87 66.20 ± 8.96	7.75 ± 3.98 9.89 ± 4.12 10.60 ± 4.22	55.63 ± 17.14 61.00 ± 17.82 89.13 ± 7.54

Language	Author (year)	ACE-R/ ACE-III	Participants type	Gender male: female	Age in years Mean ± SD	Years of Education Mean ± SD	ACE-R/ACE-III Mean ± SD
Italian	(Pigliautile et al., 2012)	ACE-R	Young-old				
			Dementia (n= 40)	16:24	70.8 ± 3.6	7.1 ± 3.7	63.3 ± 13.2
			Healthy (n= 41)	18:23	69.6 ± 2.8	8.9 ± 4.6	87.1 ± 9.3
			old-old	25:42	80.9 ± 3.6	7.1 ± 4.8	53.6 ± 12.2
			Dementia (n= 67)	11:20	80.7 ± 3.6	7.7 ± 3.9	80.5 ± 10.7
			Healthy (n= 31)				
Japanese	(Kawata et al., 2012)	ACE-R	Dementia (n= 126)	34:92	77.3 ± 7.6	10.6 ± 2.5	58.4 ± 16.4
			Healthy (n= 85)	34:51	71.5 ±9.1	12.3 ± 2.6	90.8 ± 6.9
Japanese	(Yoshida et al., 2012)	ACE-R	Dementia (n= 130)	42: 88	75.4 ± 7	11.1 ± 2.7	61.5 ± 12.9
			MCI (n= 39)	17: 22	71.4 ± 9.2	11.4 ± 2.1	82.2 ± 6.4
			Healthy (n= 73)	27: 46	66.3 ± 10	12.7 ± 2.3	93.3 ± 3.9
Korean	(Kwak et al., 2010)	ACE-R	Alzheimer (n= 30)	13:17	73.1 ± 11.2	8.9 ± 4.2	52.5 ± 15.1
			SIVD (n= 42)	20:22	70.1 ± 10.2	8.6 ± 3.9	53.2 ± 17.0
			Healthy (n= 84)	40:44	67.8 ± 9.3	10.1 ± 4.1	80.7 ± 6.0

Language	Author (year)	ACE-R/ ACE-III	Participants type	Gender male: female	Age in years Mean ± SD	Years of Education Mean ± SD	ACE-R/ACE-III Mean ± SD
Portuguese	(Goncalves et al., 2015)	ACE-R	Subcortical vascular dementia (n= 18) Alzheimer (n= 36) Healthy (n= 38)	11:7 16:20 17:21	75.50 ± 5.29 75.14 ± 4.12 76.95 ± 6.92	3.22 ± 1.73 4.64 ± 3.16 5.61 ± 2.81	55.06 ± 9.19 55.53 ± 10.16 82.11 ± 1.29
Spanish	(Raimondi et al., 2012)	ACE-R	Alzheimer (n= 25) VaD (n= 32) Healthy (n= 26)	12:13 16:16 13:13	77.64 ± 5.3 75.59 ± 6.4 73.23 ± 8.9	14.48 ± 3.6 12.97 ± 4.3 14.46 ± 2.2	
Spanish	(Torralva et al., 2011)	ACE-R	Alzheimer (n= 46) bvFTD (n= 41) Healthy (n= 40)	12: 34 9: 32 11: 29	73.4 ± 5.7 70.0 ± 9.3 71.5 ±5.6	12.9 ± 4.6 12.8 ± 5.1 13.0 ± 3.8	78.1 ± 9.4 64.2 ±16 94.3 ± 4.2
Spanish	(Matias-Guiu et al., 2014)	ACE-III	Dementia (n= 87) Healthy (n= 130)	34:53 46:84	77.3 ± 8.4 71.0 ± 11.0	7.5 ± 4.6 9.8 ± 5.9	50.4 ± 16.0 81.8± 12.7

*Only the median (min-max) was reported in the article.

** Alzheimer disease (AD), Frontotemporal lobar degeneration (FTLD), Behavioural Variant Frontotemporal lobar degeneration (bvFTD), Subcortical vascular dementia (SVD) and Subcortical Ischemic Vascular Dementia (SIVD).

**** A blank space indicates no information is available.

Table 2 *Diagnostic Accuracy and Quality Assessment*

Language	Author (year)	Cutoff score	Sensitivity	Specificity	ROC curve	STARD score/number of items	Main limitations	Rating of overall quality
Brazilian	(Carvalho et al., 2010)	78	100	82.26	0.947	31/62	No sufficient details about the ACE-R or rational for the cutoff point, non-blind, time interval not stated, indeterminate data was not reported, power not calculated	–
Brazilian	(Sobreira et al., 2015)	76	88	68	0.84	34/62	Non-blind, power not calculated, indeterminate data was not reported,	–
Chinese	(Fang et al.,2014)	67/68	92	86	0.945	33/62	Non-blind, indeterminate data was not reported, power not calculated, time interval not stated, poorly defined sample	–
Chinese	(Wong et al., 2013)	73/74	93	95	0.98	40/62	Indeterminate data was reported, time interval not stated, poorly defined sample	+
French	(Bastide et al., 2012)	83/89	98	99	0.986	32/62	No rational for the cutoff point of the reference standard, non-blind, indeterminate data was not reported, power not calculated, time interval not stated, poorly defined sample	–
German	(Alexopoulos et al., 2010)	AD 82/83 FTLD 83/84	92 88	96 96	0.99 0.97	35/62	Power not calculated, indeterminate data was not reported, no rational for the cutoff point of ACE-R, time interval not stated, poorly defined sample	–

Language	Author (year)	Cutoff score	Sensitivity	Specificity	ROC curve	STARD score/number of items	Main limitations	Rating of overall quality
Greek	(Konstantinopoulou et al., 2011)	85 82 80	97 89 86	82 88 92	0.963	21/62	No rational for the cutoff point of ACE-R or the reference standard, no sufficient details about ACE-R, indeterminate data was not reported, non-blind, power not calculated, time interval not stated	_
Italian	(Pigliautile et al., 2012)	Young-old 79 old-old 60	90 82	80 100	0.936 0.931	31/62	No rational for the cutoff point of ACE-R or the reference standard, non-blind, indeterminate data was not reported, time interval not stated	_
Japanese	(Kawata et al., 2012)	80	94	94	0.98	37/62	Poorly defined sample, no rational for the cutoff point of ACE-R or the reference standard, indeterminate data was not reported, power not calculated, time interval not stated	_
Japanese	(Yoshida et al., 2012)	82/83	99	99	0.99	44/62	Power not calculated, indeterminate data was not reported, no rational for the cutoff point of ACE-R, time interval not stated	+
Korean	(Kwak et al., 2010)	78	93	95		35/62	Poorly defined sample, No rational for the cutoff point of ACE-R or the reference standard, indeterminate data was not reported, power not calculated, time interval not stated	_
Portuguese	(Goncalves et al., 2015)	SVD 72/73 AD 72/73	SVD 100 AD 97	SVD 97 AD 92	SVD 0.99 AD 0.98	34/62	No rational for the cutoff point of ACE-R or the reference standard, poorly define sample, indeterminate data was not reported, time interval not stated	+

Language	Author (year)	Cutoff score	Sensitivity	Specificity	ROC curve	STARD score/number of items	Main limitations	Rating of overall quality
Spanish	(Raimondi et al., 2012)	88	100	100	1.0	31/62	Poorly defined sample, no rational for the cutoff point of ACE-R, non-blind, indeterminate data was not reported, power not calculated, time interval not stated	_
Spanish	(Torralva et al., 2011)	85	97	88		32/62	Poorly defined sample, non-blind, power not calculated, indeterminate data was not reported, time interval not stated	_
Spanish	(Matias-Guiu et al., 2014)	65.6	83	80	0.92	32/62	No rational for the cutoff point of ACE-R or the reference standard, non-blind, indeterminate data was not reported, time interval not stated	_

**Alzheimer disease (AD), Frontotemporal lobar degeneration (FTLD), subcortical vascular dementia (SVD).*

++ = High quality (detailed and adequate information was reported) + = medium quality (Information was reported but with insufficient details) and - = low quality (Information was not reported)

Description of Study Characteristics

The articles included in this review were the studies identified as papers written in English on the topic of diagnostic accuracy of the translated versions of the ACE-R and the ACE-III. The translated versions were in the following languages: Brazilian, Chinese/ Mandarin, Chinese/Cantonese, French, German, Greek, Italian, Japanese, Korean, Portuguese, and Spanish.

The clinical cutoff scores for the translated measures included in this review ranged between 60 (Pigliautile et al., 2012) and 89 (Bastide et al., 2012). The sensitivity of the measures to identify people with dementia ranged between 82% (Pigliautile et al., 2012) and 100% (Carvalho et al., 2010; Raimondi et al., 2012). The specificity of the studies to distinguish people without dementia ranged between 68% (Sobreira et al., 2015) and 100% (Pigliautile et al., 2012; Raimondi et al., 2012).

The mean age of participants in the studies ranged between 66.20 ± 8.96 (Konstantinopoulou et al., 2011) and 80.9 ± 3.6 (Pigliautile et al., 2012). The years of education ranged between 3.22 ± 1.73 and 20 ± 4 (Goncalves et al., 2015). The types of dementia included across the studies were Alzheimer disease (AD), Frontotemporal lobar degeneration (FTLD), Behavioural Variant Frontotemporal lobar degeneration (bvFTD), and Subcortical vascular dementia (SVD) or Subcortical Ischemic Vascular Dementia (SIVD).

Methodological Review of the Studies

The methodological review was completed in three steps. The first step involved extracting the sensitivity and specificity data to evaluate the ability to distinguish between people with or without dementia. The second step was to score

the articles on the basis of the STARD criteria (Bossuyt et al., 2015). To investigate how likely identified issues were to alter the conclusion of the study, the third step was to assess the quality of the evidence on the basis of the critical appraisal and an overall rating of high (++), medium (+), or low (-) quality (NICE, 2014) with reference to the STARD rating criteria.

In the current review, 12 studies were judged to be of low (-) quality, and three were judged to be of medium (+) quality. The discussion of the quality of the studies is explained in the results section below. Common methodological problems were identified during the critical appraisal of the studies, which influenced the ability to draw evidence-based conclusions. In all 15 studies included in the current review, no information was given on how indeterminate scores were handled. This might have inflated or deflated the estimation of the diagnostic accuracy if data occurred more frequently in either people with or people without dementia (Bossuyt et al., 2003). There was also no indication of the time interval between the index and the reference tests in 14 studies; consequently, there may have been changes in the target condition over time that might have influenced the diagnostic accuracy of the measure (Bossuyt et al., 2003). In 11 studies, insufficient information was given about either the index test or the reference standard that could inform the reader about the definition of the target condition and different diagnostic strategies (Bossuyt et al., 2003). The power calculation indicating the intended sample size was not reported in 11 studies, despite the importance of determining the sample size needed to identify clinically relevant findings (Machin, Campbell, Fayers, & Pinol, 1997). Furthermore, nine studies did not include information on the sampling process of participants; thus, it was difficult to assess the population for whom the

study was generalisable (Konttnerus & Muris, 2002). Similarly, in nine studies, assessors were not blind to clinical information, meaning that researchers were aware of the clinical diagnosis of the participants while administrating the ACE-R or the ACE-III. Non-blindness might mean that more people were accurately diagnosed because assessors already knew who had dementia, which might have influenced the administration and scoring of the screening test (Philbrick, Horwitz, & Feinstein, 1980).

Results of Individual Studies Categorised by the Language of Translation

Brazilian Translation. In two of the studies, the diagnostic accuracy of the Brazilian translation of the ACE-R was assessed for its ability to detect dementia. The findings from the first study (Carvalho et al., 2010) suggested that sensitivity for the ACE-R was 100% and that specificity was 82.26%, indicating excellent ability to detect dementia. A clear description was given for the clinical characteristics of participants so that the reader was informed about the feasibility and the generalisability of the findings (Bossuyt et al., 2003). The reference standards were clinical gold standards for the assessment of dementia, and the rationale for choosing the reference standard was given. However, there was insufficient information about the administration of the ACE-R and the rationale for the cutoff score. Similarly, information was not provided on the blindness of the assessors to the clinical information or the time interval between the clinical assessment and the administration of the ACE-R. In addition, the authors of the study did not report the power calculation or sampling process. It was not clear how the indeterminate data was handled. In view of the appraisal, the conclusion

regarding the diagnostic accuracy of the measure as a tool to distinguish between people with or without dementia was compromised, as the study was of low quality.

The findings from the second article on the Brazilian translation of the ACE-R (Sobreira et al., 2015) indicated good ability in distinguishing between people with or without dementia among those who had Parkinson's disease (sensitivity = 88%, specificity = 68%). A coherent clinical rationale was provided with clear objectives and hypotheses, which allowed the reader to evaluate the analysis and the results (Bossuyt et al., 2003). Information was given on the index test and the reference standard that could assist the reader to have an informed interpretation of the diagnostic accuracy estimates (Konttnerus & Muris, 2002). However, the assessors were not blind to the clinical information, and the authors did not indicate how indeterminate scores were handled. Similarly, the authors did not report the power calculation and how the sample size was determined. Taking into account the sensitivity and specificity of the current measure, together with the quality of information reported, the study was assessed as low quality and the authors conclusions about sensitivity and specificity were likely compromised.

Chinese Translation. Two of the studies were on the diagnostic accuracy of the Chinese translation of the ACE-R. The first article was an investigation of the diagnostic accuracy of the Chinese (Mandarin) translation of the ACE-R (Fang et al., 2013) in diagnosing dementia. The results suggested that the ACE-R was an excellent tool (sensitivity = 92%, specificity = 86%) for distinguishing between people with or without the target condition. Sufficient information was given about the study objectives and hypotheses and the clinical background of the index test, which would allow replication (Konttnerus & Muris, 2002). In addition,

information was provided about the index and the reference standards, the baseline demographics of participants, and eligibility criteria, which could inform the reader about the generalisability of the findings (Bossuyt et al., 2003). However, no information was given on how indeterminate results of either tests were handled. Furthermore, assessors were not blind to the clinical information, and the time gap between both measurements was not specified. In addition, the sampling was poorly defined, and the power calculation was not conducted. The validity of the study to draw conclusions about sensitivity and specificity was likely compromised because the study was considered of low quality.

The second article was a report on the diagnostic accuracy of the Chinese (Cantonese) translation of the ACE-R (Wong et al., 2013). The results indicated an excellent ability of the ACE-R as a tool to distinguish between people with or without dementia (sensitivity = 93%, specificity = 95%). Taking into consideration the checklist items of STARD, the authors of the study provided sufficient details on the index test to allow replication, and gold-standard reference tests were used that were consistent with the literature. To minimise the risk of bias, a researcher blind to the clinical information of all participants administered the index test (Cantonese ACE-R) within a week of the clinical assessment. However, the sample of the study was poorly defined, and the study's authors did not indicate how indeterminate data were handled. Similarly, no information was given on the time interval between the reference standard and the ACE-R. Therefore, the validity of the study for drawing a conclusion about sensitivity and specificity was slightly compromised, as the study was of medium quality.

French Translation. One published paper was a retrospective study on the diagnostic accuracy of the French version of the ACE-R (Bastide et al., 2012). The sensitivity of the test was 98%, and the specificity was 99%, suggesting that the test is an excellent tool to identify those who have dementia and those who do not. The STARD appraisal checklist indicated that detailed information was given about the index test and the reference standard, which provided a clear rationale for the testing procedure and would allow replication. However, the authors did not indicate blindness of the assessors to the clinical information when administering and scoring the ACE-R or indicate the time interval between both measures. Similarly, sampling was poorly defined, and power was not calculated. Therefore, the study was of low quality, and the ability to draw a conclusion of excellent sensitivity and specificity was likely compromised.

German Translation. The study on the German translation of the ACE-R (Alexopoulos et al., 2010) was an investigation of the diagnostic accuracy of the translated screening tool. The results of the study suggested that the measure could be used to discriminate between people with or without dementia: Alzheimer's disease (sensitivity = 92%, specificity = 96%) and frontotemporal lobar degeneration (sensitivity = 88%, specificity = 96%). However, the sample was poorly defined; no indication of the power calculation was included, and no information was provided on how indeterminate data were handled. Furthermore, the authors did not give the time interval between the index and the reference tests or explain the rationale of the cutoff point of the ACE-R. Therefore, the study was of low quality, and the ability of the authors to draw a conclusion about sensitivity and specificity was likely to be compromised.

Greek Translation. The article on the Greek translation of the ACE-R (Konstantinopoulou et al., 2011) was an investigation of the diagnostic accuracy of the Greek ACE-R in detecting different types of dementia. The findings from this study suggested that the ACE-R was used to detect those with or without dementia (sensitivity ranged from 86% to 97%; specificity ranged from 82% to 92%). A clear description was given on the clinical background of the index test, objectives, and hypotheses—eligibility criteria that provided clear information on the design of the study that would help the reader to interpret the results and replicate the study (Bossuyt et al., 2003). However, there was no sufficient information on the administration of the ACE-R or the definition of the cutoff points. Similarly, no information was given on the assessors' blindness to the clinical information or the time interval between measures. In addition, there was also no indication of the power calculation or how indeterminate scores were handled. In light of that, the study was determined to be of low quality, and the ability of the authors to draw a conclusion on the diagnostic accuracy of the measure was likely compromised.

Italian Translation. Although few articles included examinations of the Italian versions of the ACE-R, one article (Pigliautile et al., 2012) met the inclusion criteria of the current review. The aim of that study was to evaluate the diagnostic accuracy of the translated measure on young-old adults and old-old adults with or without dementia. The findings from the study were a sensitivity of 90% and a specificity of 80% for young-old adults and a sensitivity of 82% and a specificity of 100% for old-old adults, demonstrating excellent ability of the ACE-R as a tool to distinguish between people with or without dementia. A clear description was given for the clinical characteristics of participants that informed the reader about

the feasibility and the generalisability of the findings (Bossuyt et al., 2003). However, the assessors were not blind to the clinical information, and the authors did not report the time interval between the clinical assessment and the administration of the ACE-R. Similarly, there was no clear rationale given for the cutoff point of the ACE-R or how indeterminate scores were handled. In view of the appraisal, the study was determined to be of low quality, and the ability of the authors to draw a conclusion of excellent sensitivity and specificity was likely compromised.

Japanese Translation. In two studies, the authors investigated the diagnostic accuracy of the Japanese translation of the ACE-R in diagnosing dementia. The results of the first article (Kawata et al., 2012) suggested that the ACE-R is an excellent tool to identify people with dementia (sensitivity = 94%, specificity = 94%). In terms of an appraisal based on STARD criteria, sufficient information was given on the index test and the reference standard, which provided the reader with the clinical information that could assist the reader in estimating the accuracy of the results (Konttnerus & Muris, 2002). Compared to other studies, the clinical assessment in this study was conducted independently from the administration of the ACE-R to avoid a potential risk of biasing the scores. However, the study poorly defined the sampling process and did not provide power calculation of the estimated sample size. Likewise, there was no information on the rationale of the cutoff point of the ACE-R or the reference standard. Therefore, the study was of medium quality, and the ability of the authors to draw a conclusion about the sensitivity and specificity was slightly compromised.

Authors of the second article (Yoshida et al., 2012) also investigated the diagnostic accuracy of the Japanese translation of the ACE-R. The results indicated that the ACE-R was excellent in distinguishing between people with or without dementia (sensitivity = 99%, specificity = 99%). In light of a STARD-based appraisal, sufficient information was given about the index test and the reference standard that could inform the reader about the target condition and how it was defined and categorised (Konttnerus & Muris, 2002). Similar to the other Japanese translation (Kawata et al., 2012), the clinical assessment was independently conducted from administering the ACE-R, meaning that assessors were blind to the reference standard to minimise any possible source of bias (Philbrick et al., 1980). However, the authors did not report the rationale for the cutoff point of the ACE-R. Neither did they indicate the estimated sample size based on the power calculation. The time interval between the reference standard and the ACE-R was not reported. Furthermore, there was no information on how the authors dealt with the indeterminate scores. Therefore, the conclusion regarding the diagnostic accuracy of the measure as a tool to distinguish between people with or without dementia was compromised, as the study was of low quality.

Korean Translation. One article was published on the diagnostic accuracy of the Korean translation of the ACE-R (Kwak et al., 2010). The authors focused on investigating the ACE-R for its use in detecting dementia and to differentiate between Alzheimer's disease and subcortical ischemic vascular dementia. The findings from the study suggested that the Korean translation of the measure had 93% sensitivity to detect people with dementia and 95% specificity to detect people without dementia, suggesting an excellent diagnostic accuracy. However, there was

no clear definition of the cutoff or the rationale for the reference test. Similarly, no information was given on the sampling process or power calculation. The authors did not indicate the time interval between measures or how they dealt with indeterminate scores. Therefore, the study was of low quality, and the ability of the study to provide a conclusion of excellent diagnostic accuracy was compromised.

Portuguese Translation. In one published paper, Goncalves et al. (2015) reported on their examination of the diagnostic accuracy of the translated version of the ACE-R to Portuguese. The findings from that study generally suggested that the ACE-R was used to detect those with Alzheimer's disease (sensitivity = 100%, specificity = 97%) or subcortical vascular dementia (sensitivity = 97%, specificity = 92%). However, a STARD criteria appraisal of the study revealed that no information was given about the rationale for the cutoff point of the ACE-R and the reference standard. Similarly, there was no information given on the time interval between the index and reference standard measures. In addition, no information was available on the sampling process or how indeterminate scores were handled. Therefore, despite the evidence of sensitivity and specificity, the study was of medium quality, and the ability of the study to draw a conclusion about the diagnostic accuracy was slightly compromised.

Spanish Translation. Two articles were identified on the diagnostic accuracy of the Spanish translation of the ACE-R, and one article was an examination of the diagnostic accuracy of the Spanish version of the ACE-III. In the first article on the Spanish ACE-R (Raimondi et al., 2012), people who had Alzheimer's disease or subcortical ischemic vascular dementia were compared with healthy individuals who participated as study controls. The results suggested that

the ACE-R is an excellent tool to discriminate between people with or without dementia (sensitivity = 100%, specificity = 100%). In terms of a STARD criteria appraisal, the sampling process was poorly defined, and the estimated sample size based on the power calculation was not reported. Furthermore, there was no rationale for the cutoff point of the ACE-R, and the indeterminate data were not defined. In addition, assessors were not blind to clinical information, and the time interval between the measurements was not reported. Despite the evidence of the diagnostic accuracy, the validity of the study to draw a conclusion about sensitivity and specificity was compromised in light of the low quality of the study.

In the second article, the diagnostic accuracy of the Spanish translation of the ACE-R was also examined, with the study population being Argentinian (Torralva et al., 2011). The study population included people who were healthy individuals (study controls), people with Alzheimer's disease, and people diagnosed as having a behavioural variant of frontotemporal dementia. The findings from the study suggested that the ACE-R is an excellent tool to use to discriminate between people with or without dementia (sensitivity = 97%, specificity = 88%). However, the critical appraisal showed that the sampling process was poorly defined and that the power was not calculated. Furthermore, assessors were not blind to the clinical information when administering the ACE-R, and the time interval between measures was not stated. In view of the above, the study was of low quality, and the conclusion regarding the diagnostic accuracy of the test was likely compromised.

The third article (Matias-Guiu et al., 2014) was on the diagnostic accuracy of the Spanish translation of the ACE-III, the only translated version of

the ACE-III that met all of the inclusion criteria of the current review. The results of that article suggested that the ACE-III is a good tool that can be used to distinguish between people with or without dementia (sensitivity = 83%, specificity = 80%). A coherent clinical rationale was provided with clear objectives and hypotheses, which allowed the reader to evaluate the analysis and the results. There was also a clear description of the clinical characteristics of participants that would allow the reader to judge the generalisability of the findings (Bossuyt et al., 2003). However, the authors did not state the rationale for the cutoff point of the ACE-R or the reference standard. The assessors were not blind to the clinical information, and the time interval between both measures was not clear. The authors did not report how the indeterminate scores were handled. In light of the above, the study was of low quality, and ability of the study to draw a conclusion about the sensitivity and specificity was likely compromised.

Discussion

The ACE-R and the ACE-III are screening tools designed to detect dementia as part of a wider comprehensive clinical assessment. The ACE-R and the ACE-III have been translated to different languages and adapted to diverse cultures. Fifteen translated papers met the inclusion criteria and were included in the review. The aim of the current review was to investigate the diagnostic accuracy of the translated versions of the ACE-R and the ACE-III in detecting dementia.

Summary of the Results

The diagnostic accuracy assessed through the sensitivity and specificity of the studies included in the current review revealed the measures' ability to

discriminate between people with or without dementia. The sensitivity ranged between 82% (Pigliautile et al., 2011) and 100% (Carvalho et al., 2010; Raimondi et al., 2012). The specificity ranged between 68% (Sobreira et al., 2015) and 100% (Pigliautile et al., 2011; Raimondi et al., 2012). However, the critical appraisal of the studies suggested that the conclusion of excellent sensitivity and specificity might have been compromised due to biases in study design.

General Methodological and Conceptual Issues

Sensitivity and specificity of all screening tools were reported, but the other measures of diagnostic accuracy used to discriminate between people with or without the target condition were rarely reported. The LR was stated in only two studies: the Spanish translation of the ACE-R (Torralva et al., 2011) and the Korean translation of the ACE-R (Kwak et al., 2010). Similarly, the PPV and the NPV were reported in only two studies: the Greek translation of the ACE-R (Konstantinopoulou et al., 2011) and the Brazilian translation of the ACE-R (Carvalho et al., 2010). The LR, PPV, and NPV could be used in future research as other measures of diagnostic accuracy to provide the reader with other confirming information on the diagnostic accuracy.

Overall, the evidence of diagnostic accuracy was positive, but valid conclusions could not be confirmed because of bias risk as a result of some methodological issues. There were common methodological problems that affected the quality of the included studies. First, there was insufficient information given about the index test and the reference standard that could inform the reader about the definition of the target condition and different diagnostic strategies. Second, there was no information available on the sampling process, intended sample size,

or flowchart of participants that could reflect the recruitment process and allow the reader to assess the population to whom the study was generalisable. Third, there was no information given on how missing data and indeterminate scores were handled. That might have inflated or deflated the estimation of the diagnostic accuracy if those data occurred more frequently in either people with or without dementia. Fourth, assessors were not blind to the clinical information in some studies, meaning that more people were accurately diagnosed because assessors already knew who had dementia which might have influenced the administration and scoring of the ACE. Finally, there was no indication of the time interval between the index and the reference tests, indicating possible changes in the target condition over time that might have influenced the diagnostic accuracy of the measure.

To be up to standard, screening tools must be able to detect people with or without the target condition. It was interesting to observe the diverse cutoff points of the translated versions of the ACE-R and the ACE-III across the range of populations. The cutoff scores ranged from 65.5 in the Spanish translation of the ACE-III up to 89 in the French translation of the ACE-R (Bastide et al., 2012). The variation of the cutoff points could be due to differences in mean age and years of education of participants. For example, the mean age and years of education of healthy controls and people with dementia in the Spanish ACE-III (Matias-Guiu et al., 2014) were different from the mean age and years of education of people in the French ACE-R (Bastide et al., 2012). Years of education were less and the mean age was higher in the Spanish study.

Issues to Consider for Translation and Cultural Adaptation

The current review did not report the cultural and language adaptation of the translated ACE-R and ACE-III because of the limited reporting of those information in the articles. The guidance of evaluating the cross-cultural validity of a measure (Mokkink et al., 2012) indicated adequate description of the original and translating languages of the screening tool. It also involved detailed information on the expertise of the translators in both languages and constructs. Detailed description of the process of translation including independent forward and backward translations and explanation of any discrepancies between the original article and the translation. In addition, it involved reporting on the reviewing process by a committee and the pre-testing to check cultural relevance and coherence.

A previous study comparing between ACE-R and Mini Mental State Examination (MMSE) in estimating cognitive functioning in people with Alzheimer's disease suggested a high statistical correlation between the scores of both screening tools (Law et al, 2013). It might be that MMSE would be a more advantageous tool if translated from English because of its length and the nature of the items.

Clinical and Research Implications

In light of the need to allow access to dementia care for those who do not speak English, ACE-R and ACE-II have been translated into a number of languages, but no review has examined the diagnostic accuracy of these non-English version. Researchers and clinicians can refer to the current review to look up the cut-off points and the diagnostic accuracy when they screen non-English—

speaking individuals for dementia. However, on the basis of the current review, they are advised to take into account that the diagnostic accuracy of the measures might have been inflated or deflated due to the methodological issues mentioned.

Limitations of the Current Review

A main limitation identified in the current systematic review was in relation to evaluating the translated versions of ACE-R. A previous study suggested that ACE-R was clinically outdated and not used in clinical practice due to licensing issues. Therefore, ACE-III was developed and have been clinically used (Hsieh et al., 2013). There were also some limitations in the review process, which might have led to systematic bias. Thorough assessment of the identified articles against inclusion and exclusion criteria was carried out by the researcher alone. Although the supervisor was consulted in relation to queries to any missing articles, that was a limitation that might have produced bias. Similar limitations apply to quality assessment of articles. Additionally, some articles relating to diagnostic accuracy (N=4) were excluded because they were not in English due to a language barrier, which could have provided clinicians and researchers with a wider selection of translations. The excluded studies were in Czech (Bartoš et al., 2011; Berankova et al., 2015), Turkish (Mihci et al., 2011), and Spanish (Munoz-Neira et al., 2012). That meant no studies looking at Turkish, Czech and Chilean Spanish language were included in the current review. Another limitation was that the cultural adaptation of the measures was not evaluated and so it was not clear if the translated versions were an adequate reflection of the original version (Mokkink et al., 2012). There was a lack of detailed information on the translation and cultural adaptation process. Given that the studies were on the diagnostic accuracy of translated

measures, it was of particular importance to investigate the cultural validity of the measures.

Areas for Future Research

The ACE-III was published in 2013, so there were only three published translations for this version: a Spanish translation (Matias-Guiu et al., 2015), an Egyptian-Arabic translation (Qassem et al., 2015), and a Portuguese translation (Machado et al., 2015). The current review included only the Spanish translation of the ACE-III (Matias-Guiu et al., 2015) because the other two translations were on normative data. Future research could focus on the translated versions of the ACE-III (Hsieh et al., 2013). Another future review could be on the original English version of the ACE-III. Because of the recent year of publication, only a few studies included the psychometric properties and the diagnostic accuracy of the English ACE-III.

Conclusion

The current literature review revealed that the non-English versions of the ACE-R and the ACE-III were useful diagnostic tools in detecting dementia. However, the quality assessment suggested that included studies were of low to medium quality, which indicated that the positive conclusions of the diagnostic accuracy were likely to be compromised.

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Part 2: Empirical Paper

The Effect of Age on the Underlying Abilities of Mindfulness Practice

Abstract

Introduction: Cognitive control and acceptance are considered as two key underlying processes of mindfulness practice. Recent evidence has shown that increasing age is related to a decline in cognitive control and the enhancement of emotional regulation and, consequently, acceptance. However, the effect of age on both underlying processes has not been investigated within a sample of older adults and younger adults using clinically relevant measures.

Aims: To determine whether there is a difference in performance between an older adult group and a younger adult group on measures of the cognitive control/awareness and emotion regulation/acceptance elements of mindfulness. It hypothesised that older adult would perform worse that younger adults on measures of cognitive control and better on measure of emotion regulation/ acceptance.

Design: Cross-sectional between-groups design with one older adult group and one younger adult group. Measures were administrated in a face-to-face research interview. A total of 55 older healthy adults aged 65+ (M=72.5) and 55 younger healthy adults aged 18-25 (M= 21.30) were recruited from the community for participation.

Results: The results revealed that older adults performed better in mindfulness measures of cognitive control/awareness whereas younger adults performed better in mindfulness measures of emotion regulation/acceptance.

Conclusion: Age might compromise the underlying processes of mindfulness practice. The results were discussed in light of available literature and with reference to limitations and clinical implications.

Introduction

Mindfulness is conceptualised as the process of directing attention to the present experience (Kabat-Zinn, 1990) by enhancing the state of self-awareness (Brown & Ryan, 2003) and acceptance (Bishop et al., 2004). It creates a skilled position of acknowledging thoughts and emotions and assuming an observer's viewpoint of internal and external events (Wells, 2006). A growing body of evidence exists for mindfulness-based psychotherapies in reducing anxiety and depression (Hofmann, Sawyer, Witt, & Oh, 2010). Unlike cognitive behavioural therapy, mindfulness consists of a nonjudgmental approach to worrying or depressing thoughts rather than attempting to reappraise them. It is hypothesised that this nonjudgmental and accepting stance leads to improvement in depressive or anxious symptoms (Carmody, 2009).

Authors of previous studies suggest two key underlying processes of mindfulness practice: cognitive control/awareness (Teasdale, Segal, & Williams, 1995) and emotion regulation/acceptance (Bishop et al., 2004). However, little is known about the interaction between age and these underlying processes of mindfulness-based psychotherapies (Prakash, De Leon, Patterson, Schirda, & Janssen, 2014). The effect of age on these processes can inform the clinical approach used with clients from different age groups. It can also help in understanding any particular difficulties across life groups in compliance with mindfulness practice, hence enriching the formulation, tailoring the treatment plan, and the modifying the therapeutic goals.

Cognitive Control and Mindfulness

Although there are a number of reviews focusing on cognitive control (Park et al., 2002; Prakash et al., 2014; Salthouse, 2010), there seems to be no explicit definition of the construct. On the basis of available studies, cognitive control refers to cognitive processes that include four main components: working memory, response inhibition (Niendam et al., 2012), response selection, and task switching (Morton, Ezekiel, & Wilk, 2010). Response selection refers to the cognitive process during which a stimulus presents and a particular response is decided (Niendam et al., 2012) while response inhibition involves the inhibition of any process or response to an internal or external stimulus (Morton, Ezekiel, & Wilk, 2010). Cognitive control allows people to switch between different tasks, which requires a level of cognitive flexibility (Dreisbach, 2012).

The exploration of the concept of cognitive control in relation to mindfulness practice has increased, as cognitive control is considered one of the key components underlying mindfulness-based psychotherapies (Teasdale et al., 1995). Cognitive control is linked to the ability to ignore distracting stimuli, thereby maintaining the focus of attention (Dreisbach, 2012) during mindfulness practice. As such, cognitive control is a crucial component of the awareness aspect of mindfulness-based psychotherapy (Bishop et al., 2004; Chiesa et al., 2011; Kabat-Zinn, 1994; Lee & Orsillo, 2014).

Ageing and Cognitive Control

Previous studies suggest that age-related decline in neurocognitive functioning affects cognitive control. The results of a longitudinal study on the effect of age on executive functions show age-related decline in some

neurocognitive processes involved in cognitive control such as task switching and inhibition (Goh, An, & Resnick, 2012). A separate body of literature argues that there is an age-related diffusion between relevant and irrelevant stimulus in attention processing. In fact, older adults show better memory of external irrelevant stimuli than younger adults. Older adults are also found to over-process distracting stimuli when they occur (Gazzaley, Cooney, Rissman, & D'Esposito, 2005). It is not just that older adults are less able to attend to relevant stimuli, but that, compared to younger adults, the older adults process more and remember more task-irrelevant stimuli.

Emotion Regulation and Mindfulness

A key component of mindfulness practice is accepting emotions as they occur by taking a nonjudgmental position that allows a full emotional experience (Baer, 2010). Mindfulness involves a state of openness, curiosity, and acceptance of the emotional experiences. During mindfulness practice, people are encouraged to connect with and acknowledge unpleasant feelings such as anxiety or pain rather than avoiding or suppressing them (Hofmann & Asmundson, 2008).

All thoughts and feelings are perceived as an object of observation rather than a disruption. As those feelings and thoughts emerge during mindfulness practice, instruction is given to acknowledge their presence without any form of judgment of the quality of the emotional object (Bishop et al., 2004). As such, it requires staying with any feelings that might unfold during the process. This ability to sit with feelings has been defined as an important emotional regulation strategy, in which emotion regulation is the overarching term for a number of strategies used

to dampen down/enhance emotional responses to events, suggesting a direct link between mindfulness and emotional regulation (Farb et al., 2010).

Ageing and Emotion Regulation

A separate body of literature has concluded that emotional regulation as a whole is enhanced as we age (Carstensen, 1993, 2006). An age-related enhancement in the state of emotion regulation in older adults is well grounded in literature (Prakash et al., 2014). Regarding the theory of socioemotional selectivity, Carstensen (1993, 2006) argues that older adults' preference toward positive rather than negative emotions is explained by the change in goal orientation related to their perception of life. With advanced age comes the realisation of limited time left as life proceeds, and thus, the goal of emotion satisfaction becomes a priority over future-oriented goals in younger age. This shift in emotion orientation, leads older adults to selectively attend to positive emotions (Isaacowitz, Wadlinger, Goren, & Wilson, 2006).

The results of a cross-sectional study investigating the developmental course of emotional experience through adulthood indicate a positive association between ageing and emotional well-being and stability (Carstensen et al., 2011). Similarly, the findings of another cross-sectional study on the emotional experience in older, middle-aged, and younger adults suggest a higher level of emotional control, mood stability, and emotional maturity in older adults compared with the findings regarding the other groups. This result is consistent with the assumption of increasing self-regulatory capacity with age (Lawton, Kleban, Rajagopal, & Dean, 1992).

The Current Study

As noted previously, cognitive control and aspects of emotion regulation, particularly acceptance, are considered to be two key underlying processes of mindfulness. Several researchers have concluded that increasing age is related to a decline in cognitive control and the enhancement of emotion regulation, including acceptance (Prakash et al., 2014). However, the interactions between age and both underlying processes have not been investigated using clinically relevant measures that involve a sample of older adults and younger adults. Accordingly, it is hypothesised in the current study that performance on measures of cognitive control in regards to mindfulness will be worse in older adults than younger adults, whereas performance on a measure of acceptance aspects of mindfulness will be better in older adults than younger adults.

Research Questions and Hypotheses

1. Is there a difference in performance between an older adult group and a younger adult group in cognitive control elements of mindfulness as measured using the Meditation Breath Attention Score (MBAS) and the awareness sub-scale of the Philadelphia Mindfulness Scale (PHLMS)? It is tentatively predicted that performance on both of these measures will be worse in an older adult sample than a younger one.
2. Is there a difference between an older adult group and a younger adult group on the acceptance/nonjudgment element of mindfulness assessed by the acceptance/nonjudgmental sub-scale of the Philadelphia Mindfulness Scale

(PHLMS)? It is tentatively predicted that performance on this measure will be better in an older adult sample than a younger adult group.

3. If there is an age-related difference indicated in the MBAS, is that difference associated with changes in cognitive flexibility? It is tentatively hypothesised that if there is a difference between older and younger adults on the MBAS score, it will be mediated by cognitive flexibility (measured by difference score on the trail-making test [TMT]).

Methods

Design

Cross-sectional between-groups design with one older adult group, one younger adult group, and two dependent variables.

Participants

The participants in this study were healthy older adults aged 65+ and healthy younger adults aged 18 to 25.

Eligibility Criteria

Apart from the specified age range, the following criteria determined the eligibility to participate in the current study were assessed through self-report in a screening by telephone or e-mail.

1. Inclusion Criteria

Native speakers or people with high proficiency in English, doing a university degree in the English language.

2. Exclusion Criteria

- significant sensory impairment,
- learning disability,
- severe mental health problems identified by self-reported contact with mental health services,
- self-reported previous experience of meditation or mindfulness practice, and
- possible dementia (indicated by scores below the threshold for dementia on Addenbrooke's Cognitive Examination, third edition [ACE-III], which is 82).

Setting

The younger adult sample consisted of University College London (UCL) students and other younger adults who registered at the Psychology subject-pool website for recruitment. The older adult sample was recruited via The University of the Third Age, which was developed for retired and semi-retired people who are keen to learn new skills. The older adults were also recruited from Age UK, which is a charity organisation for older adults. They were invited to take part in the current study through e-mails, posters, and leaflets. Snowball sampling was also used by asking participants to recommend people who might be interested or to pass out information to others.

Ethics

Ethical approval for this study was obtained after the review of the research committee in the Clinical, Educational and Health Psychology Department in University College London. The Ethics Approval reference number is CEHP2015531 (see Appendix A).

Sample Size

G*Power version 3.0.10 was used to perform power analysis for two-tailed independent *t* tests for a medium effect size. A medium effect size for cognitive control and acceptance/non-judgment was of interest because this would be a difference that would have clinical relevance. The estimated number of participants was 51 older adults and 51 younger adults, based on Cohen's $d = 0.5$ and $\beta = 0.8$.

Measures

Demographic information. Participants self-reported age, gender, marital status, ethnicity, years of education, and current or history of physical or mental health issues.

Addenbrooke's Cognitive Examination, third edition (ACE-III). This measure was used in accordance with Hsieh, Schubert, Hoon, Mioshi, and Hodges (2013). The ACE-III is a brief cognitive test that measures attention, memory, verbal fluency, language, and visuospatial abilities. It has a high level of validity as it shows a significant correlation with a number of standardised neuropsychological measures such as WAIS-DS, RAVLT, SYDBAT, and others. It has been validated on healthy controls and on patients with diagnoses of dementia (Hsieh et al., 2013; Jubb & Evans, 2015) and has a high level of sensitivity and specificity in detecting dementia. It also shows a high level of internal reliability as measured by Cronbach's coefficient =0.88 (Hsieh et al., 2013). The ACE-III was used with all participants, but the main purpose was to use it with older adults after

consent as a screening tool to assess their eligibility to participate in the current study.

Meditation Breath Attention Score (MBAS). This measure was used in accordance with the methods used in several studies (Frewen, Evans, Maraj, Dozois, & Partridge, 2008; Frewen, Unholzer, Logie-Hagan, & MacKinley, 2014; Lai, MacNeil, & Frewen, 2015; Logie & Frewen, 2015). MBAS is an experience–sampling measure (Larson & Csikszentmihalyi, 1983), which assesses the level to which participants are able to do the awareness aspect of mindfulness and its components during a live experience (Frewen et al., 2008). It has high face and construct validity as a measure of attentional awareness of mindfulness (Frewen et al., 2014). It has been used in a naïve sample without previous meditation experience (Liu et al., 2013).

Participants were instructed to complete a mindfulness exercise during which they focused their attention on their breathing for two minutes. Then, they carried on with the exercise for 15 minutes during which the instructor rang a bell every 3 minutes. When the instructor rang the bell, the participants gave a signal that their attention was maintained on their breathing. The instructor counted the number of signals they received from the participants on a scale from 0 to 5.

The Philadelphia Mindfulness Scale (PHLMS). This measure was used in accordance with Cardaciotto, Herbert, Forman, Moitra, and Farrow (2008). This is a 20-item scale used to measure awareness and acceptance independently. The internal consistency is good (Cronbach's alpha for the awareness scale = 0.82 and for acceptance = 0.75) (Cardaciotto et al., 2008). Concurrent validity was

demonstrated through strong correlations of sub-scales with the Kentucky Inventory of Mindfulness Skills (KIMS) (Park, Reilly-Spong, & Gross, 2013).

Trail-Making Test (TMT). This measure was used in accordance with Partington & Leiter (1949). This measure was used in the study to assess cognitive flexibility. This is a neuropsychological test that measures visual attention and task switching. It is used to assess speed of processing (Lezak, 1995), complex visual scanning (Shum, McFarland, & Bain, 1990), and executive functioning and cognitive flexibility (Gaudino, Geisler, & Squires, 1995). It consists of two parts: A (numbers) and B (numbers and letters). Discrepancy scores between A and B are important in assessing cognitive flexibility (Tombaugh, 2004). The TMT has an excellent level of reliability, which ranges from 0.78 to 0.92 (Bowie & Harvey, 2006). The TMT has good concurrent validity and was correlated with the Wechsler Adult Intelligence Scale, third version (WAIS-III), the Stroop Test, the WCST, and cognitive tests (Sanchez-Cubillo et al., 2009).

Test of Pre-morbid Functioning (TOPF). This measure was used in accordance with Wechsler (2011). This test is used to provide a quick estimate of a person's IQ and memory functioning to match the samples. The Test of Pre-morbid Functioning (TOPF) is the revised version of the Wechsler Test of Adult Reading (WTAR) and can be used to predict sub-scale scores on the WAIS-IV and the Wechsler Memory Scale (WME). The TOPF has an overall high reliability, with good internal consistency (Chronbach's alpha = 0.95). This test was correlated with the WAIS-IV full scale IQ score (R = .72, $p < 0.001$; R^2 = .52, $p < 0.001$). The premorbid IQ score was calculated from the raw score and adjusted for years of education and sex. This measure was used in the study to assess whether the older

and younger groups were matched on IQ; if not, TOPF would have been included as a covariate in the analysis.

The Hospital Anxiety and Depression Scale (HADS). This measure was used in accordance with Zigmond and Snaith (1983). This is a self-report scale used to screen for anxiety, depression, and general emotional distress. It consists of 14 items: 7 to assess depression and 7 to assess anxiety. The response to each question is on a scale from 0 to 3, which means that the total score of each sub-scale is between 0 and 21 with a clinical cutoff point of 8. The Hospital Anxiety and Depression Scale (HADS) has a good level of internal consistency with a Cronbach's coefficient of 0.7 to 0.9 (Aben, Verhey, Lousberg, Lodder & Honig, 2002; Bambauer, Locke, Aupont, Mullan & McLaughlin, 2005; Bjelland, Dahl, Haug & Neckelmann, 2002; Herrmann, 1997; Herrero et al., 2003). HADS has also shown a good level of reliability and validity on clinically diagnosed patients and healthy people. This test is used as a screening tool for mood as well as in the analysis to assess whether anxiety or depression correlated with mindfulness measures because mindfulness practice is influenced by mood. Therefore, anxiety and depression were measured as potentially confounding variables.

Procedure

All older adult participants who contacted the researcher during the recruitment process were screened for eligibility. Screening questions were asked over the phone or sent via e-mail to potential participants to assess eligibility. Similarly, all younger adults who signed up for the UCL Psychology subject pool were screened for eligibility. Those who met the inclusion criteria were invited to meet the researcher in a single face-to-face interview in the UCL or in their homes.

The information sheet (see Appendix B) was e-mailed to eligible participants and provided at the interview to ensure that the aims and the process were coherently understood. Then, the researcher and each participant jointly signed the consent form (see Appendix C). The demographic information was gathered, and the measures were administered (see measure section and Appendix D). The order of the neuropsychological measures and mindfulness measures was counterbalanced, and within each counterbalanced block the order of the assessments (neuropsychology or mindfulness measures) was randomised. The research session approximately lasted for an hour and 30 minutes. The current study was part of a wider research project (see appendix E) on the relationships among dementia and age and the underlying abilities of cognitive behavioural therapies. Therefore, further questionnaires related to abilities to take part in cognitive behavioural therapy were administrated during the session in the same counterbalanced block as the mindfulness measures. Approximately 32% of the data were collected by a research assistant because of sample size and time limitations.

Data Analysis

The SPSS statistical package (Version 22) was used to analyse the data. For all continuous variables, an initial descriptive analysis was conducted to investigate frequency and distribution and whether assumptions of normality were met. Histogram and Q-Q plots were inspected. Skewness kurtosis values were examined, and Kolmogorov-Smirnov tests were used to test for the significance of any deviation from normality

On the basis of whether parametric assumptions were met, an independent *t* test or nonparametric equivalent was conducted to examine whether the samples were matched on key variables. Where such data were nominal, a chi-square test was performed to analyse goodness of fit. Independent *t* tests were used to investigate hypotheses 1 and 2 because the assumptions of normality were met for these variables. A number of parametric Pearson correlations were also conducted to explore relationships between variables and eligibility for a multiple regression, although this was not conducted in the end because of a lack of correlations. Bonferroni correction could have been performed to adjust the P values and reduce type I error when multiple tests were conducted. However, it was not preformed to avoid the probability of producing type II error (Mittelhammer, Judge & Miller, 2000).

Results

A total number of 190 people showed interest in the current study. However, only 110 took part in the study. A number of younger adults did not meet inclusion criteria or cancelled their appointments for no given reason. Some older adults who showed initial interest in the study were not seen because they were resident in areas outside London, they declined, or they did not meet inclusion criteria. The flow through the study of younger and older participants is reported in Figures 1 and 2 below, based on CONSORT guidance for transparent reporting of trials (CONSORT, 2010). They state the number of participants with initial interest for participation. Then, they show the breakdown of people who were screened,

excluded, withdrew and not seen because of time constrains and sample size limitations.

Figure 1. Flow diagram for older adults (OA).

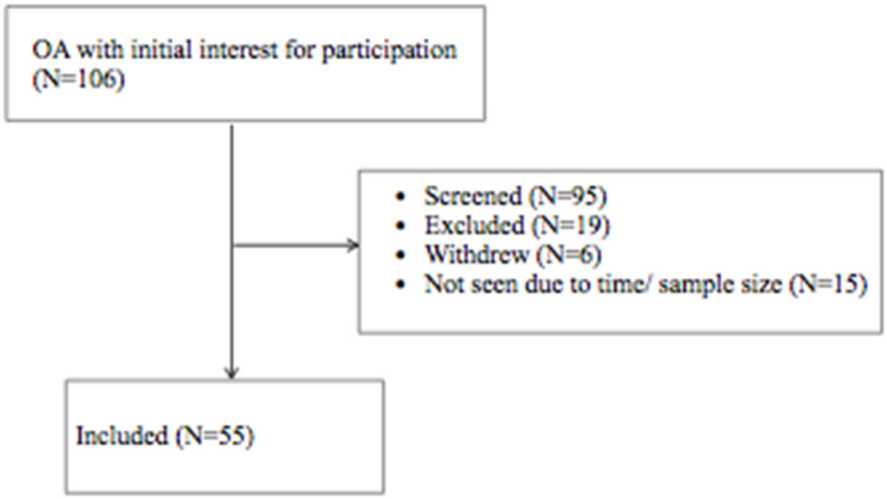
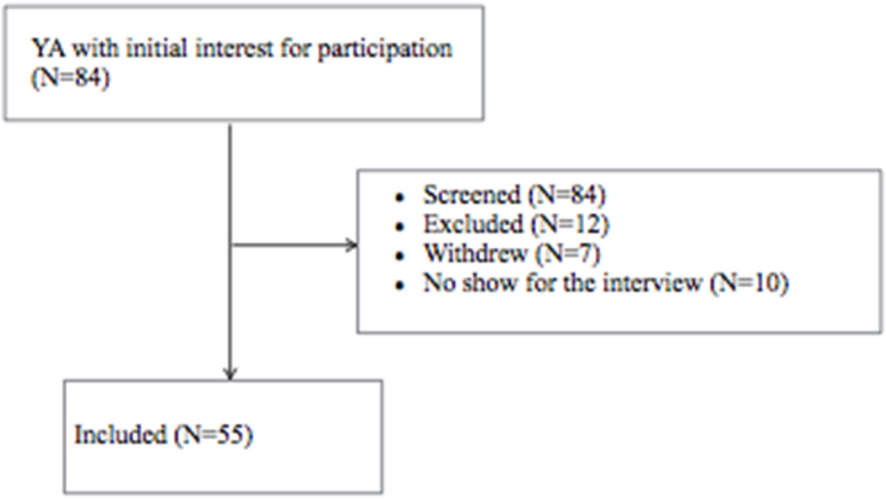


Figure 2. Flow diagram for younger adults (YA).



The representativeness of older and younger adults who took part in relation to those who were not included was examined using chi square. The total of included females was (N= 74) and the total of included males was (N= 36). The total of excluded females was (N= 49) and the total of excluded males was (N= 19) with one missing data. The results of chi square indicated significant difference in gender distribution between the included and excluded samples, χ^2 (1) = 0.299, p = 0.58.

Participant Characteristics

The demographics of the older adults (N = 55) and younger adults (N = 55) who took part in the study are presented in Table 1.

Table 1 *Participant Characteristics*

Demographics	OA Group (N = 55)		YA Group (N = 55)	
	N (%)	*M* (*SD*)	N (%)	*M* (*SD*)
Age	55 (100%)	72.5 (6.30)	55 (100%)	21.30 (2.02)
Gender				
Female	34 (62%)		40 (73%)	
Male	21 (38%)		15 (27%)	
Ethnicity				
English, Welsh, Scottish, Northern Irish, British	49 (89.1%)		29 (52.7%)	
Irish	2 (3.6%)		0 (0%)	
Gypsy or Irish traveler	0 (0%)		1 (1.8%)	
Other White	3 (5.5%)		3 (5.5%)	

Demographics	OA Group (N = 55)		YA Group (N = 55)	
	N (%)	*M* (*SD*)	N (%)	*M* (*SD*)
White and Black African	0 (0%)		1 (1.8%)	
White and Asian	0 (0%)		1 (1.8%)	
Other mixed	0 (0%)		1 (1.8%)	
Indian	0 (0%)		3 (5.5%)	
Chinese	0 (0%)		13 (23.6%)	
Other Asian	0 (0%)		1 (1.8%)	
Africa	0 (0%)		2 (3.6%)	
Any other	1 (1.8%)		0 (0%)	
Years of Education	55	16.7 (3.58)	55	15.36 (1.37)
TOPF	55	118.6 (9.0)	55	110.8 (7.69)
HADS				
Anxiety	55	4.55 (2.88)	53	6.02 (3.4)
Depression	55	2.47 (1.8)	55	2.7 (2.44)

Note. OA = older adult; YA = younger adult.

A chi-square test of goodness-of-fit was performed to investigate whether ethnicity (white or nonwhite) was equally distributed in the younger and older adult samples. The results indicated that ethnicity was not equally distributed in the samples, χ^2 (1) = 37.23, p <0.001. A chi square of goodness-of-fit was performed also to investigate the distribution of gender in both samples. The results suggested that gender was not equally distributed, χ^2 (1) = 13.12, p <0.001. For the exact breakdown of gender and ethnicity in both groups, refer to Table 1.

An independent *t* test was conducted to investigate the difference in years of education between older and younger adults. The results revealed that there was no statistically significant difference between older and younger adults in years of education, t (69.6) = 1.36, p = .176, suggesting that the older and younger samples matched in years of education. An independent *t* test was also used to explore the difference between older and younger adults in TOPF and HADS. The results suggested that TOPF scores of premorbid IQ were significantly different between older and younger adults, t (108) = 4.91, p < 0.001. Older adults had higher TOPF scores, potentially suggesting higher level of IQ than the younger adult sample. The results of HADS suggested that there was a statistically significant difference between older and younger adults with the anxiety sub-scale of HADS being higher in the younger adult sample, t(106) = 2.422, p = .017. Conversely, the results of the depression sub-scale of HADS suggested no significant difference between the older and younger adult samples, t (108) = 0.75, p = 0.454.

For mindfulness measures, the MBAS histogram was slightly negatively skewed for older adults, suggesting that older adults tended to score towards the ceiling in cognitive control in the current study. However, the results of the

skewness test (-1.26) and the kurtosis test (1.07) were less than 1.96, suggesting normality of distribution. The histograms of MBAS for younger adults and both PHLMS sub-scales (awareness and acceptance) showed normal distribution for older and younger adults. HADS depression was positively skewed in younger adults, suggesting that younger people scored low in depression and that they tended to be non-depressed. The TOPF histogram for older adults was negatively skewed, suggesting high pre-morbid IQ scores in the older adult sample. Homogeneity of variance for all measures between older and younger groups was investigated using Levene's test. The results of all mindfulness measures, HADS and TOPF were not significant, suggesting homogeneity of variance between the older and younger groups. The results of the study allowed responses to the initial research questions. These responses are noted below.

Research Question 1

Is there a difference in performance between an older adult group and a younger adult group in cognitive control elements of mindfulness as measured using the MBAS and the awareness sub-scale of the PHLMS? To examine this hypothesis, an independent *t* test was performed because the data qualified the assumptions of normal distribution and homogeneity. On the basis of the results, the cognitive control element of mindfulness, measured using MBAS, in older adults (M = 3.38, SE = .193) was significantly better than in younger adults (M = 2.75, SE = .188). This difference was statistically significant, t (108) = 2.36, p = .02. The hypothesis tentatively predicted that performance on this measure would be worse in an older adult sample than in a younger one. Therefore, the data showed the opposite of the prediction.

To confirm our findings, we used the awareness sub-scale of the PHLMS to assess the cognitive control element of mindfulness. We tentatively predicted that performance on this measure would be worse in an older adult sample than a younger one. However, the results of independent *t* test suggested that the cognitive control element of mindfulness between older (M = 35.83, SE = .70) and younger adults (M = 36.98, SE = .67) did not significantly differ, t (108) = 1.17, p = .245. Therefore, the data showed the opposite of the prediction.

Research Question 2

Is there a difference between an older adult group and a younger adult group on the acceptance/non-judgment element of mindfulness assessed by the acceptance/nonjudgmental sub-scale of the PHLMS? As with the first hypothesis, an independent *t* test was conducted with our tentative prediction that performance in this measure would be better in an older adult group than a younger adult. The results suggested that younger adults (M = 29.82, SE = .89) were significantly better in the acceptance/non-judgment element of mindfulness than older adults (M = 26.52, SE = .718), t (108) = 2.86, p = 0.005. Therefore, the data showed the opposite of the prediction.

Research Question 3

If there is an age-related difference indicated in the MBAS, is that difference associated with changes in cognitive flexibility? We tentatively hypothesised that if there were a difference between older and younger adults on the MBAS score, it would be mediated by cognitive flexibility (measured by difference score on the trail-making test). The independent *t* test showed significant difference between older and younger adults, with evidence of being better in older adults, t (1) = 8.19,

p = 0.004. Pearson's correlation was then performed to investigate whether there was a correlation between cognitive flexibility and MBAS. The results suggested that there was no significant correlation between MBAS measure of cognitive control and the TMT of cognitive flexibility, r = .098, n = 110, p = .306. Therefore, it was not useful to do additional statistical analysis to further investigate whether cognitive flexibility is a mediator between age and cognitive control measured by MBAS (MacKinnon, Fairchild, & Fritz, 2007).

Table 2. *Differences among the Main Variables, Comparing Older Adults and Younger Adults*

Variable	OA Mean (*SD*)	YA Mean (SD)	*t* Test
MBAS	3.38 (1.43)	2.75 (1.39)	$t(108) = 2.36$, $p = .02$
PHLMS awareness	35.83 (5.25)	36.98 (5.01)	$t(108) = 1.17$, $p = .245$
PHLMS acceptance	26.52 (5.32)	29.82 (6.63)	$t(108) = 2.86$, $p = 0.005$
TMT	41.98 (35.93)	19.85 (13.10)	$t(1) = 8.19$, $p = 0.004$

Note. MBAS = Meditation Breath Attention Score; PHLMS = Philadelphia Mindfulness Scale; TMT = Trail-Making Test.

To investigate whether any of the potential differences between the groups were correlated with the dependent variables and thus might constitute confounds, a series of exploratory Pearson or Spearman correlation coefficients were run to

investigate relationships between variables and mindfulness measures. In the older adult sample, no significant correlation existed between MBAS mindfulness measure and any of the demographic variables, TOPF, HADS, or TMT, which differed between the groups. A significant negative correlation existed between the PHLMS awareness subtest and the HADS anxiety sub-scale (r = -.277, p = 0.04), suggesting that the lower the anxiety was the higher the awareness level was. In the younger adult sample, no significant correlation existed between MBAS mindfulness measure and any of the variables. However, a statistically significant negative correlation existed between PHLMS awareness subtest and HADS depression (r = -0.34, p = 0.01).

Feasibility

During the interview, a few people complained about the length of the 25-minute MBAS task, during which participants were instructed to focus their attention on breathing. One older and one younger adult reported dizziness after the mindfulness task, without having any previous history of current medical condition that might have been associated with this. A few participants had previous or current experiences of yoga but not meditation or mindfulness. Some other participants reported feeling distracted by some noises in the background despite our attempt for a quiet atmosphere in the interviewing room; the noises might have influenced their ability to focus their attention on their breathing during the mindfulness live-experience measure.

Discussion

Summary of Results

The aim of the current study was to investigate the effect of age on the underlying processes of mindfulness through a comparison between older and younger adult groups, matched in their years of education. Contrary to the first hypothesis, the older adult group was found to perform significantly better in the measure that tapped on the cognitive control element of mindfulness. Similarly, the results of the second hypothesis contrasted the tentative prediction. The younger adult group performed significantly better on the measure of acceptance/non-judgment of mindfulness. However, the third hypothesis could not be examined because there was no correlation between the measure of cognitive control measured by the MBAS (Frewen et al., 2008; Frewen & Logie, 2014; Lai et al., 2014) and the measure of cognitive flexibility suing the TMT. These findings should be considered tentatively in light of the limitations of the current study.

Interpretation of Findings

The hypotheses of the current study were conceptualised in line with the findings of a previous review (Prakash et al., 2014). The rationale behind predicting that cognitive control aspects of mindfulness would be worse with age was related to neuropsychological changes, particularly in executive functioning (Park et al., 2002; Salthouse, 2010). On contrast, emotional regulation was suggested to enhance or maintain with increasing age (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Charles, 2010; Hay & Diehl, 2011). However, the results of the current study did not correspond with that.

One of the interpretations of the results could be related to the assumption that cognitive control and emotional regulation were fractionated abilities. The results of a longitudinal study investigating the effect of age on executive functions showed age-related decline in two particular components of cognitive control which were task switching and response inhibition (Goh, An, & Resnick, 2012). Similarly, emotional regulation was assumed to have various components (Sims, Hogan, & Carstensen, 2015), and it may be that the aspects of emotional regulation underlying acceptance did not enhance with age.

Another interpretation of the results could be related to the MBAS (Frewen et al., 2008; Frewen & Logie, 2014; Lai et al., 2014) measure of cognitive control being an experience sampling measure. The nature of the mindfulness task completed by participants could have influenced the type of people who were interested in taking part. That might have biased the data and led to over- or under-representation of some individuals (Scollon & Kim-Prieto, 2003). During the screening process, participants denied any previous experience of mindfulness or meditation; therefore, the length of the breathing exercise for a naïve mindfulness sample might not have reflected ability as much as the adjustment to a new experience. Some participants reported feeling relaxed, which might have affected their focus of attention, and others reported yoga experience, which might have had a positive effect on sustaining attention. The nature of MBAS may have had an effect on the overall performance on the measure.

It was also thought that some responses might not have reflected the measured ability. It was clear that some participants fell asleep during the task, but they kept raising the hand to indicate focusing their attention on their breathing. Some

participants reported feeling relaxed after completing the task, which again raised the question of whether they were practicing mindfulness for the first time and whether they were controlling their attention to focus on the present moment.

Another potential methodological problem when conducting an experience measure is the reactivity of participants to being part of a study. Reactivity means that behaviours may change intentionally or unintentionally under examination circumstances. Authors of a previous study suggested a strong association between self-monitoring and sampling measures (Wheeler & Reis, 1991). This can be the case because people may pay particular attention to their thoughts and feelings, which may lead to changes in their behaviours.

Because of some of the strengths and weaknesses of experience measures, the MBAS was used in addition to the awareness sub-scale of the Philadelphia Mindfulness Measure. The reason for using a self-reported questionnaire in addition to the experience measure was to use different assessment measures to confirm the findings on the effect of age on cognitive control. However, the results of second measure were not significant.

The older adult group had higher cognitive functioning than the younger adult group. However, trail-making performance and TOPF did not correlate with MBAS. It could have been a possible interpretation of the results that the higher cognitive control found in the older adult group was explained by a high predicted IQ level on TOPF measure (Wechsler, 2011).

There were significant difference between the older and younger adult samples in their ethnicities. The results of the current study could be interpreted considering that the ethnic and cultural background of participants influenced their

performance on mindfulness measures. There may be an impact of cultural differences, particularly on emotional regulation processes. Whereas Western cultures primarily rely on active strategies to manage distress, Eastern cultures, specifically Asian, leant towards reframing and accepting situations to deal with difficulties (Weisz, Rothbaum, & Blackburn, 1984), perhaps leading to the finding of higher scores on acceptance measures in the current study. A previous review suggested that a culturally competent psychological treatment addresses the cultural values and the concept of self and others in a therapeutic context. It suggested that treatment disparities may be decreased with culturally responsive treatment fitting with pre-existing coping skills (Hall, Hong, Zane, & Meyer, 2011). Perhaps the philosophical roots of mindfulness and meditation practice might have explained the ethnic and cultural influences on the current results.

It was also interesting that although the younger adult group was more anxious than the older adult group, the younger adults performed better on the acceptance measure. This finding possibly called into question the validity of the measures of either PHLMS acceptance or HADS, and these validity issues could also explain the findings.

Limitations

The first limitation of the current study was that the older adult sample was recruited through contacting community centres that had access to older people. Although researchers were contacted by interested older people from inside and outside London, it might be that the nature of people engaged with these organisations provided a source of sampling bias in terms of age group, gender, ethnicity, and educational background. It seemed that the majority of our older

sample consisted of young-old rather than old-old adults (M = 72.5, SD = 6.30). There was also a possible influence of ethnicity as 98% of the older sample was from a white British ethnic group.

The second limitation of the current study was that the younger adult sample consisted mainly of UCL students and a few younger adults in the community. The main source of recruitment was the Psychology subject pool, which mainly targeted UCL students and staff. That might have contributed to the wide variation in the demographics because UCL had students from various ethnic backgrounds. The findings showed that 60% of the younger adult sample was white, confirmed by the significant difference in ethnicity between both groups.

The third limitation was that the PHLMS measure (Cardaciotto et al., 2008) was a self-report questionnaire completed by participants. There have been general methodological critiques of self-report measures of mindfulness, including exaggeration of responses, current emotional state bias, forgetting details, or social desirability bias (Austin, Gibson, Deary, McGregor & Dent 1998).

Clinical Implications

The findings from the current study potentially indicate that cognitive control as an underlying process of mindfulness was better in older adults than younger adults and that the emotional control/acceptance component of mindfulness was better in younger adults than older adults. These findings raised the question of whether age was an influential factor to be considered when using mindfulness clinically as an intervention. The lack of correspondence with previous findings confirmed the importance of considering individual factors related to the formulation rather than assuming that older or younger adults might struggle to stay

in the present moment or take an accepting position of their emotions because of age-related changes.

Future Research

The current study should be replicated using other mindfulness measures that tap on cognitive control/awareness and emotional regulation/acceptance to eliminate any possible methodological pitfalls in the measures used in the current study. Further studies can also be conducted to assess difference between young-old and old-old adults in the underlying processes of mindfulness practice. Another area of future research can be the difference between people from the same age group with and without mindfulness experience to examine the effect of mindfulness on the underlying processes of mindfulness practice.

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Part 3: Critical Appraisal

Introduction

This critical appraisal provides a reflection on the process of conducting the present project. It discusses some of the challenges that arose as part of conducting the systematic review and the empirical paper. It draws on the wider clinical implications of older adult research. It also highlights the dilemmas encountered at different stages of the project. It concludes with a reflection on some of the issues in evaluating translated screening measures.

Wider Clinical Implications of Older Adult Research

Evidence suggests that clinical depression and anxiety are prevalent in older adults (Byers, Yaffe, Covinsky, Friedman, & Bruce, 2010). This prevalence is associated with poor quality of life, increased physical disability, and upraised suicidal risk (Unutzer & Bruce, 2002). An increasing body of evidence is focused on the effectiveness of psychological therapies in managing psychological distress. As part of my clinical psychology training, it has been quite apparent how clinical psychologists can contribute to the diagnosis and treatment of mental health issues in older adults. Therefore, this study contributes to the development of a coherent understanding of age-related changes that might impact psychological therapy.

The observations made during the process of this thesis suggest age-related changes that might contribute to how people respond to mindfulness as one of the psychological therapies with a growing body of evidence in treating anxiety and depression. Whereas the focus of this study is the effect of age on the underlying processes of mindfulness practice, it is important to consider individual factors related to the conceptualised formulation rather than assuming that older or

younger adults might struggle to stay in the present moment or to take an accepting position of their emotions because of age-related changes.

Reflections on Recruitment, Interviews, and Engagement

This project is part of a wider ongoing research project on the underlying abilities of cognitive behavioural therapy on a sample of people with dementia, healthy older adults, and healthy younger adults. However, because of the required sample size according to the power calculation and the time constraints, not all initially interested people in London and greater London were seen in the part of the study reported here. It is quite intriguing to reflect on the level of interest in participation and the degree of engagement during the interviews. The leaflets were distributed through the University of Third Age and Age UK, and they reached areas outside London. A high volume of interested older people contacted researchers to express their interest in taking part in the study.

During the interviewing process, I was impressed by the stories I heard from people reflecting on their motivation for taking part in the study. Most people reported having a partner, a sibling, or a close friend with dementia or a mental health issue. They recognised how depression and anxiety were prevalent in older people. Therefore, they wanted to participate as healthy individuals (used as healthy controls) in the study to contribute to developing a better understanding of evidence-based psychological therapies. I was also impressed by how older people experienced taking part in a study that lasted for an average of an hour and thirty minutes, during which they had to complete a number of tasks. People commented on feeling productive after getting out of their homes to participate in helpful

research. Some others commented on feeling good about taking part in a project that might aid in tailoring psychological therapies based on people's needs. I was humbled by some of the appreciative comments I received from older participants. Some of the participants felt grateful that one aim of this research project was to contribute to providing better psychological support for older people. They were interested to know when the results would be ready and when clinicians might have access to the findings.

Similar to the level of engagement of the older adult sample, the level of engagement of the younger adult sample was quite high. A few young participants reflected on the personal meaning of participating in studies that would help in the understanding of psychological therapies for older people. Some of them talked about stories they experienced with older persons in their families who suffered from dementia or psychological distress. I was impressed by how some of the young participants connected emotionally with the process and how motivated they were to know more about the study and its implications. There was a noticeable curiosity about how older people from the comparison group were experiencing the questionnaires and the mindfulness task. There was also a particular interest in how age might have an impact on people's cognitive and emotional functioning. I was moved by some of the feelings and thoughts shared by the younger participants about how much they cared about elderly people in their families. I was also touched by feelings that came up in relation to older people in their families who did not get the psychological support they wanted for them.

As a Trainee clinical psychologists, I have been taught to approach my tasks from a scientific-practitioner point of view. During my interaction with

participants, I was mindful of the aim of the meeting being a scheduled time to collect data for research purposes. However, I was aware that the nature of our study might bring up some different thoughts and feelings for people. While I was working under the pressure of scheduled time-slots, I was conscious of the importance of using my clinical skills to validate personal experiences and shared stories within the context of research. I dedicated some time by the end of each interview to check with participants about how they felt during the interviewing process and if they had any further questions to ask about the nature of the study, the questions asked, or their performance in the study.

The process of collecting data and meeting participants informed my thinking and helped me to enhance my understanding about the various perspectives of the study. It gave me the opportunity to learn about the potential impact of age not only though the questionnaires and the mindfulness task, but also through observing the pattern of answers and responses during the interview. The design of the study was quantitate but there was a lot of information shared within the interview that could have been of quantitative value.

Dealing with Dilemmas

In the process of conducting this research, a few dilemmas arose and were discussed during different stages. It is through reflections on the rationale behind our decisions that the effective directions were learnt. The dilemma provided me with the space to think about different perspectives and encouraged me to be mindful of the various aspects of the matter.

The first dilemma was associated with measuring the underlying abilities of mindfulness practice. Researchers have developed numerous measures to assess

the two main components of mindfulness: focusing attention at the present moment and acceptance of emerging emotions. In a systematic review on the psychometric properties of self-reported mindfulness measures, Park, Reilly-Spong, and Gross (2013) identified approximately 10 measures of mindfulness. During the process of identifying the appropriate measure to assess the components of mindfulness in the current projects, we looked at how the contracts were assessed besides the validity and reliability of the measures. We determined that it was sensible to choose a measure that had sub-scales of awareness and acceptance and fairly excellent psychometric properties. Therefore, we chose the Philadelphia Mindfulness Measure (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008). In addition, we included the MBAS (Frewen et al., 2008; Frewen et al., 2014; Lai et al., 2015; Logie & Frewen, 2015) as a live-experience measure of the cognitive control aspect of awareness.

The second dilemma was related to using COSMIN (Mokkink et al., 2012) to evaluate the quality of the translation and the cultural adaptation. The aim of the systematic review was to review the evidence for the diagnostic accuracy of the non-English updated versions of Addenbrooke's Cognitive Examination (ACE)—the ACE-Revised (ACE-R) (Mioshi et al., 2006) and the ACE-III (Hsieh et al., 2013) —in the diagnosis of dementia. It was a natural dilemma to raise about whether it would be beneficial to critically appraise the cross-cultural validity of the measures using COSMIN's appraisal tool. I was curious about the cultural adaptation process, but I was quite surprised that most studies did not report enough information on that matter. The conclusion of focusing on the diagnostic accuracy aspect as the main objective of the review was the result of considering how many

articles included detailed information on translation and cultural adaptation that would allow a systematic appraisal. Therefore, the scope of the review was particularly on the evidence for the diagnostic accuracy of the measures.

Issues in Evaluating Translated-Sscreening Measures

The idea of investigating the diagnostic accuracy of the translated versions of ACE-R and ACE-III arose from acknowledging the cultural and ethnic diversity of patients seen in clinical settings. As part of globalisation, there is an increased awareness in the cross-cultural validity of the standardised English measures when used with people from different cultural and ethnic backgrounds. There is also an increased tendency to address the importance of acknowledging the influence of cultural diversity on how patients understand the questions and if their answers reflect their actual abilities or if their cultural knowledge may be the barrier.

The common question that clinicians ask when using psychometric measures is about the validity of using the English screening measures with non-English speakers, knowing that the English measures are standardised on English populations. The question is particularly raised from the viewpoint of practicing in a diverse city where some patients are seen with the presence of an interpreter because of the language barrier. It is felt that as a part of maintaining good practice, it is crucial to think about the quality of the tools we use in our assessment, which influence our clinical decision making.

Screening measures are translated with the aim of obtaining cross-culturally and conceptually equivalent tools in different languages (WHO, 2016). The scope of the systematic review is on reviewing the evidence for the diagnostic accuracy of the non-English updated versions of Addenbrooke's Cognitive Examination

(ACE)—the ACE-Revised (ACE-R) and the ACE-III —in the diagnosis of dementia. ACE-R has been translated to several languages, including Brazilian, Chinese/Mandarin, Chinese/Cantonese, French, German, Greek, Italian, Japanese, Korean, Portuguese, Spanish, Czech, Turkish, and Spanish. Similarly, ACE-III is translated to Spanish, Arabic, and Portuguese. However, the cultural adaptation of the measures is not evaluated in the current literature review, which entailed adequate reflection of the translated measure to the original version (Mokkink et al., 2012). That is because there is a lack of detailed information on the translation and cultural adaptation process. It is intriguing to observe a pattern of the lack of adequate description of the translation and cultural adaptation process across the articles included in the systematic review. Although the primary aim of the articles is to investigate the quality of the evidence of the diagnostic accuracy of the translated measures, it is important to report the translation and cultural adaptation process to ensure that the tools are partially screening in the same way they are developed for.

Reflecting on translated psychometrics tests, some clinicians suggest that using a standardised screening tool implies that mental health issues are universal across cultures. An oppositional viewpoint is to be skeptical about using a standardised tool across cultures, referring to the variation in clinical presentation in different cultures. A balanced perspective emphasises the importance of using validated screening tools but with adaptation to the particulars of every culture, which might involve adjusting the cutoff points (Benson & Thistlethwaite, 2009). Arguments about the cross-cultural validity of the translated screening tools have to be taken into consideration. However, clinicians have to be aware that the validity

of these arguments might be compromised with dementia screening tools because of the biological nature of the disease.

Conclusion

There is a recognised need for conducting research in the field of psychological therapies for older people. The emotional difficulties that are prevalent with increasing age require careful consideration of how to maintain quality of life in the context of cognitive and emotional changes. The body of evidence on psychological therapies for older adults is increasing. However, there is still much that remains unknown about the interaction between the underlying processes of psychological therapies, including mindfulness. The process of conducting this research was quite rewarding and inspiring. Supporting research on older adults is essential to improve their cognitive functioning and emotional well-being. Despite the limitations of this thesis, it is a step in advancing the understanding of the effect of age on mindfulness practice for better management of mental health issues and enhancement of the quality of life with advanced age.

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APPENDICES

Appendix A: Ethical Approval Letter

Ethics Approval CEHP2015531 Josh Stott

Dear Josh,

I am writing to let you know that we have approved your recent ethics application, "CBT abilities in older people and people with dementia."

(Note to the REC - This approval does not relate to recruitment of a dementia sample, who are to be recruited under NHS governance.)

The approval reference number is CEHP/2014/531. I have attached a copy of your application form.

I will keep the approved forms on file, and a copy has been lodged with the UCL Research Ethics Committee. Please notify us of any amendments, in line with guidance on the PaLS Intranet.

Best Wishes,

John King
Chair of Ethics, CEHP

Appendix B: Information Sheet

UCL DIVISION OF PSYCHOLOGY
AND LANGUAGE SCIENCES

Information Sheet for Participants in Research Studies

You will be given a copy of this information sheet.

Title of Project:	The Interaction between Age and the Underlying abilities of cognitive behavioural therapies
This study has been approved by the [Insert Details of your Research Department] Ethics Chair Project ID Number:	Ethics Chair Dr John King Clinical, Educational and Health Psychology Department 1-19 Torrington Place WC1E 7HB
Name, Address and Contact Details of Investigators:	Noor Habib Clinical Psychology Doctorate 1-19 Torrington Place WC1E 7HB [redacted]

We would like to invite you to participate in this research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, please read the following information carefully and discuss it with others if you wish. Please let us know if you need any further information or clarification.

Why have we approached you?

We have asked you to participate in this study as someone who does NOT have a diagnosis of dementia and falls into one of the two age groups (65 or older; or 18-25) that we are interested in.

What is the aim of this project?

This project has two main aims:

Aim 1

Is to examine how age affects a person's ability to take part in a form of psychological therapy known as cognitive behavioural therapy (CBT). CBT is designed to help a person cope with or change the way they think and feel and is commonly used to help people with depression and anxiety. Researchers have suggested that certain elements considered core to CBT maybe harder for older people, while other elements maybe harder for younger people. However, few studies have looked at this in detail. This study examines aims to examine performance of different age groups on tasks measuring different elements of CBT.

Aim 2

This research is also looking at people with dementia's ability to participate in CBT. There are

some studies looking at whether CBT can help people with dementia to manage the anxiety and depression commonly associated with dementia, but these studies have mixed results. We therefore want to look in more detail at whether people with dementia can understand the various elements of CBT. We are also developing questionnaires that may help determine which people with dementia might benefit from CBT.

In order to do this we need to compare performance of people with dementia on these questionnaires to people who don't have dementia. We have inviting you to participate as you have NOT got a diagnosis of dementia.

What will the research involve?
The research involves completing some pencil and paper measures and doing a 15 minute exercise that involves focussing your attention on your breathing. The study will take place either at University College London or in your own home, whichever you prefer. It will take around an hour and thirty minutes to complete all tasks. You can have a break at any point if you wish to.

What are the possible benefits of participation?
All participants will be entered into a prize drawer to win a £50 voucher. We will also reimburse any travel expenses incurred if you have travelled to meet us today. We hope that your participation will be valuable in improving our ability to provide cognitive behavioural therapy to people of different age groups and to people with dementia.

What are the possible risks of participation?
All of the questionnaires and thetask that will be used have been used before and are not believed to cause any harm. If at any point you consider any of the measures to be distressing you are free to withdraw without giving a reason. You will also have the opportunities to debrief and discuss any concerns or distress at the end of the research.

It is up to you to decide whether or not to take part. If you choose not to participate, you won't incur any penalties or lose any benefits to which you might have been entitled. However, if you do decide to take part, you will be given this information sheet to keep and asked to sign a consent form. Even after agreeing to take part, you can still withdraw at any time and without giving a reason. If you decide to withdraw from participation, you can request that all your data is deleted from our database and not included in the analysis.

All data will be collected and stored in accordance with the Data Protection Act 1998.

Thank you for your time

Appendix C: Consent Form

UCL DIVISION OF PSYCHOLOGY
AND LANGUAGE SCIENCES

Informed Consent Form for Participants

Title of Project: **The Interaction between Age and the underlying abilities of Cognitive Behavioural Therapies.**

This study has been approved by

Project ID Number: CEHP2015531

Ethics Chair Dr John King

Clinical, Educational and Health Psychology Department
1-19 Torrington Place
Camden
WC1E 7HB

Participant's Statement

I .....

agree that I have

- read the information sheet and/or the project has been explained to me orally;
- had the opportunity to ask questions and discuss the study; and
- received satisfactory answers to all my questions or have been advised of an individual to contact for answers to pertinent questions about the research and my rights as a participant and whom to contact in the event of a research-related injury.

I understand that I am free to withdraw from the study without penalty if I so wish, and I consent to the processing of my personal information for the purposes of this study only and that it will not be used for any other purpose. I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

Signed: Date:

Investigator's Statement

I ..... confirm that I have carefully explained the purpose of the study to the participant and outlined any reasonably foreseeable risks or benefits (where applicable).

Signed: Date:

Appendix D: PHLMS

PHLMS©

Instructions: Please circle how often you experienced each of the following statements *within the past week.*

1. I am aware of what thoughts are passing through my mind.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

2. I try to distract myself when I feel unpleasant emotions.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

3. When talking with other people, I am aware of their facial and body expressions.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

4. There are aspects of myself I don't want to think about.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

5. When I shower, I am aware of how the water is running over my body.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

6. I try to stay busy to keep thoughts or feelings from coming to mind.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

7. When I am startled, I notice what is going on inside my body.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

8. I wish I could control my emotions more easily.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

9. When I walk outside, I am aware of smells or how the air feels against my face.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

10. I tell myself that I shouldn't have certain thoughts.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

11. When someone asks how I am feeling, I can identify my emotions easily.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

12. There are things I try not to think about.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

13. I am aware of thoughts I'm having when my mood changes.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

14. I tell myself that I shouldn't feel sad.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

15. I notice changes inside my body, like my heart beating faster or my muscles getting tense.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

16. If there is something I don't want to think about, I'll try many things to get it out of my mind.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

17. Whenever my emotions change, I am conscious of them immediately.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

18. I try to put my problems out of mind.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

19. When talking with other people, I am aware of the emotions I am experiencing.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

20. When I have a bad memory, I try to distract myself to make it go away.

1	2	3	4	5
Never	Rarely	Sometimes	Often	Very Often

Appendix E: Joint Project Submission Declaration

Appendix : Joint Project Submission Declaration

Declaration of overlapping projects

The D.Clin.Psy projects of Noor Habib and Catherine B and the PhD project or our supervisor Dr Joshua Stott contain overlapping data. This is a declaration that we have followed UCL guidance of overlapping research projects created by Norah Fredericson, Professor of Educational Psychology.

I am required to make a clear declaration that my thesis will "make a distinct contribution to the knowledge of the subject and will afford evidence of originality as shown by the discovery of new facts and/or the exercise of the independent critical power."

I confirm that my research questions are coherently different from those asked by my colleague Catherine and my supervisor Joshua.

I also confirm that although the three projects have common data, they do not completely overlap.

I am finally required to confirm that I agree for my thesis to be made available upon request to examiners of other theses and I confirm that I agree for this to happen.

The guidance states that my colleague, supervisor and myself sign this declaration to confirm the accuracy of the given information to our best knowledge.

[redacted]

Noor Habib

Trainee Clinical Psychologist

[redacted]

[redacted]

Catherine Bousfield

Trainee Clinical Psychologist

[redacted]

[redacted]

Dr. Joshua Stott

Senior Clinical Tutor

[redacted]