Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents Living in the West of Scotland

and

Clinical Research Portfolio

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Contents

Chapter 1

Systematic Review

Construct Validity and Factorial Invariance of the Mental Health Continuum-Short Form (MHC-SF): A Systematic Review

University of Glasgow

Prepared in accordance with the guidelines for the following peer reviewed journal:
Assessment
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Construct Validity and Factorial Invariance of the Mental Health Continuum-Short Form (MHC-SF): A Systematic Review

Scientific Abstract

Background

Mental health is not just the absence of mental illness, but also the presence of mental wellbeing. The Mental Health Continuum-Short Form (MHC-SF) is thought to measure three wellbeing factors (emotional, social and psychological), which reflect the World Health Organisation's definition of mental health. The objective of this study was to systematically review the MHC-SF's construct validity and factorial invariance across the lifespan, to establish whether this theoretical tripartite model is empirically supported. Six electronic databases were searched using the keywords 'MHC-SF' and 'psychometric properties', resulting in 19 studies (2002-2017), which examined the factorial structure of the MHC-SF using factor analytic methodology. Results supported the MHC-SF's three-dimensional factor structure across the lifespan, with some evidence to suggest that a general wellbeing factor is also a meaningful measure of wellbeing. Future research should set to confirm second order and bifactor models, utilising additional/alternative statistical methodologies such as structural equation modelling.

Keywords: Mental Health Continuum-Short Form, Mental Health, Mental Wellbeing, Tripartite Model, Factor Structure, Factor Analysis, Life Span

Introduction

Traditionally mental health was defined as a unidimensional construct, where mental illness and mental wellbeing were situated at opposite ends of the same continuum (Greenspoon and Saklofske, 2001). This conceptualisation has been criticised for its deficit focus and dependency on the absence of psychopathology as an indicator of mental health (Diener et al., 2002; Keyes, 2002). For almost half a century social scientists have argued that the absence of mental illness is necessary but not sufficient for achieving mental health (Jahoda, 1958). Instead it is believed that mental health must also be defined by the presence of positive components (WHO, 2004). Keyes (2002) conceptualised this notion within a dual factor/complete state model of mental health, whereby mental health is comprised of two related yet distinct dimensions, mental illness and mental wellbeing (see **Figure 1**[1]).

Mental illness refers to symptoms of psychopathology and the mental wellbeing refers to the positive strengths based components of mental health (Keyes, 2002; 2003; 2005a). Mental wellbeing has its theoretical foundations in two compatible philosophical traditions: the hedonic vs. eudaimonic traditions (Bradburn, 1969; Keyes, Shmotkin & Ryff, 2002). Aristippus' hedonic tradition refers to an individual's subjective feelings towards life, i.e. their 'emotional wellbeing'. Emotional wellbeing refers to the presence and pursuit of pleasant emotions and satisfaction with life (Diener, 1984; Diener et al., 1999). Aristotle's eudaimonic tradition captures how an individual is functioning psychologically on their pursuit of self-actualisation, i.e. their 'psychological wellbeing' (Waterman, 1993). Ryff (1989) proposed a model of psychological wellbeing comprised of six components; personal growth, positive interaction with others, self-acceptance, purpose in life, autonomy, and environmental mastery[2]. Psychological wellbeing is considered to be the result of pursuing positive goals and the realisation of personal potential (Ryan, Huta & Deci, 2006). It refers to a private intrapersonal phenomenon experienced by the individual. Keyes (1998) extended

[1] Not all cells within the Dual Factor Model of mental health will be equally occupied.

[2] See Ryff (1989) for further explanation of psychological wellbeing concepts.

the eudaimonic tradition to include interpersonal and social aspects of a person's functioning. These are publically experienced phenomena that represent societal value and functioning in society, i.e. 'social wellbeing'. There are five elements to Keyes' model of social wellbeing[3]: coherence, acceptance, actualisation, contribution and integration.

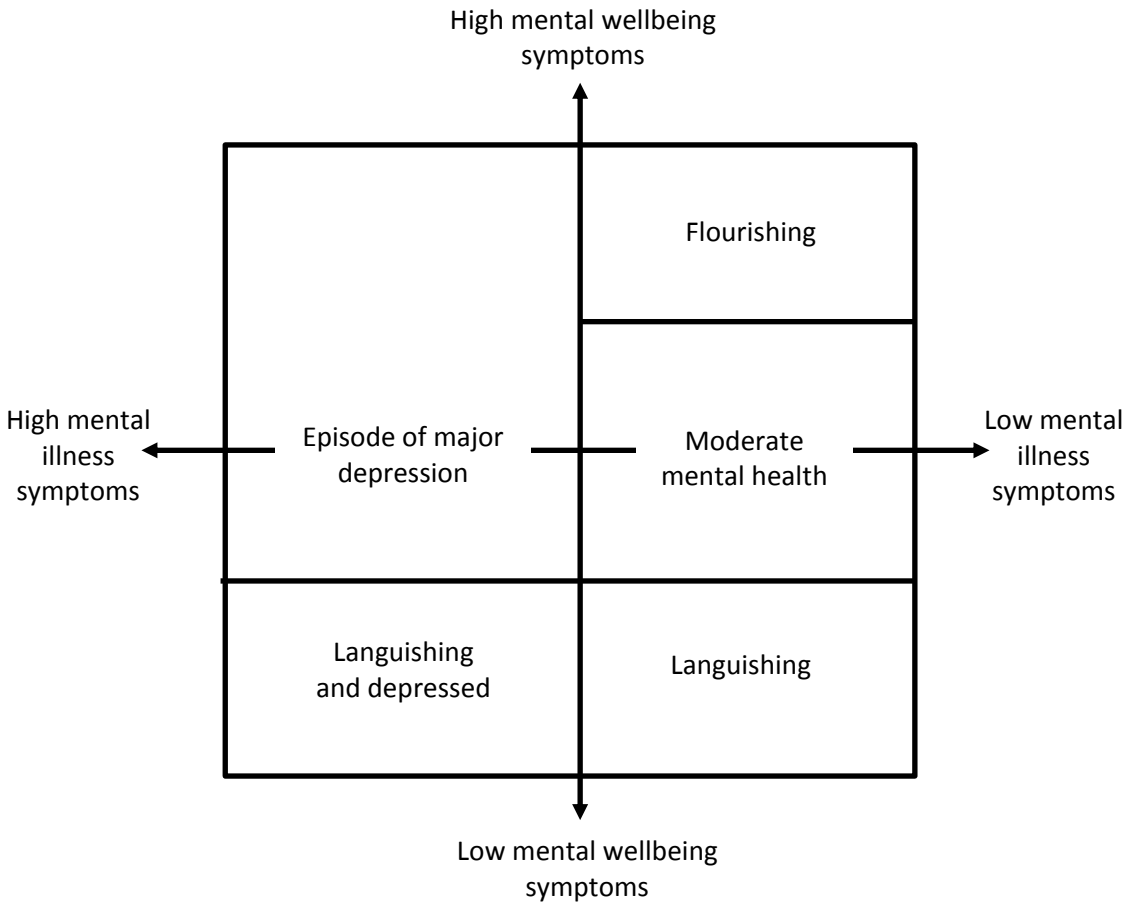


Figure 1

Dual-factor (complete state) model of mental health [adapted from Keyes (2003)]

Theory and empirical evidence suggests that there are distinctions between the emotional, psychological and social components of wellbeing (Lent, 2004), but that together these factors represent mental wellbeing (Gallagher et al., 2009; Keyes, 2005; 2007). Despite several decades of

[3] See Keyes (1998) for further explanation of social wellbeing concepts.

wellbeing research, there is little consensus on its measurement (Zukauskeine et al. 2015); however, many researchers believe that instruments should measure emotional, psychological and social wellbeing factors (Ryan & Deci, 2001). The Mental Health Continuum-Short Form (MHC-SF) was developed to operationalise mental wellbeing within this multidimensional theoretical framework (Keyes 2002; 2007). It is a 14-item self-report questionnaire, which allows individuals to rate their experience of symptoms of wellbeing on a 6-point Likert scale (never-every day), across a two week or one month period. It is widely used in research studies and has thus gained a large body of cross-cultural evidence to support its utility and theoretical merit (Hone et al., 2014; Joshanloo et al., 2013).

It is as important to continue to foster mental wellbeing within a climate of longer life expectancy, as it is to promote mental wellbeing within the early years (Keyes, 2006). The complete state model suggests that mental illness and mental wellbeing are likely to follow different trajectories across the lifespan (Westerhof & Keyes, 2010). Specifically, fewer symptoms of mental illness at a particular point in the lifespan does not necessarily equate to greater mental wellbeing. As such, research needs to focus on determining measurement invariance across age (Kokko et al. 2013). Studies have examined the dimensional structure of mental wellbeing using the MHC-SF with populations across the lifespan, from children as young as seven (de Carvalho et al., 2016) to adults in their latter stages of life (Keyes et al., 2008; Lamers et al., 2011). The MHC-SF is one of the most extensively used research measures of wellbeing due to its foundation in the theoretical literature; however, to date there has been no integrative review or synthesis aimed at investigating the developmental generalisability of this tripartite model of mental wellbeing.

This review aims to establish whether Keyes' (2005) tripartite theoretical framework applies as a universal lifespan perspective on mental wellbeing, whether an individual is young or old. This is important, as establishing the MHC-SF's structure as universal and developmentally consistent would facilitate meaningful comparison and identification of difference/discontinuity of mental wellbeing among participants within different phases of the life cycle, across a standard set of

dimensions (Van de Schoot et al. 2012). Hence, the purpose of this review is to systematically examine and synthesise research investigating the factor structure of the MHC-SF, to see whether the MHC-SF demonstrates construct validity.

Review Questions

1. Do studies examining the factor structure of the MHC-SF reflect the tripartite model of mental wellbeing (i.e. emotional, psychological and social wellbeing)?
2. Do studies replicate a tripartite model of mental wellbeing across the lifespan? That is, does the MHC-SF demonstrate measurement invariance across child, adolescent, adult and older adult populations?

Method

Search Strategy

A literature search was carried out to identify studies that investigated the psychometric properties of the MHC-SF using factor analytic methods. The search was not restricted by publication date. Six online databases (PsychINFO, MEDLINE, EMBASE, including Scopus, SocINDEX and PubMed) were systematically searched on 6th January 2017, by one reviewer. In addition, the reference lists of all studies that met the inclusion criteria were screened to identify any further articles. To maximise comprehensiveness, a list of all articles that cited the main text article (Keyes, 2002) were also screened.

Table 1

Search terms

Mental Health Continuum – Short Form	Psychometric Properties
MHC-SF	Factor analysis
	Factor analyses
	Factor analytical
	Validity
	EFA
	CFA
	Factor Structure
	Latent Structure

N.B. 'Exploratory factor analysis' and 'confirmatory factor analysis' was not be included as specific search terms as these will be identified through the inclusion of 'factor analy*'.

Key terms and their associated synonyms/closely related words (see

Table 1) were combined using the Boolean operator 'AND' in a pre-determined search algorithm; (Mental Health Continuum Short Form OR MHC-SF) AND (psychometric * OR valid* OR EFA OR CFA OR ((factor OR latent) N2 structure) OR (factor* N2 analy*)). This was modified in accordance with database requirements.

Eligibility Criteria

Articles were deemed suitable for inclusion if: (1) the study examined the factor structure of the MHC-SF; (2) the methodology utilised was either exploratory or confirmatory factor analysis; (3) the paper was in a peer reviewed journal; and (4) published in English. Studies were excluded if: (1) they were book chapters or theses; (2) they examined the psychometric evaluation of a longer

version of the MHC; or (3) they used an alternative methodology (i.e. not factor analytic) for examining the factor structure of the MHC-SF.

Study selection

The titles and abstracts of all studies identified in the search (n=66 after removal of duplicates), were screened to determine their relevance for inclusion in the review. The number of relevant citations after title and abstract review was 46. The full paper was then read to establish whether the article met inclusion criteria; the reasons for excluding 32 of these articles were recorded (see **Figure 2**). The reference lists of all 14 articles were screened for additional studies, yielding four further papers. A further two studies were included (n=20) following a search of all articles that cited the main study (Keyes, 2002). One of these papers (Joshanloo & Lamers, 2016) was removed at data extraction to avoid analysing the same data twice; this sample had previously been analysed by another included study and was therefore secondary analysis (Lamers et al., 2011).

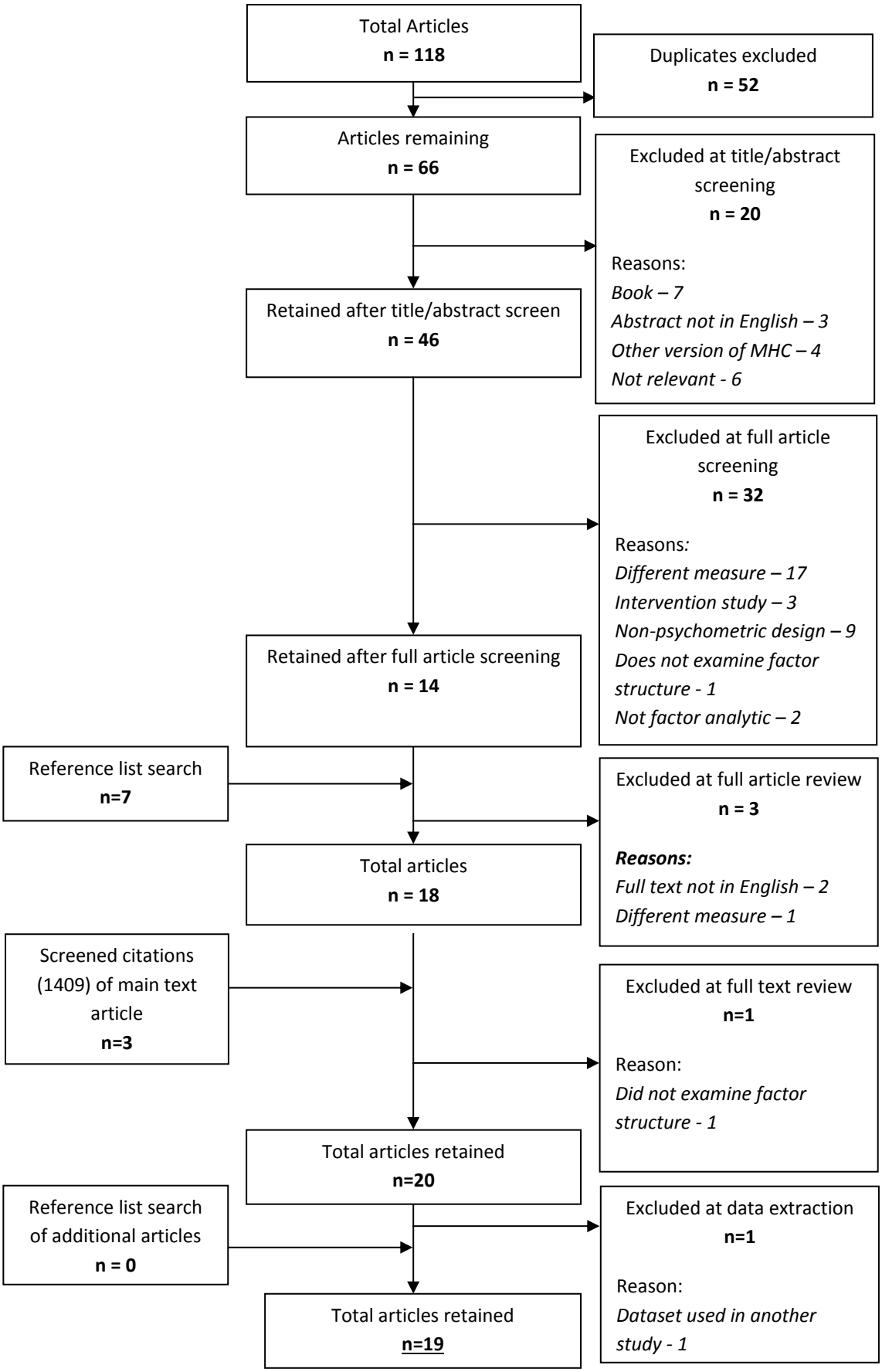


Figure 2

Selection strategy for systematic review articles

Quality Appraisal

The quality of studies were examined using the criteria outlined by de Vet et al. (2005). They proposed criteria for assessing the quality of studies that apply factor analytic methods to health status questionnaires. The checklist (Appendix 2, sections A-C) evaluates studies according to their justification of methods, sample size and data quality, and full report of statistical procedures. Studies were awarded a rank (see **Table *3***, 1-11; strongest-weakest) according to their percentage score, thus indicating the strength of factor analytic methods relative to other studies (Appendix 2, A-C). Percentage score was calculated from a count of positively scored items (i.e. the sum of items scoring (+) or 'yes' (see Appendix 2)), for items applicable to the type of factor analysis used within the study (scores out of 28-items for studies using CFA and 40-items for studies also using EFA). No studies were excluded from analysis based on their quality ranking, to provide a comprehensive review of the literature. In addition, section D (Appendix 2) examined the quality of the translation process, for the ten studies that had translated the MHC-SF for the first time into another language (n=10/19 (see Table 2). Section D items were taken from the cultural validity subsection of the COSMIN (Terwee et al., 2012) quality review tool and were calculated separately.

Two reviewers, both Trainee Clinical Psychologists, rated quality; a primary reviewer assessed the quality of all studies and the second reviewer independently evaluated five studies. Items with added complexity or ambiguity, were rated cautiously and awarded a negative point by reviewers. As recommended by McHugh (2012), both percentage agreement (82%) and Cohen's Kappa (K=0.720, 95% CI=0.62-0.82, p=<0.001) were calculated as measures of interrater reliability. Using Cohen's guidelines for the interpretation of Kappa, interrater reliability for the 200 items was substantial (Cohen, 1960); however, McHugh's (2012) more recent guidelines suggest this agreement is moderate. Percentage agreement was above the 80% minimum suggested by most studies (McHugh, 2012). Disagreement on items was resolved through discussion to reach consensus.

Table 2

Quality of MHC-SF translation process based on COSMIN criteria (Terwee et al., 2012)

Citation	MHC-SF Version	Score	Rank
Machado and Bandeira, 2015	Brazilian Portuguese	6/8	1
Petrillo et al., 2015	Italian	4/8	2
Lim, 2014	Korean	4/8	2
Guo et al., 2015	Chinese	4/8	2
Jovanić, 2015	Serbian	2/8	3
Joshanloo et al., 2013	Persian	2/8	3
Doré et al., 2016	French Canadian	2/8	3
Lamers et al. 2011	Dutch	2/8	3
Karaś et al. 2014	Polish	0/8	4
Ismail and Salama-Younes, 2008	French	0/8	4

Results

Descriptive details about included studies are provided in **Table 3**. Studies published between 2008 and 2017, were carried out across the world in Asia (China, India, Iran and South Korea), Australasia (Australia and New Zealand), Europe (France, Italy, Poland, Netherlands, Portugal and Serbia), North America (Canada and USA), South America (Brazil) and South Africa. As such, 13 language versions of the MHC-SF were used; no study reported fully on their translation process, with 9/10 studies reporting on only 0-4/8 of the items (**Table** 2). Five of the studies (de Carvalho et al., 2016; Joshanloo, 2016; Joshanloo et al., 2013; Jovanović, 2015; Karaś et al., 2014) reported on data from more than one sample of participants (total number of samples=27), with sample sizes ranging from 208-2248 participants. Seventeen of the 27 samples were recruited from educational settings (see **Table 3**). Participant age ranged from 7-89 years.

Table 3

Samples, examined models, factor structure and quality indicator of review studies

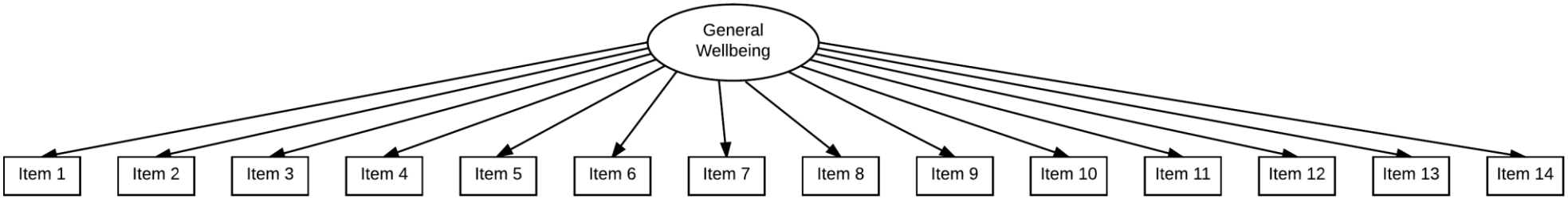
Author(s), Year	MHC-SF Language – Adaptation	Country	N	Sample	% Female	Age Range (years)	Mean Age (SD)	Factor Analytic Method	Models Tested (CFA)	Factor Structure	Quality Weighting (%)	Rank
Singh et al., 2015	English	India, Delhi	539	Students in private schools	43.2%	13-18	15 (1.4)	EFA/CFA	Correlated 3 factor	Correlated 3 factor (both samples)	80.0	1
Lamers et al., 2011	Dutch	Netherlands	1662	Representative sample based on LISS panel of CentERdata, an Internet panel for longitundinal Internet studies in the social sciences	50.2%	18-87	47.6 (17.7)	CFA	Correlated 3 factor	Correlated 3 factor	77.5	2
Doré et al., 2016	French Canadian	Canada, Quebec	1485	Postsecondary students	58%	16-40	18.4 (2.4)	CFA	Single factor Correlated 2 factor Correlated 3 factor Second order model	Correlated 3 factors / Second order model	67.9	3
de Carvalho et al., 2016	Portuguese Sample 1: Adapted adolescent version Sample 2: Adolescent version	Portugal, municipalities in the Lisbon District	Sample 1: 208 Sample 2: 21	Sample 1: children at elementary school Sample 2: youths at middle school	Sample 1: 43.9% Sample 2: 2:68.5%	Sample 1: 7-9 Sample 2: 10-14	Sample 1: 8 (0.65) Sample 2: 11 (1.21)	CFA	Correlated 3 factor	Correlated 3 factor	67.9	3
Jovanović, 2015	Serbian	Serbia	Sample 1: 1095 Sample 2:	Sample 1: Undergraduate students	Sample 1: 73% Sample 2:	Sample 1: 18-26 Sample 2:	Sample 1: 21.20 (1.86) Sample 2:	CFA	Single factor Correlated 2 factor Correlated 3 factor Bifactor model	Bifactor model	67.9	3

Author(s), Year	MHC-SF Language – Adaptation	Country	N	Sample	% Female	Age Range (years)	Mean Age (SD)	Factor Analytic Method	Models Tested (CFA)	Factor Structure	Quality Weighting (%)	Rank
			325	Sample 2: Serbian adults	52%	27-63	43.76 (8.73)		Second order model			
Petrillo et al., 2015	Italian	Italy, central and southern regions	1438	Convenience sample using snowballing techniques (home, university courses, fitness centres, work place and leisure centres)	51.5%	18-89	47.12 (19.56)	CFA	Single factor Correlated 2 factor Correlated 3 factor Second order model	Correlated 3 factors / Second order model	64.3	4
Joshanloo, 2016	Sample 1: Unknown Sample 2: English	Sample 1: Iran, Tehran Sample 2: USA	Sample 1: 387 Sample 2: 395	Sample 1: University students Sample 2: American universities	55.8%	Sample 2: 18->30	Sample 1: 21.86 (3.29)	CFA	Correlated 3 factor	Correlated 3 factor (both samples)	64.3	4
Hides et al., 2016	English	Australia	2220	Snowballing techniques to recruit via student email, Facebook, youth relevant websites, the Young and Well Cooperative Research Centre website and emails to partner organisations	64%	16-25		EFA/CFA	Single factor Correlated 3 factor Bifactor model	Bifactor model	62.5	5
Joshanloo et al., 2016	English	New Zealand, Wellington	456	University students	70.2%		21.20 (5.60)	CFA	Single factor Correlated 2 factor Correlated 3 factor	Correlated 3 factor	60.7	6
de Bruin and Plessis, 2015	English	South Africa	902	Undergraduate psychology students			21.1 (2.7)	CFA	Single factor Correlated 3 factor Bifactor model	Bifactor solution	60.7	6
Lim, 2014	Korean	South Korea, Ulsan and Mungyeong	547	High school students	57%	14-17	16.08 (0.34)	CFA	Single factor Correlated 2 factor Correlated 3 factor	Correlated 3 factor	60.7	6

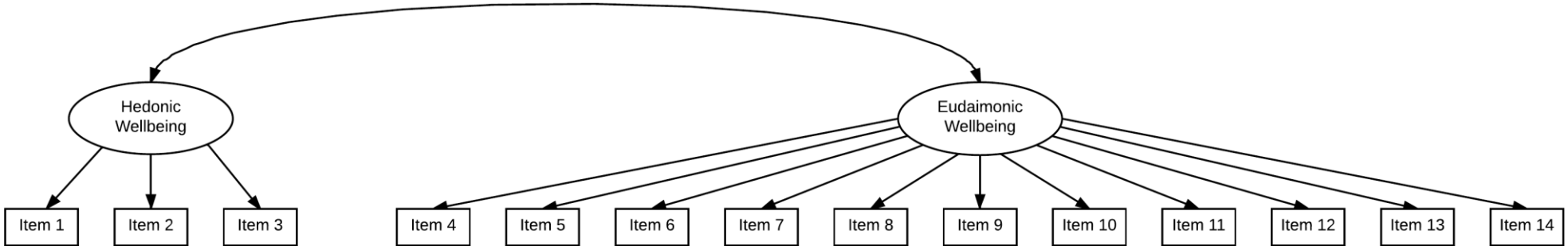
Author(s), Year	MHC-SF Language – Adaptation	Country	N	Sample	% Female	Age Range (years)	Mean Age (SD)	Factor Analytic Method	Models Tested (CFA)	Factor Structure	Quality Weighting (%)	Rank
Joshanloo et al., 2013	Sample 1: Dutch	Sample 1: Netherlands	Sample 1: 308	University students	Sample 1: 66.6%		Sample 1: 21.6 (5.04)	CFA	Correlated 3 factor	Correlated 3 factor (in all three groups)	57.1	7
	Sample 2: English	Sample 2: South Africa	Sample 2: 328	University students	Sample 2: 78.6%		Sample 2: 20.8 (1.59)					
	Sample 3: Persian	Sample 3: Iran	Sample 3: 484	University students	Sample 3: 59.3%		Sample 3: 21.7 (2.21)					
Guo et al., 2015	Chinese	China, Weifang	5399	Stratified and clustered random sampling. Middle and high school students	51.1%		15.13 (1.56)	CFA	Correlated 3 factor	Correlated 3 factor	57.1	7
Joshanloo et al., 2017	Italian	Italy, various regions	Sample 1*: 2248	Convenience sample.	67.38%		41.56 (16.15)	CFA	Correlated 3 factor	Correlated 3 factor	57.1	7
Joshanloo and Jovanović, 2016	Serbian	Serbia	1883	High school students, undergraduate students and adults	65.6%	15->65	27.91 (14.49)	CFA	Single factor Correlated 2 factor Correlated 3 factor	Correlated 3 factor	53.6	8
Karaś et al., 2014	Polish	Poland	Sample 1: 655		Sample 1: 49.8%	Sample 1: 25-60	Sample 1: 37.16	CFA	Correlated 3 factor	Correlated 3 factor	53.6	8
			Sample 2: 835		Sample 2: 56.1%	Sample 2: 16-81	Sample 2: 29.56					
			Sample 3: 477	Students	Sample 3: 63.3%	Sample 3: 18-33	Sample 3: 21.51					
			Sample 4: 148	Participants attending high school	Sample 4: 53.4%	Sample 4: 16-19	Sample 4: 17.24					
Machado and	Brazilian Portuguese	Brazil, various states	686	Convenience sampling	72.7%	18-73	33.9 (11.3)	EFA/CFA	Single factor Correlated 2 factor Correlated 3 factor	Single factor (both)	52.5	9

Author(s), Year	MHC-SF Language – Adaptation	Country	N	Sample	% Female	Age Range (years)	Mean Age (SD)	Factor Analytic Method	Models Tested (CFA)	Factor Structure	Quality Weighting (%)	Rank
Bundeira, 2015									Bifactor model			
Ismail and Salama-Younes, 2011	French	France	643	Older adults who regularly practice physical activity in a group	78.38%	58-83	65.85 (4.36)	CFA	Single factor Correlated 2 factor Correlated 3 factor	Correlated 3 factor	50.0	10
Keyes et al., 2008	Setswana	South Africa, Northwest Province	1050	Data part of the PURE (Prospective Urban and Rural Epidemiology) and FORT studies	62.34%	30->80		CFA	Single factor Correlated 2 factor Correlated 3 factor	Correlated 3 factor	42.9	11

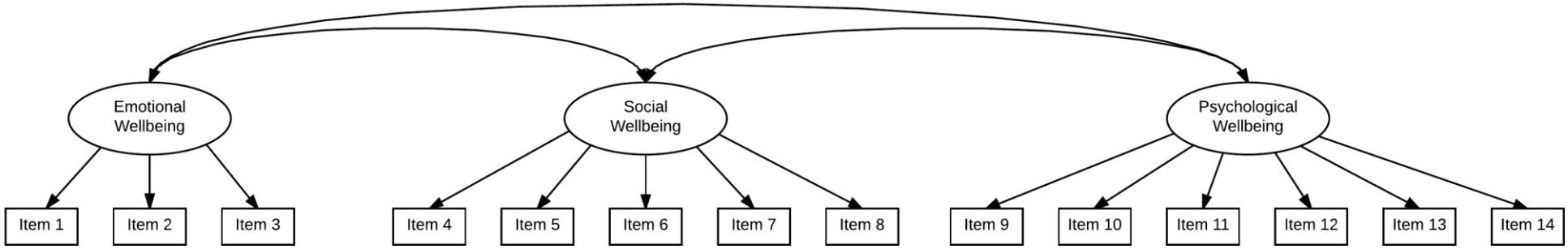
N.B. *Sample 2 in Joshanloo et al. (2017) study was not examined in this paper, as the factor structure is examined further in Petrillo et al. (2015)



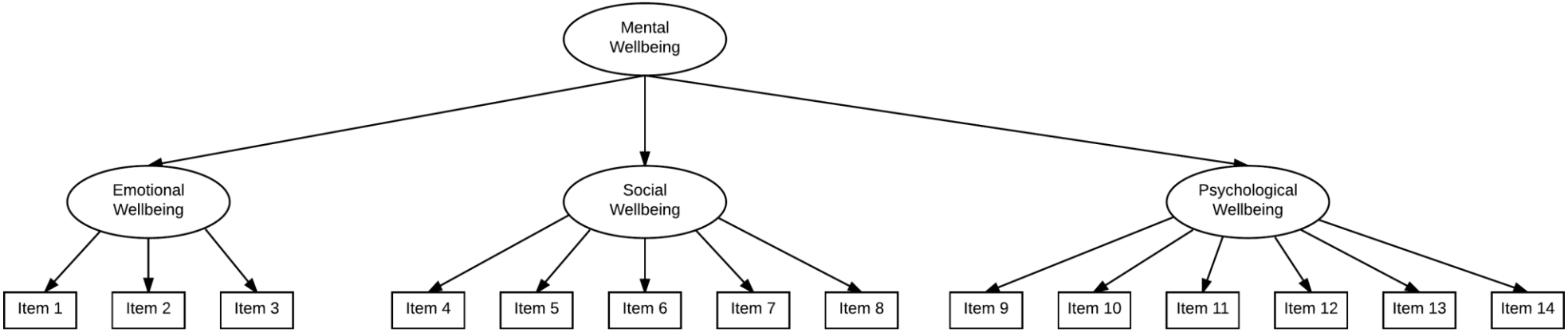
A: Single Factor Model of the MHC-SF



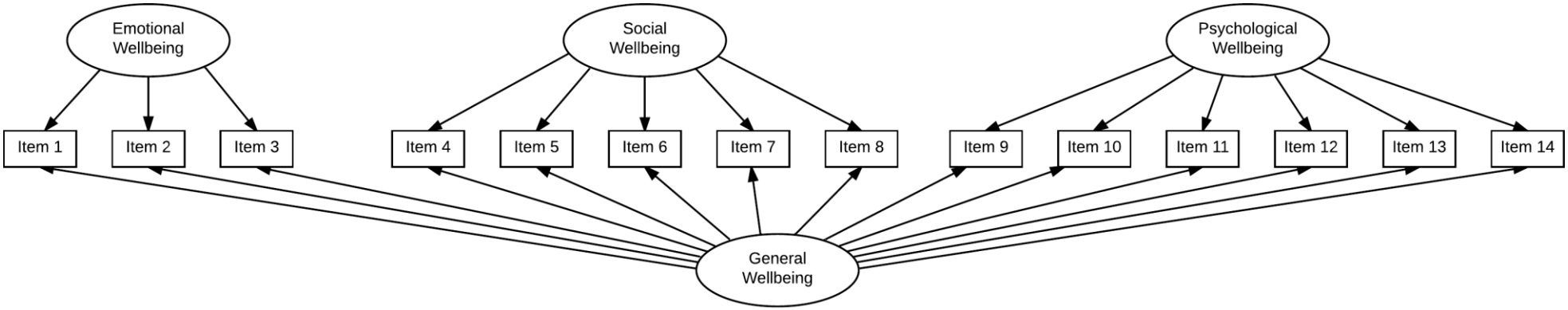
B: Two Correlated Factors Model of the MHC-SF



C: Three Correlated Factors Model of the MHC-SF



D: Second Order Three Factor Model of the MHC-SF



E: Bifactor Model of the MHC-SF

Adapted from Jovanović (2015)

Figure 3

Competing Models of the MHC-SF Factor Structure

Use of Factor Analysis

Nineteen studies carried out factor analysis on five different theoretically grounded factor structures (see **Figure 3**, A-E): (A) a unidimensional factor model in which all items load on to a single wellbeing factor; (B) a two correlated factors model which reflects hedonic (Items 1-3) and eudaimonic (Items 4-14) wellbeing; (C) Keyes' (2002) three correlated factors model which reflects emotional (Items 1-3), social (Items 4-8) and psychological (Items 9-14) wellbeing factors; (D) a second order factor model where a higher order factor accounts for the shared commonality of three lower order factors (emotional, social and psychological wellbeing); and (E) a bifactor model with three specific wellbeing dimensions (emotional, social and psychological), in addition to a general wellbeing factor (items load on to both a specific wellbeing dimension and the general wellbeing factor). **Table 4** shows which factor analytic methods were used, as well as which competing models were compared for each of the 19 studies.

MHC-SF factor structure

Across the 19 studies, a range of factor structures (Models A and C-E, **Figure** 3) were found to fit the data (see **Table 4**). Keyes' (2002) correlated tripartite model (Model C, **Figure 3**), reflecting Emotional (Items 1, 2 and 3), Social (Items 4, 5, 6, 7 and 8) and Psychological (Items 9, 10, 11, 12, 13 and 14) wellbeing factors was found to be most parsimonious (13/19 studies). However, a majority of the studies (13/14) that that reached this conclusion, did not examine the fit of bifactor or hierarchical solutions (see **Table 4**). Keyes' (2002) tripartite model was equally or better represented by a bifactor model, second order or single factor model in all studies (n=6) that incorporated bifactor and/or second order comparator models in their CFA analyses (see **Table 4**), demonstrating that comparator models were important in determining best fit. In addition to the tripartite model, methodologically stronger studies (rated 1-6) were more likely (5/11) to indicate that a bifactor or hierarchical model provided the best fit (see ***Table 3***). The majority (7/8) of the weaker studies (rated 6-11) found the tripartite solution to be most parsimonious. Studies with

percentage scores equal to or above 60% were considered methodologically stronger; although an arbitrary threshold, this meant that approximately 50% of the ranks were considered strong.

Factorial invariance of the MHC-SF across developmental stages

Difference associated with the age range of samples across studies (see Figure **4**), meant it was not possible categorise samples into discrete developmental stages (e.g. child, adolescent, young adult, adult and older adult). Specifically, several studies did not specify an age range or had samples where the age range covered more than one life stage, e.g. Joshanloo and Jovanović's (2016) sample of participants aged 16-81 years old. As such, it was not possible to extract data to reflect the factor structure of the MHC-SF across the lifespan categorically. **Figure 4** represents the best fitting factor structure for each sample, according to age range.

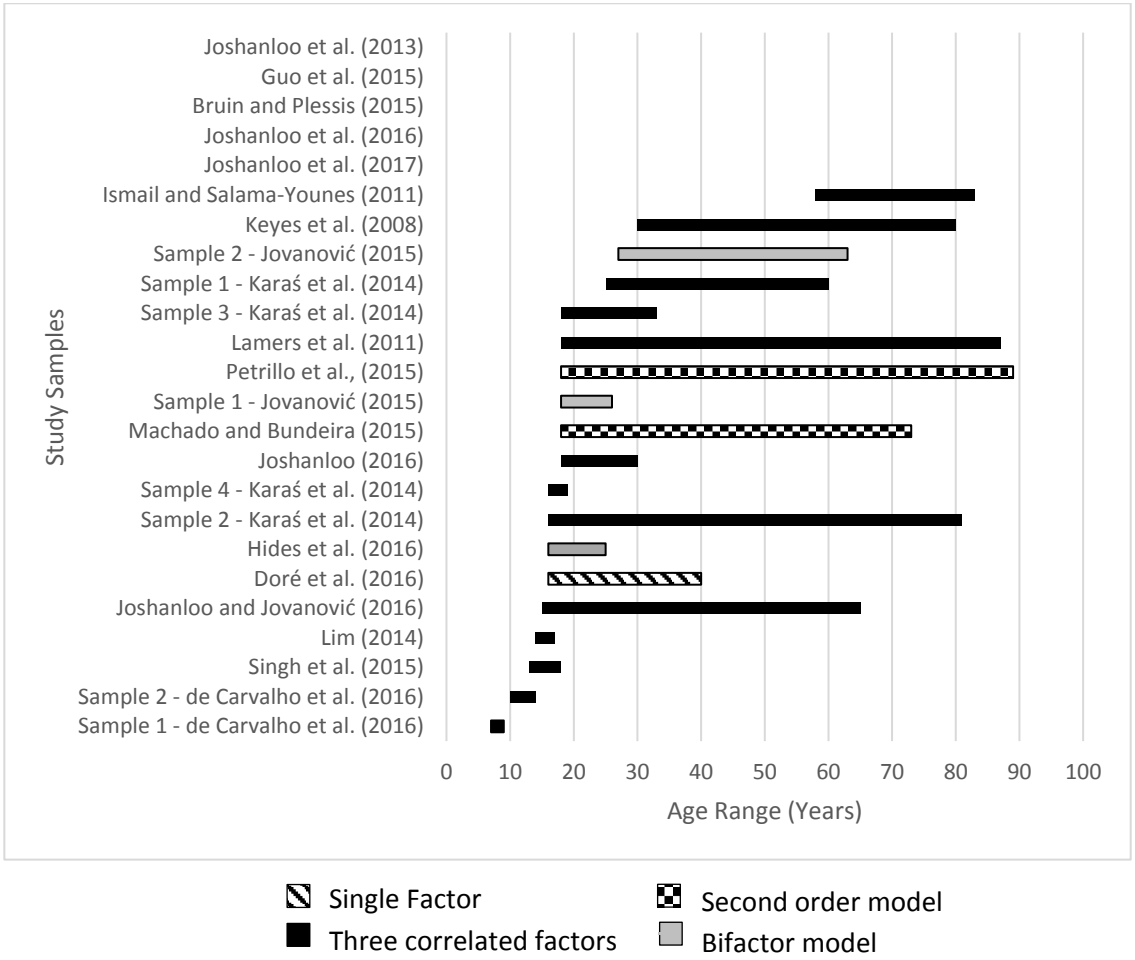


Figure 4

Best fitting model of mental wellbeing across review studies according to participant age range

Table 4

Models examined within factor analytic studies of the MHC-SF

Quality Rank	Study	Assessed Models (See Figure 4 for models **A-E**)					Model of Best Fit
		A Single Factor	**B** 2 Correlated Factors	**C** 3 Correlated Factors	**D** Second Order	**E** Bifactor	
9	Machado & Bundeira, 2015*	✔	✔	✔		✔	A
7	Joshanloo et al., 2017			✔			C
2	Lamers et al., 2011			✔			C
8	Karaś et al., 2014			✔			C
7	Joshanloo et al., 2013			✔			C
7	Guo et al., 2015			✔			C
1	Singh et al., 2015*			✔			C
3	de Carvalho et al., 2016			✔			C
4	Joshanloo, 2016			✔			C
10	Ismail & Salama-Younes, 2011	✔	✔	✔			C
11	Keyes et al., 2008	✔	✔	✔			C
6	Lim, 2014	✔	✔	✔			C
8	Joshanloo & Jovanović, 2016	✔	✔	✔			C
6	Joshanloo et al., 2016	✔	✔	✔			C
4	Petrillo et al., 2015	✔	✔	✔	✔		D(C)
3	Doré et al., 2016	✔	✔	✔	✔		D(C)
5	Hides et al., 201*	✔		✔		✔	E
6	de Bruin and Plessis, 2015	✔		✔		✔	E
3	Jovanović, 2015	✔	✔	✔	✔	✔	E

N.b. All studies used CFA; the * indicates studies that also used EFA.

Discussion

The MHC-SF has been used to measure mental wellbeing for more than a decade; however, this is the first systematic review and narrative synthesis of factor analytic studies of the Mental Health Continuum–Short Form. First, this study aimed to establish whether there is support for Keyes' (2002) three correlated factor structure of mental wellbeing as measured by the MHC-SF. Secondly, the study sought to examine whether this is universal across age, by investigating the replicability of the tripartite factor structure across the lifespan.

Factor structure

The majority of studies (14/19) concluded that Keyes' (2002) tripartite factor structure indicated the best fit for their data (see **Table *3***); thus indicating that mental wellbeing can be conceptualised as being comprised of emotional, social and psychological wellbeing factors. This was not universally observed. Five studies reported alternative factor structures; the unidimensional, bifactor, and second order models were found by one (Machado & Bundeira, 2015), three (de Bruin & Plessis, 2015; Hides et al., 2016; Jovanović, 2015) and two (Doré et al., 2016; Petrillo et al., 2015) studies respectively. Despite the absence of any psychometric evidence to suggest that the MHC-SF is best understood as being comprised of two correlated factors (hedonic and eudiamonic wellbeing), almost half of the studies sought to confirm this model (see **Table *3***).

Although a significant majority of studies concluded that a correlated tripartite structure is the most parsimonious model of wellbeing, 5 (45.5%) of the methodologically stronger studies (rated 1-6) reported that bifactor or second order models demonstrated a better fit (de Bruin & Plessis, 2015; Doré et al., 2016; Hides et al., 2016; Jovanović, 2015; Petrillo et al., 2015). Furthermore, a large majority of the studies (8/13) that concluded the tripartite model provided the best fit, had not used any comparator models and were therefore unable to comment on the fit of this model relative to others. Although the results suggests that the tripartite model fits the data well, there is evidence to suggest that bifactor or second order models may offer more parsimonious models for

understanding the structure of mental wellbeing. These models were first examined in 2015 and have thus received less psychometric research attention. It is possible that repeatedly seeking to confirm the tripartite model of wellbeing has created an 'echo chamber' effect within the literature, which has reinforced the existence of this mental wellbeing model. This effect has been exacerbated by the use of CFA in studies where EFA would have been more appropriate (de Vet et al., 2005), i.e. where studies have examined the tripartite model for the first time in a different culture/language.

Factorial invariance of MHC-SF across developmental stages

It is important for measurement invariance of the MHC-SF to be determined, to allow meaningful unbiased comparisons of group difference (Meredith, 1993; Van de Schoot et al., 2012). To examine the measurement invariance of the MHC-SF across the lifespan and subsequently developmental stages, this systematic review sought to examine samples categorically, via stratification of age range into discrete developmental life stages. Most studies did not provide enough detail about the age groups of samples to allow stratified analysis. Keyes' (2002) three correlated factor structure was however evidenced in samples across the lifespan, with no obvious pattern between age and the alternative observed MHC-SF factor structures (see **Figure 4**). The replicability of the tripartite structure across studies with different mean ages of samples provides a good basis for using the MHC-SF with age stratified samples.

To date there is little consensus about mental wellbeing across the lifespan, with evidence identifying different contradicting trends, which depict linear, U-shaped and inverted U-shaped trajectories (Ulloa, Møller & Sousa-Poza, 2013). Successful aging requires progression through a number of developmental life stages, which are characterised by inherently unique maturational and developmental challenges (Erikson, 1963). In general terms, there are systematic changes in various factors across the lifespan, e.g. social context, support systems, functions of relationships,

capacities and resources (Ryan & Deci, 2001)[4]. As needs will be expressed and satisfied differently, it is suggested that component factors of mental wellbeing may present and interact uniquely across age and developmental stage (Ryan & LaGuardia, 2000). Hence, the relative importance of the social, emotional and psychological components of mental wellbeing may vary with age, rendering factorial measurement invariance vital for understanding the pathways to mental wellbeing across the lifespan (Henderson & Knight, 2012).

Limitations

The quality review tool, designed by de Vet et al. (2005) provided an indication of the relative quality of studies included in this review. Reviewers consistently awarded items with added complexity or ambiguity a negative point; as such, percentage scores and ranks should be reviewed with due caution, as reviewers may have underestimated the quality of studies. This was due to the lack of clarity surrounding the scoring of items on this scale, as well as an implied assumption that the reviewer possesses a sophisticated and advanced statistical knowledge. To account for this limitation, no study was excluded from the analysis. Furthermore, quality review tools of this nature are narrow in focus and do not consider broader methodological issues, such as the use of factor analysis to compare the fit of competing models. Specifically, studies that examine competing models may be better placed to draw conclusions about the MHC-SFs factor structure.

It is possible that studies where the tripartite structure has not provided a good fit with data have been more difficult to get published. As such, the exclusion of publications within the grey literature and those not published in the English language can be considered a limitation of the current study. The focused nature of the current studies inclusion criteria are important, as it has been argued that CFA is unable to adequately represent the factor structure of psychological scales (Marsh et

[4] A review of the distinct transitions, affordances and tasks present within each developmental context is beyond the scope of this study, but have been captured in detail elsewhere (middle childhood (Scales, 2014), adolescence (Žukauskiene,2014), adulthood (Benson, 2014; Ryan & Deci, 2001) and older adulthood (Kim, Lehning & Sacco, 2016)).

al., 2011; Morin et al., 2013). For example, CFA has been criticised for its overestimation of factor correlations (Brown, 2015). It has been proposed that SEM may provide a superior, more sophisticated representation of multi-dimensional constructs, by overcoming some of the limitations apparent in CFA (Marsh et al. 2011; 2014; Morin et al., 2013). Studies carrying out SEM to investigate the factor structure of the MHC-SF have found that SEM models provide a better fit than CFA (Joshanloo, 2016; Joshanloo & Jovanic, 2016; Joshanloo & Lamers, 2016; Schutte & Wissing, 2017).

Future Research

Future research should focus on examining and determining the factorial measurement invariance of the MHC-SF across developmental stages, by recruiting representative and adequately powered samples of participants from across the lifespan. These studies will need to control for cohort effects, such as life expectancy and socioeconomic factors (Wunder et al., 2009). The results of this systematic review indicate that studies seeking to confirm the factor structure should as a minimum be examining Keyes' (2002) three correlated factors solution and the bifactor model. Where possible it would also be beneficial to examine unidimensional and second order factor structures in addition; however, there is no evidence to suggest that there is merit in further investigation of the two correlated factor model of mental wellbeing, as psychometric support for this model fit is not convincing. Consideration should also be given to the methodology utilised in future studies, particularly in relation to incorporating more robust psychometric methods for the examination of the MHC-SF's factor structure. Joshanloo and Lamers (2016) suggested that SEM should routinely be utilised alongside CFA methods when investigating the structure of wellbeing measures such as the MHC-SF (e.g. Schutte & Wissing (2017)). SEM is an integration of CFA and EFA, which imposes less restrictive constraints and allows items to load across all factors (Asparouhov & Muthen, 2009). As such, future systematic reviews should broaden their focus to include studies which utilise these alternative methodologies.

Conclusion

This systematic review included nineteen studies, which examined the factor structure of the MHC-SF using factor analysis. Results showed that the tripartite model of mental wellbeing, comprised of emotional, social and psychological factors is evidenced with cross-cultural samples across the lifespan. There is some evidence to suggest that the three first order factors might be represented within a hierarchical second order or bifactor model; however, the majority of studies included within this review did not set out to examine these structures, thus limiting the robustness of such findings. Future research should additionally examine the fit of second order and bifactor models of mental wellbeing, using structural equation modelling.

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Chapter 2

Major Research Project

Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents Living in the West of Scotland

University of Glasgow

Prepared in accordance with the guidelines for the following peer reviewed journal:
Journal of the American Academy of Child and Adolescent Psychiatry
(see Appendix 4 for author guidelines)

Word Count: 7,492

Plain English Summary

Background

People who are free from mental illness are often thought to be mentally healthy. We now know that this is not the whole picture. To have good mental health, people must also have 'mental wellbeing'. People with high levels of mental wellbeing are said to be 'flourishing'. The World Health Organisation (2004) describe a person as flourishing if they are achieving their level of ability, coping with everyday stresses well, working well and involved in their community. Enhancing mental wellbeing is important, as it buffers against mental illness. One questionnaire that has been developed to measure mental wellbeing is the Mental Health Continuum-Short Form (MHC-SF), which was developed by Keyes (2002). It is a questionnaire that people can complete by themselves. It measures different aspects of wellbeing; this includes whether they are currently experiencing positive feelings (emotional wellbeing) and whether they are managing and coping in their everyday life (psychological wellbeing) and in the wider community (social wellbeing). Research has confirmed that this is a good questionnaire to use with adults. Research still needs to be completed to see whether it is a good questionnaire to use with teenagers in the West of Scotland. It is important to find this out, as the teenage years are a very important time of development, which will impact on life as an adult. The Scottish government are keen to make sure Scotland's teenagers are mentally healthy or 'flourishing'.

Aims and Questions

This study aims to test whether the MHC-SF is a good questionnaire for measuring mental wellbeing, with teenagers in the West of Scotland. People from deprived urban areas tend to have poorer physical and mental health than their less deprived counterparts. This study will therefore also investigate whether there is any link between mental wellbeing and levels of deprivation.

Methods

Participants were 790 teenage school pupils in S2-S4 (which is roughly age 13-16 years old), from four secondary schools in the West of Scotland. The only children who were excluded were teenagers from Additional Support Needs schools; this is because the questionnaires may have placed too much demand on these children. Head teachers were asked whether they would like their pupils to take part or not. Parents were then contacted with information about the study and said whether their child could take part. Thereafter, the teenager was given information and said whether they wanted to take part. Participants who opted to take part completed the MHC-SF and four other questionnaires at school. The four other questionnaires were to help to see if the MCH-SF consistently measures what it is meant to measure. This was checked using statistical tests.

Results

The results of the study show that the MHC-SF is a reliable tool for measuring wellbeing in teenagers living in the West of Scotland. As expected, the MHC-SF appears to have a coherent structure, which measures three different parts of mental wellbeing reliably. The three parts that can be measured separately are emotional, social and psychological wellbeing. As well as this, the tool also reliably measures mental wellbeing as a whole.

Practical Applications

The World Health Organisation and the Scottish Government currently see improving mental wellbeing as a priority, particularly for teenagers. The study shows that the MHC-SF is a valid way of measuring wellbeing in Scottish teenagers. This means that researchers and clinicians can feel

more confident in measuring the mental wellbeing of teenagers using the MHC-SF. Subsequently, the mental wellbeing of teenagers can be better understood and improved.

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Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents Living in the West of Scotland

Scientific Abstract

Objective

The Mental Health Continuum-Short Form (MHC-SF) measures the three core components of mental health (emotional, social and psychological wellbeing), as defined by the World Health Organisation. This study sought to bridge a gap in the literature, by examining its psychometric properties and structural validity for use with adolescents in the UK.

Method

In total, 790 adolescents aged 13-16 (50.4% female; M=13.96, SD=.86) from the West of Scotland completed the MHC-SF and four compactor scales. The study employed a quantitative repeated measures (test-retest) design, whereby 605 participants completed the MHC-SF two weeks later. Confirmatory factor analysis (CFA) on four different theoretical models of mental wellbeing determined the relative fit of the tripartite MHC-SF factor structure, comprised of emotional, social and psychological wellbeing. Further CFA sought to confirm the dual factor model of mental health.

Results

Confirmatory factor analysis matched the tripartite model of mental wellbeing. The data fit a second order model of mental wellbeing equally well, proving evidence for an overarching latent general wellbeing factor. Results indicated good internal consistency and test-retest reliability. Convergent validity was indicated by significant positive correlations with other measures of wellbeing. Additionally, significant negative correlations with measures of mental illness indicated

discriminant validity. CFA confirmed the dual factor model of mental health, where mental wellbeing and mental illness are two correlated, yet distinct factors of mental health.

Conclusion

The MHC-SF is a psychometrically sound instrument, providing valid and reliable measurement of mental wellbeing and its three first order factors, with adolescents in the UK.

Key words: Mental Health Continuum-Short Form, Psychometric Properties, Factor Analysis, UK adolescents, Mental Wellbeing

Introduction

Mental health has been increasingly recognised as a complete state of being, with growing consensus that mental health is best understood as the absence of mental illness and the presence of positive aspects of mental wellbeing (Suldo & Shaffer, 2008; World Health Organisation, 2004). This is highlighted by Keyes' (2005a) dual-factor model of mental health, which describes mental illness and mental wellbeing as related yet distinct constructs of mental health. According to the Royal Society in the UK (United Kingdom), mental wellbeing can be defined as 'a positive and sustainable state that allows individuals, groups or nations to thrive and flourish' (Huppert, Baylis & Keverne, 2004). In the same way as mental illness is thought to be comprised of clusters of symptoms, mental wellbeing is also thought to be a syndrome comprised of "symptom" components (Keyes, 2002; 2003; 2005a).

A theory driven understanding of the wellbeing literature (Diener, 1984; Keyes, 1998; Ryff, 1989; see Chapter 1 for a comprehensive review) has led to mental wellbeing being operationalised to encompass three components: emotional, psychological and social wellbeing. These are consistent with the WHO's (2004) definition of mental health as 'a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community'. The Mental Health Continuum-Short Form (MHC-SF) was developed by Keyes (2002; 2006; 2007) to measure these dimensional components. Keyes (2007) described individuals presenting with high levels of wellbeing as 'flourishing', those with low levels as 'languishing', and classified individuals who do not fit the criteria for either as 'moderately mentally healthy'.

Flourishing is not only conceptualised as a desirable end state, but is considered a protective factor that prevents the development of mental illness (Keyes, Dhingra & Simoes, 2010; Keyes & Simoes, 2012; Lamers et al., 2015). Hence, it is possible for individuals presenting with fewer psychopathological symptoms on a measure of mental illness to fall into the category of reduced

wellbeing (i.e. 'languishing'), and for those with diagnostic levels of psychopathology to report increased mental wellbeing (i.e. 'flourishing') (Keyes, 2002). This theoretical stance, based on the dual factor model, has been pivotal in shaping recent advances in mental health care treatments. As well as offering traditional and widely available psychotherapeutic approaches that have an explicit aim of reducing the symptoms associated with mental illness (e.g. Cognitive Behavioural Therapy), there has been an emergence in the availability of psychotherapeutic interventions that show promise for promoting and enhancing mental wellbeing (e.g. Well-being Therapy (Fava & Ruini, 2003), Positive Psychology (Seligman, 2002) and Acceptance and Commitment Therapy (Bohlmeijer et al., 2015; Trompetter et al., 2017)). It is therefore important to systematically utilise both measures of mental illness and mental wellbeing when evaluating psychotherapeutic interventions in mental health care (Trompetter et al., 2017)[5].

The UK was reported to have the lowest index for child wellbeing, in a study of rich developed countries (Pickett & Wilkinson, 2007). The determinants of mental wellbeing in youth are distinct from the determinants of mental illness, suggesting that these dual factors of mental health should be understood individually within the context of childhood and adolescence (Patalay & Fitzsimmons, 2016). Patalay and Fitzsimmons (2016) demonstrated this in relation to sociodemographic correlates of wellbeing in a UK sample. In youth (aged 11) low absolute and relative socioeconomic status was associated with increased symptoms of mental illness; however, a reverse social gradient was observed for mental wellbeing, where higher socioeconomic status was associated with lower mental wellbeing. This is counterintuitive, as the social gradient for other child outcomes, such as physical health and cognition, are observed in childhood (Bradley & Corwyn, 2002).

Patalay and Fitzsimmons (2016) hypothesised that although the socio-economic status of youth during this life stage does not yet negatively influence their subjective experience of wellbeing, this

[5] Trompetter et al. (2017) provides a more comprehensive analysis of these issues.

social gradient might become evident in adolescence and early adulthood, where differences in social support and resources become increasingly apparent. This contrasts markedly with findings observed at subsequent stages across the lifespan (WHO, 2014) and provides a helpful foundation for developing interventions that not only function to prevent symptoms of psychopathology, but that also improve mental wellbeing. The former Chief Medical Officer for Scotland argued for a salutogenic approach to managing health inequality; this refers to an approach where focus is placed on the factors that support the promotion of mental wellbeing, rather than attending to the causal and risk factors for mental illness (Antonovsky, 1996). As such, it is important for studies to avoid dimensional conflation of the dual factors and to explicitly examine the impact of socioeconomic status on child and adolescent mental wellbeing (de Cavalho et al., 2016; Patalay & Fitzsimons, 2016).

Adolescence is arguably one of the most critical and intense periods of development, rendering mental health at this life stage remarkably significant (Call et al., 2002). The maturation of neurobiological processes, alongside puberty and physical growth results in change across multiple developmental facets (Zukauskeine, 2014)[6]. Psychologically, self-identity and morality begin to develop, as well as well as a maturing intellectual capacity for reasoning, abstraction, cognitive flexibility and rational judgement. Socially, greater independence and autonomy from parents means an interpersonal shift, with a move towards redefining oneself in relation to others. Adolescence marks new potential for emotional growth, with development in managing and comprehending emotion, and understanding of emotion in relation to complex interpersonal and cultural systems. Adolescence functions as an influential precursor to a multitude of lifetime outcomes, into and throughout adulthood (Copeland et al., 2015; Keyes, 2009; Layard et al., 2014).

Increased flourishing during this period is associated with outcomes that are developmentally desirable, e.g. fewer depressive symptoms, less conduct problems and increased psychosocial

[6] For a comprehensive review of the adolescent development see Steinberg and Morris (2001). See also Zukauskeine (2014) for a review of adolescent development in relation to wellbeing.

functioning (Keyes, 2006); however, although development is inevitable flourishing is not (Keyes, 2006). Hence, research and policy alike are increasingly highlighting the important opportunity that adolescence provides to enhance mental wellbeing, by fostering positive mental, emotional, social and physical development (Keyes, 2006; Scottish Government, 2017; WHO, 2013). The promotion and prevention of mental wellbeing is particularly important in adolescence, as 50% of mental disorders are evident by age 14 and 75% by age 24 (Jones, 2013).

Despite an increased focus on adolescent mental wellbeing, research has remained largely adult-centric (Keyes, 2006). Research on adolescents has tended to utilise pathology or deficit models, measuring negative indicators in studies of youth development (Roberts et al., 2002; VanderVen, 2008). Hence, there has been an increased need to shift towards a similarly comprehensive approach to researching wellbeing in youth (Bornstein et al., 2003). To provide an inclusive and thorough understanding of an individual's mental health functioning, it follows that mental wellbeing should be assessable using robust measurement instruments (Huebner, Gilman & Suldo, 2007). To effectively monitor mental wellbeing and evaluate interventions with adolescents, it is necessary to develop well-validated theoretically consistent tools for measuring mental wellbeing within this population (Bornstein et al., 2003; Clarke et al., 2011).

The MHC-SF is well validated for use with adults (Guo et al., 2015; Lamers et al., 2010; Westerhof & Keyes, 2010). Psychometric studies have also been conducted with adolescents aged 12-18 in America (Keyes, 2005b), 14-17 in South Korea (Lim, 2014), 16-19 in Poland (Karas, Cieciuch & Keyes, 2014), 13-18 in India (Singh et al., 2015) and 11-19 in China (Guo et al., 2015), as well as with a sample of Egyptian athletes between 12-18 years old (Salama-Younes, 2011). Although the MHC-SF has been used in studies that have recruited adolescent populations in the UK (e.g. Clarke et al., 2011), the psychometric properties of the MHC-SF have not been investigated to ascertain whether the measure is reliable and valid for this population. This study will therefore seek to validate the MHC-SF in a UK adolescent sample recruited in the West of Scotland. Socioeconomic health inequalities in Scotland are widening and are relatively high when compared with other regions

across the UK (Leyland, 2004). As such, examination of the MHC-SF's psychometric properties with a sample where the prevalence of deprivation is higher, will help provide insight into the association between and mental wellbeing and socioeconomic status (SIMD, 2016).

Aims

This study aims to establish the psychometric properties of the MHC-SF with adolescents in the West of Scotland, through examination of its reliability, validity and factor structure for use with this population. Furthermore, it aims to determine whether the psychometric properties are comparable to those reported within the empirical literature. Secondary aims are to describe the distribution of mental wellbeing across a large representative sample of adolescents attending schools in the West of Scotland. The association between mental wellbeing and deprivation will be examined, as it is anticipated that a significant proportion of this sample will be from some of the most deprived parts of Scotland.

Hypotheses

1. The factor structure of the MHC-SF with a West of Scotland adolescent sample will conform to the three-dimensional structure of mental wellbeing (psychological, social and emotional), as found in previous research with adolescent samples (Guo et al., 2015; Karas, Cierciuch & Keyes, 2014; Lim, 2014).

2. It is also predicted that the MHC-SF will demonstrate construct validity (convergent and discriminant) in a West of Scotland adolescent sample:

    2.1 The MHC-SF will be positively correlated with other measures of wellbeing, including the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) and the World Health Organisation-Five (WHO-5).

2.2 In addition, the MHC-SF will demonstrate moderate negative correlations with measures of psychosocial maladjustment (SDQ) and mental health problems (GHQ-12).

3. Furthermore, confirmatory factor analysis will provide evidence for the dual-factor model of mental health (Keyes' 2005a), thus confirming that mental illness and mental wellbeing are two related yet distinct dimensions.

4. Finally, there will be an association between the MHC-SF and the Scottish Index of Multiple Deprivation (SIMD). This hypothesis will only be addressed if the MHC-SF is shown to have sufficiently robust psychometric properties.

Methods

Ethical Approval

Ethical approval to carry out this study (see Appendix 5 for Research Proposal) was granted by the University of Glasgow College of Medical, Veterinary and Life Sciences, Project Number 200160029 (Appendix 6). Renfrewshire (Appendix 7) and North Lanarkshire (Appendix 8) councils subsequently gave permission for schools within their authority to be approached for participation.

Design

This study employed a quantitative repeated measures design (test-retest), in order to determine the psychometric properties of the MHC-SF.

Participants

Participants were 790 adolescent secondary school pupils aged 12 to 16 years old[7] (M=13.96, SD=0.86); demographic information is detailed in Appendix 9. A whole school year and class group sampling frame was used to recruit participants in their second to fourth years of schooling from four government funded secondary schools in the West of Scotland. Participants were recruited across a three-month period (March-May 2017). The majority of participants reported their ethnicity as Scottish (701, [88.7%]). The Scottish Index of Multiple Deprivation (SIMD, 2016) quintiles categorise deprivation ranks for the 6505 data zones in Scotland into five groups (1, most deprived – 5, least deprived) using postcode data; each quintile contains 20% of the data zones. Participants were recruited from two council areas in the West of Scotland. To establish the representativeness of the sample, the percentage of data zones within each SIMD quintile across both council areas was calculated and compared with the percentage of participants within each quintile. The percentage of data zones within each quintile (1-5) was 30.5%, 25.3%, 17.3%, 14.7% and 12.2%, with 14.9%, 30.6%, 21.6%, 14.9% and 18.0% of participants reporting postcodes within the respective quintiles of deprivation. In broad terms, the current sample appears to be largely representative of the wider population of interest; however, the current sample had significantly fewer participants in the most deprived quintile. It was not possible to calculate SIMD quintiles due to missing or invalid postcodes for 12.7% (100) participants, which may help to explain the skew towards less deprivation in the current sample.

Measures

Participants provided basic demographic information (school name, age, ethnicity, religion school year, gender and postcode) before completing a battery of five self-report measures (see Appendix 10 for questionnaires): the Mental Health Continuum-Short Form (MHC-SF), Warwick-Edinburgh Mental Well-being Scale (WEMWBS), World Health Organisation-5 Wellbeing Index (WHO-5),

[7] Only one participant was 12 years old.

General Health Questionnaire-12 (GHQ-12), and the Strengths and Difficulties Questionnaire (SDQ). Participants were invited to complete the MHC-SF two weeks later.

Mental Health Continuum - Short Form (MHC-SF)

The 14 item self-report MHC-SF (Keyes, 2006) is a shortened version of the MHC Long Form, which measures social, emotional and psychological mental wellbeing on three subscales. Participants rate the frequency with which they have experienced symptoms of wellbeing over the past two weeks, on a 6-point Likert scale (Never-Everyday). Total scores on the MHC-SF range from 0-70, with higher scores indicating increased levels of flourishing. Total scores can be classified into three categories of mental health; languishing, moderately mentally healthy or flourishing[8]. The scale has been validated for use with adolescents cross-culturally (Guo et al., 2015; Karas, Cieciuch & Keyes, 2014; Keyes, 2005b; Lim, 2014; Singh et al., 2015). It has been shown to correlate with the WEMWS in a UK sample of adolescents aged 13-16 (Clarke et al., 2011).

Measures for validation

The WEMWBS (Tennant et al., 2007) and the WHO-5 are both self-report measures of mental wellbeing. The WEMWBS has demonstrates validity for use with adolescents in the UK; the WHO-5 has been used in research with this population. The SDQ (Goodman, Meltzer & Bailey, 1998) and GHQ-12 (Goldberg & Williams, 1988) are behavioural screening questionnaire, which assess for psychiatric disorder/symptoms of psychopathology. See Appendix 12 for more detail about the psychometric properties of these four questionnaires.

[8] Scoring protocol for the MHC-SF is detailed in Appendix 11, as well as the algorithm used for calculation of diagnostic categories.

Recruitment

All Head Teachers of secondary schools within Renfrewshire (n=11) and North Lanarkshire (n=23) councils were approached and invited to partake in this study via written correspondence. Five of the 34 schools opted to participate in the study; however, data from one of these schools (n=54) was excluded from the analysis, due to failure to administer all of the measures necessary to comply with the methodological design of the study. Convenience sampling, through discussions with a nominated staff member within each participating school, determined the number of participants recruited from each school and their school year.

It is not a legal requirement, when a competent adolescent provides their own consent, for parental assent to be given (ScotCRN, 2012); however, in line with Clark et al.'s (2011) methodology when validating a measure of wellbeing in a UK adolescent sample, parents/guardians of eligible participants were sent a Parent/Guardian Information Sheet (Appendix 13) about the research and a corresponding Opt-Out Form (Appendix 14). Any child whose parent/guardian opted out of the opportunity for their child to participate, was not approached to participate in the research; it was not possible to calculate the number of opt-outs. Children whose parents did not opt out were provided with a Participant Information Sheet (Appendix 15) and were asked to provide written consent (Appendix 16) as to whether they would like to partake in the study or not.

Research Procedure

Schools were responsible for sending Research Information Sheets and Consent Forms to the parents/guardians of each pupil deemed eligible for participation in the study and for compiling responses, in line with their standard procedure for written communication with families. The Principal Investigator was available to go into each secondary school to collect data from multiple participants at one time, but was only required to do so in one school. Multiple participants completed the study at one time, within a timetabled lesson determined by the nominated school staff member. All schools opted for the study to be completed in a pencil and paper format. At time

point one, demographic information was collected and the five questionnaires were completed. A second MHC-SF questionnaire was completed by participants two weeks later. Data from time point one and time point two were matched using the participant's unique identifier, school, age and gender.

Data Analysis

All quantitative data analysis was conducted using SPSS-21 and AMOS-21 statistics packages. Power was achieved (see Appendix 17, for sample size calculation). Confirmatory factor analysis (CFA) was performed to assess the factor structure of the MHC-SF. The Maximum Likelihood estimator was used, as strictly ordinal level data violates the assumption of multivariate normality. Four theoretical and empirically based models (three correlated factors, two correlated factors, single factor and second order model) were examined. Full Information Maximum Likelihood Estimation was used to manage missing data (<2% for all variables), as it is a commonly recommended method for facilitating the inclusion of all available observations (Brown, 2015). To examine whether theoretical models were a good fit for the data, several fit indices were computed, as recommended by Brown (2015); $\square^2$, Comparative Fit Indices (CFI), Root Mean Square Error of Approximation (RMSEA) and the Tucker-Lewis Index (TLI). Decisions about model fit were determined in accordance Hu and Bentler's (1999) indicators; they suggested that good fit is indicated by indexes which are 'close to' the following values: an RMSEA <.08, CFI >.95 and TLI >.95, with good fit indicated by a non-significant χ^2 (Barrett, 2007). To compare the two models, the Akaike Information Criterion (AIC) was used; smaller values indicated a better fit (Vrieze, 2012).

Cronbach's alpha was used to examine the internal consistency of the MHC-SF and its three subscales. Test-retest reliability of the MHC-SF was determined using Pearson's Correlation Coefficient. Correlational analysis (Spearman's Rho) was utilised to determine the construct validity of the MHC-SF, i.e. to measure the convergent validity of the MHC-SF against alternative measures of wellbeing, as well as the discriminant validity of the MHC-SF with measures of psychosocial

adjustment (SDQ) and mental health problems (GHQ). The study used CFA to confirm the dual-factor model of mental health using the same parameters for model fit as previously stated. Last, chi-square analysis was used to investigate associations between overall MHC-SF scores and demographic variables such as deprivation.

Results

Structural validity (CFA)

The fit indices for four theoretically founded models are presented in **Table *5***. CFA revealed that Keyes' (2002) three correlated factors model fitted the data best. Indices met or were close to the outlined criteria for an acceptable fit, with a lower RMSEA (.066) and AIC (416.832), and a higher CFI (.954) and TLI (.935) indices than for the alternative models. The X^2 was significant ($X^2(74)= 326.832$, $p<0.001$).This confirms the hypothesised tripartite structure of mental wellbeing comprised of emotional, social and psychological wellbeing factors. The second order model provided an equally good fit, which suggests that the three dimensions tap into a general mental wellbeing construct. **Figure 5** displays the second order model and salient factor loadings (>.5), which loaded significantly on to the target factors.

Internal Consistency and Test-retest Reliability

High internal consistency for the full MHC-SF scale was indicated by a large Cronbach's Alpha Coefficient (α=.92). Satisfactory coefficients were also observed for the Emotional (α=.81), Social (α=.83) and Psychological (α=.85) wellbeing subscales. Five hundred and fifty-eight (558) MHC-SF test-retest pairs provided data for inclusion in test-retest reliability analysis, representing 70.6% of the whole sample (n=790). Spearman's Correlation Coefficient (one-tailed) was significant (r_s=.76, n=558, p=<.001), demonstrating the stability of the full scale MHC-SF across a two week period.

Test-retest reliability also demonstrated the stability of the Emotional (r_s=.71, n=619, p=<.001), Social (r_s=.69, n=595, p=<.001) and Psychological (r_s=.70, n=599, p=<.001) wellbeing subscales.

Table 5

Fit indices for alternative models of mental wellbeing

Model	X^2	Df	P	CFI	TLI	RMSEA	AIC
Single factor	514.810	77	>.001	.921	.893	.085	598.810
Two correlated factors	412.450	76	>.001	.939	.916	.075	498.450
Three correlated factors	326.832	74	>.001	.954	.935	.066	416.832
Second order (3 factor) model	326.832	74	>.001	.954	.935	.066	416.832

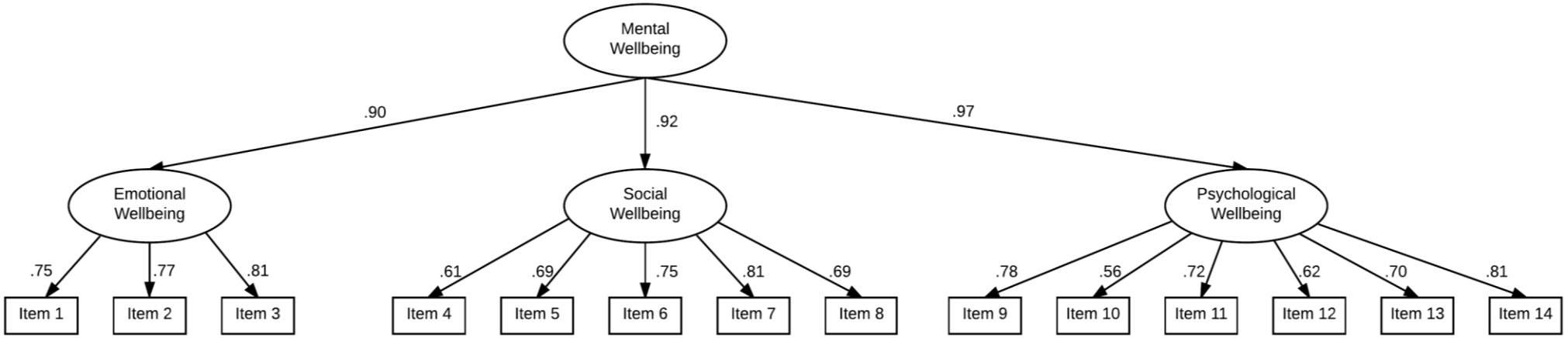

Figure 5

Second order factor structure and factor loadings

Convergent and discriminant validity

Table *6* presents the MHC-SF's convergent validity with alternative validation wellbeing measures, using Spearman's Rho correlation coefficients. The MHC-SF and its subscales demonstrated statistically significant associations with two measures of wellbeing, the WEMWBS and WHO-5, in the expected direction. Furthermore, the MHC-SF and its three subscales also demonstrated statistically significant associations in the expected direction, with two measures of mental illness, the SDQ and GHQ.

Table 6

Correlations of validation instruments with the MHC-SF and subscales

	MHC-SF Full Scale and Subscales			
	Mental Wellbeing	Emotional Wellbeing	Social Wellbeing	Psychological Wellbeing
WEMWBS	.81* (n=694)	.74* (n=743)	.69* (n=721)	.81* (n=730)
WHO-5	.76* (n=715)	.69* (n=772)	.66* (n=741)	.74* (n=753)
SDQ	-.52* (n=687)	-.47* (n=737)	-.42* (n=713)	-.51* (n=721)
GHQ	-.64* (n=685)	-.57* (n=739)	-.54* (n=710)	-.62* (n=724)

N.b. All (one-tailed) correlations are significant (*) indicating a p<.001.

The discriminant validity of the MHC-SF was determined through comparison of CFA fit indices of three different factor models: (1) a single factor model representing the traditional model of mental health, whereby the absence of mental illness signifies high levels of mental wellbeing; (2) an orthogonal model with two unrelated factors of mental illness and mental wellbeing; and (3) a model where these two factors are correlated. Fit indices (**Table *7***) indicated that the two correlated factor model fit the data best; lower RMSEA (.066) and AIC (1492.054), and higher CFI (.901) and TLI (.883) indices than for the alternative models were observed. The X^2 was significant ($X^2(298)= 1334.054$, $p<0.001$). This provides some evidence for the discriminant validity of the MHC-SF.

Table 7

Fit indices for alternative models of mental health

Model	□²	df	P	CFI	TLI	RMSEA	AIC
Single factor	2426.309	299	>0.001	.797	.761	.095	2582.309
Two orthogonal factors	2426.309	299	>0.001	.797	.761	.095	2582.309
Two correlated factors	1334.054	298	>0.001	.901	.883	.066	1492.054

Mental wellbeing status

According to Keyes (2002) diagnostic criteria, the majority of participants (391, 54.4%) were considered to be flourishing. A further 38.2% (n=275) had moderate mental wellbeing, with the smallest proportion of participants being categorised as languishing (53, 7.4%). Analysis revealed a statistically significant association between categorical diagnosis of mental wellbeing (flourishing, moderate mental wellbeing and languishing) with school year ($\chi^2(4, n=719)=21.8$, <p=.001).

Examination of standardised residuals indicated that, significantly fewer participants in S2 were moderately mentally healthy and significantly more in S2 were flourishing and in S4 were mentally healthy moderately, than expected. Furthermore, a significant association was found between mental wellbeing diagnosis and gender ($\chi^2(2, n=718)=13.4$, $p=.001$); males appeared to have greater wellbeing, with more male participants flourishing and fewer languishing than females. Fisher's Exact test indicated that there was no statistically significant association between diagnosis of mental wellbeing and SIMD quintile ($\chi^2(n=634)=14.4$, $p=.06$). A general trend was however observed, whereby mean MHC-SF scores decreased with increased levels of deprivation, as measured by the SIMD (most – least deprived quintile); M = 45.29 (CI = 42.21-48.37), 46.05 (CI = 43.80-48.31), 47.11 (CI = 44.73-49.48), 50.5 (CI = 47.43-52.68) and 47.02 (CI = 44.57 – 49.47). This trend was not observed for the least deprived quintile.

Discussion

This study is the first to examine the factor structure, validity and reliability of the MHC-SF in a UK adolescent sample (13-16 years old). Confirmatory factor analysis provided support for Keyes' (2002) three factor model of emotional, social and psychological wellbeing. This finding is consistent with at least eighteen studies utilising the same methodology, across cultures and languages (see Appendix 3 for a list of studies); five of these studies used adolescent samples (de Carvalho et al., 2016; Guo et al., 2015; Karás et al., 2014; Lim, 2014; Singh et al., 2015). The CFA results indicated that a second order model fits the data equally well as the three factor structure, suggesting that emotional, social and psychological factors are related to an overarching general construct of mental wellbeing. This finding has previously been observed in studies with Italian adults (Petrillo et al., 2015) and French Canadian young adults (Doré et al., 2016).

The MHC-SF and its associated emotional, social and psychological subscales demonstrated good internal consistency. These were relatively consistent with the Cronbach's alphas observed in other

studies with adolescent samples (de Carvalho et al., 2016; Guo et al., 2015; Karás et al., 2014; Lim, 2014; Singh et al., 2015). Cronbach's alpha for the full scale reflected those reported for the Portuguese, Korean and Chinese MHC-SF (de Cavalho et al., 2016) and internal consistency of MHC-SF subscales were similar to those reported for the Korean MHC-SF (Lim, 2014). Test-retest analysis demonstrated the stability of the full scale MHC-SF and its three subscales across a two week period.

The convergent and discriminant validity of the MHC-SF was confirmed. As hypothesised, the MHC-SF and associated subscales correlated with two measures of wellbeing, the WHO-5 and WEMBWS. The discriminant validity of the MHC-SF was confirmed through CFA, with two correlated factors, mental wellbeing and mental illness, providing the best fit for the data. This supports the notion for the complete state model of mental health, where mental wellbeing and mental illness are related yet distinct dimensions of mental health (Keyes, 2005). A degree of interpretive caution should be exercised when considering whether the factors have substantive meaning, as there is a possible contribution of method bias from the combination of positively (MHC-SF) and negatively (GHQ-12) worded items, that cannot be determined by this study (Brown, 2003). Expectedly, however, in line with this finding, correlational analysis revealed that the MHC-SF correlated negatively with two measures of mental illness, the GHQ and SDQ. Evidence in support of this model has been found with adolescent samples cross-culturally; in Poland (Karás et al., 2014), America (Keyes, 2006) Korea (Lim, 2014), and India (Sigh et al., 2015).

The categorisation of the MHC-SF into mental wellbeing diagnoses, revealed that over half of participants in the current sample were flourishing (54.4%). This situates the proportion of flourishing adolescents in this West of Scotland sample, as generally greater than adolescent samples within the broader international context. With the exception of a Chinese sample (57.4%) (Guo et al., 2015), prevalence of flourishing in this study was greater than in Indian (46.4%), South Korean (11.7%) and American (37.9%) samples (Keyes, 2006; Lim, 2014; Singh et al., 2015), suggesting that greater numbers of adolescents are flourishing in the West of Scotland, than their

counterparts cross-culturally. Keyes' (2006) the most culturally consistent adolescent sample to examine wellbeing diagnoses, as both samples are Westernised individualist populations (Hofstede et al., 2010). When compared, a 16.5% difference in the prevalence of flourishing is observed, highlighting the marked nature of this finding.

It is not possible to infer causality for these prevalence rates; however, the relatively large proportion of participants characterised as flourishing within this sample, may reflect a shift in Scottish government strategy over recent decades on a benefiting cohort of adolescents. Enhancing wellbeing at a population level has and is considered a national priority for Scotland (Scottish Executive, 2003; Scottish Government, 2009a; 2017), as well as a key area of educational importance during adolescence to 'be sustained into adult life' (Scottish Government, 2009b). Levin et al. (2009) similarly hypothesised that improvements may be attributable to government initiatives, identifying that the mental wellbeing of Scottish adolescents aged 11-15 years improved significantly over a twelve year period (1994-2006). They recognised the role of future research in establishing a more robust explanation of these observations.

To date there is little consensus on the relationship between deprivation and mental wellbeing. In the current study there was no significant association between SIMD quintile and mental wellbeing in adolescence; this finding is not unique with previous studies revealing little or no association with variables such as social class (West 1997; Call et al. 2002). This study did observe a similar trend to the Scottish Government (2015) report on adolescent mental wellbeing in Scotland. Broadly, mental wellbeing increased as the level of deprivation reduced; however, this was not the case for the least deprived quintile. It is possible that the relationship between mental wellbeing and social deprivation may not be linear; other relationships could be explored in future research with a representative sample, such as curvilinear or sigmoid relationships.

Patalay and Fitzsimmons (2016) concluded that deprivation in adolescence does not yet affect subjective reports of mental wellbeing, but that the association may emerge during this period and continue into adulthood. Findings from the current study provides preliminary support for this

notion, indicating that adolescence may represent the emergence of this socioeconomic gradient into adulthood. This possible developmental trajectory warrants further investigation, in order to establish appropriate and timely intervention for mitigating this relationship (Levin et al., 2009; Patalay & Fitzsimmons, 2016).

This study suggests that the psychometric merit of the MHC-SF for use with adolescents in the UK is promising, with important implications for its application in mental health, education and policy contexts. There is cross-contextual utility in using the MHC-SF to foster an understanding of wellbeing prevalence and the efficacy of wellbeing promotion, prevention and intervention with adolescents. In order to improve mental health at a population level, the complete state model suggests shifting focus from reducing symptoms of psychopathology, to a holistic mental health approach that seeks to promote mental wellbeing (Keyes, 2007). This includes ensuring that mental health and wellbeing is embedded across mental health services (Scottish Government, 2017).

Arguably, the most efficacious approach to managing complete mental health, would be to choose and implement interventions that are informed by an individual's presentation along both the mental illness and wellbeing dimensions (Howell et al., 2013). Specifically, treatments that primarily focus on the reduction of psychopathology (e.g. CBT (Kendall, 2012)) would be appropriate for individuals high in mental illness and high in mental wellbeing. Presumably, interventions that promote wellbeing (e.g. Wellbeing Therapy (Fava & Ruini, 2003)) would be beneficial for individuals with low mental illness and low mental wellbeing. For individuals with high mental illness and low mental wellbeing, either a combination of these intervention or treatment that is aligned to both dimensions of mental health (e.g. Acceptance and Commitment Therapy (Hayes & Ciarrochi, 2015)) would be most effective. A focus on intervention during adolescence is important, as mental wellbeing at this stage can promote wellbeing into adulthood (Hoyt et al., 2012).

It can therefore be argued that mental wellbeing should be systematically and routinely monitored across all interventions (Trompetter et al. 2017), as distinct and separate to mental illness (Patalay & Fitsimons, 2016). The MHC-SF shows promise for use as an outcome measure for clinical and

research purposes, in the context of wellbeing interventions; however, this study does not indicate whether the measure is sensitive to change. There is evidence to suggest that mental wellbeing is both stable and changeable, with an interplay of genetic and environmental factors influencing wellbeing across the lifespan (Røysamb et al., 2014)[9]. Further research is required to determine the suitability of the MHC-SF for measuring change. Additionally, studies should focus on establishing the psychometric and structural properties of the MHC-SF in clinical populations of adolescents, as previously suggested by Lamers et al. (2011).

Conclusion

This study is the first to examine the reliability, validity and factor structure of the MHC-SF with a sample of adolescents in the UK. In line with majority of factor analytic studies (see Chapter 1), this study provided evidence in support of Keyes' (2002) three correlated factor (emotional, social and psychological wellbeing) structure of the MHC-SF, represented by a second order model with a latent general mental wellbeing factor. Support was found for the complete state model of mental health through examination of the MHC-SF's discriminant validity, which indicated that mental illness and mental wellbeing are related yet distinct dimensions. Findings support the use of the MHC-SF as a reliable measure of mental wellbeing with adolescents aged 13-16 in the UK.

[9] See Røysamb et al. (2014) for a review of the stability and changeability of mental wellbeing.

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Appendices

Appendix 1
Systematic Review Author Guidelines for 'Assessment'

The editor invites high quality manuscripts covering a broad range of topics and techniques in the area of psychological assessment. These may include empirical studies of assessment of personality, psychopathology, cognitive functions or behavior, articles dealing with general methodological or psychometric topics relevant to assessment, or comprehensive literature reviews in any of these areas. This journal encourages submissions evaluating a) new assessment methodologies and techniques for both researchers and practitioners, b) how assessment methods and research informs understanding of major issues in clinical psychology such as the structure, classification, and mechanisms of psychopathology, and c) multi-method assessment research and the integration of assessment methods in research and practice. Additionally, the journal encourages submissions introducing useful, novel, and non-redundant instruments or demonstrating how existing instruments have applicability in new research or applied contexts. All submissions should provide strong rationales for their efforts and articulate important implications for assessment science and/or practice

Research participants may represent both clinical and nonclinical populations.

In general, regular articles should not exceed 30 pages of text, excluding Title Page, Abstract, Tables, Figures, Footnotes and Reference list.

Preparation of Manuscripts:

Authors should carefully prepare their manuscripts in accordance with the following instructions.

Authors should use the Publication Manual of the American Psychological Association (6th edition, 2009) as a guide for preparing manuscripts for submission. All manuscript pages, including reference lists and tables, must be typed double-spaced.

The first page of the paper (the title page) should contain the article title, the names and affiliations of all authors, authors' notes or acknowledgments, and the names and complete mailing addresses of the corresponding author. If requesting a masked blind review, the first page should contain only the article title and the title page should be uploaded as a separate document.

The second page should contain an abstract of no more than 150 words and five to seven keywords that will be published following the abstract.

The following sections should be prepared as indicated:

Tables. Each table should be fully titled, double-spaced on a separate page, and placed at the end of the manuscript. Tables should be numbered consecutively with Arabic numerals. Footnotes to tables should be identified with superscript lowercase letters and placed at the bottom of the table. All tables should be referred to in the text.

Figures. Electronic copies of figures can be submitted in one of the following file formats: TIFF, EPS, JPEG, or PDF. All figures should be referred to in text. Each figure should appear on a separate page at the end of the manuscript but before the tables, and all titles should appear on a single, separate page.

Endnotes. Notes should appear on a separate page before the References section. Notes should be numbered consecutively and each endnote should be referred to in text with a corresponding superscript number.

References. Text citations and references should follow the style of the Publication Manual of the American Psychological Association (6th edition, 2009).

Supplemental Materials:

Authors are encouraged to consider submitting ancillary analyses and other relevant information as electronic supplements. Such supplements should be uploaded using the supplemental files tag in Scholar One. Only doc, docx., and .pdf files are accepted for published electronic supplements. Electronic supplemental information for published manuscripts should take the form of Tables and Figures, formatted and annotated just as they would be for a manuscript, but numbered as Table S1, S2, S3, etc. and Figure S1, S2, S3 etc. Article text should refer to material in electronic supplements as appropriate, just as they would a table or figure in the published article.

Appendix 2

Quality Review Tool

Study Name:							
	Item	**Description**	**+**	**-**	**?**	**0**	**N.A.**
A		***Choice and Justification of Methods***					
1		**Exploratory vs. confirmatory factor analysis**					
	1.1	Is the type of factor analysis appropriate to the research question?					
	1.2	When both types of factor analysis were used, has this analysis been convincingly justified?					
2		**Exploratory Factor Analysis**					
	2.1	Has the number of factors to be rotated been justified?					
	2.2	Has the choice of the rotation method been justified?					
	2.3	Is the interpretation of the final factor solution properly justified?					
	2.4	In the case of a non-orthogonal factor structure, has the association between factors been discussed?					
3		**Confirmatory Factor Analysis**					
	3.1	Has the model to be confirmed been well described?					
	3.2	Has the strategy to arrive at the 'best' model been well described?					
	3.3	Were the analysis results properly interpreted?					
	3.4	Has the association between factors been discussed?					
4		**Cross-validation**					
	4.1	Has the cross-validation been applied in case this was possible?					
	4.2	Has cross-validation been performed with different randomly drawn samples?					
	4.3	If applied, did the number of observations justify this procedure?					
	4.4	If applied, was the interpretation of the results convincing?					

Comments:

B		***Sample Size and Data Quality***					
1		**Sample Size**					
	1.1	Has the number of observations been sufficient to justify the use of factor analysis?					
	1.2	Has the number of observations been sufficient to perform cross-validation?					
2		**Data Quality: Missing Data Procedures**					
	2.1	Does the study report on the percentage of missings?					
	2.2	If this percentage is alarming (>25%), is there information about whether the missing were considered random?					
	2.3	If missing data have been imputed, was the imputation method appropriate?					
3		**Data Quality: Distributional Properties**					
	3.1	Have the distributional properties (at least standard deviations in EFA and kurtosis in CFA) of the variables been reported?					
	3.2	In the case of undesirable distributional properties (lack of variance in EFA and excessive kurtosis in CFA), have they been handled properly?					

C		***Full Report of Statistical Entities***	**Yes**	**No**	**N.A**
1		**Exploratory Factor Analysis**			
	1.1	Principal component analyses or common factor analyses			
	1.2	Criteria for retaining factors			
	1.3	Eigenvalues, percentages of variance accounted for by the (un)rotated factors			
	1.4	Rotation method			
	1.5	Rationale for rotation in case of oblique solutions			
	1.6	All rotated factor loadings			
	1.7	Factor inter-correlation in oblique solutions			
2		**Confirmatory Factor Analysis**			

	2.1	Number of factors			
	2.2	Composition of factors			
	2.3	Orthogonal vs. correlated factors			
	2.4	Other model constraints (fixed and free parameters)			
	2.5	Methods of estimation			
	2.6	Overall fit			
	2.7	Relative fit			
	2.8	Parsimony			
	2.9	Any model modification to improve model fit to data			
	2.10	Factor loadings			
	2.11	Communality (or squared correlations of observed variables with the factors)			
	2.12	Factor correlations			

D		***Cross Cultural Validity***			
1		**Translation**	**Yes**	**No**	**?**
	1.1	Were both the original language in which the instrument was developed, and the language in which the instrument was translated described?			
	1.2	Was the expertise of the people involved in the translation process adequately described? E.g. expertise in the construct to be measured, expertise in both languages.			
	1.3	Did the translators work independently from each other?			
	1.4	Were items translated forward and backward?			
	1.5	Was there an adequate description of how differences between the original and translated versions were resolved?			
	1.6	Was the translation reviewed by a committee (e.g. original developers)?			
	1.7	Was the instrument pre-tested (e.g. cognitive interviews) to check interpretation, cultural relevance of the translation, and ease of comprehension?			
	1.8	Was the sample used in the pre-test adequately described?			

Appendix 3
Models examined within factor analytic studies of the MHC-SF

	Study	Assessed Models (See Figure 4 for models **A-E**)					Model of Best Fit
		A Single Factor	**B** 2 Correlated Factors	**C** 3 Correlated Factors	**D** Second Order	**E** Bifactor	
1	Joshanloo et al., 2017			✔			C
2	Doré et al., 2016	✔	✔	✔	✔		D(C)
3	de Carvalho et al., 2016			✔			C
4	Hides et al., 2016	✔		✔		✔	E
5	Joshanloo and Jovanović, 2016	✔	✔	✔			C
6	Joshanloo, 2016			✔			C
7	Joshanloo et al., 2016	✔	✔	✔			C
8	Singh et al., 2015			✔			C
9	Machado and Bundeira, 2015	✔	✔	✔		✔	A
10	Jovanović, 2015	✔	✔	✔	✔	✔	E
11	de Bruin and Plessis, 2015	✔		✔		✔	E
12	Guo et al., 2015			✔			C
13	Petrillo et al., 2015	✔	✔	✔	✔		D(C)
14	Lim, 2014	✔	✔	✔			C

	Study	Assessed Models (See Figure 4 for models **A-E**)					Model of Best Fit
		A Single Factor	**B** 2 Correlated Factors	**C** 3 Correlated Factors	**D** Second Order	**E** Bifactor	
15	Karaś et al., 2014			✔			C
16	Joshanloo et al., 2013			✔			C
17	Lamers et al., 2011			✔			C
18	Ismail and Salama-Younes, 2011	✔	✔	✔			C
19	Keyes et al., 2008	✔	✔	✔			C
20	Schutte & Wissing, 2017			✔		✔	E
21	Purugini et al., 2017	✔	✔	✔	✔		C
22	Rafiey et al., 2017			✔			C
23	Opana et al., 2017			✔			C
24	Echeverría et al., 2017			✔		✔	E
25	Joshanloo & Niknam, 2017	✔		✔			C

N.b. Studies 1-19 are included in the systematic review

Appendix 4
MRP Author Guidelines for 'Journal of the American Academy of Child and Adolescent Psychiatry'

SCOPE

The Journal of the American Academy of Child and Adolescent Psychiatry (JAACAP)'s goal is to advance the science and practice of child and adolescent psychiatry by publishing original research and papers of theoretical, scientific, and clinical relevance to the field. JAACAP welcomes unpublished manuscripts whose primary focus is on the mental health of children, adolescents, and families. Submissions may come from diverse viewpoints including but not limited to: genetic, epidemiological, neurobiological, and psychopathological research; cognitive, behavioral, psychodynamic, and other psychotherapeutic investigations; parent–child, interpersonal, and family research; and clinical and empirical research in inpatient, outpatient, consultation–liaison, and school-based settings. JAACAP also seeks to promote the well-being of children and families by publishing scholarly papers on such subjects as health policy, legislation, advocacy, culture and society, and service provision as they pertain to the mental health of children and families.

MANUSCRIPT PREPARATION

Authors are encouraged to follow the ICMJE Uniform Requirements for Manuscripts Submitted to Biomedical Journals (available at: http://www.icmje.org/); this is the format used in PubMed/MEDLINE. They should strive for a concise article that is unencumbered by excessive detail. Each manuscript submitted to JAACAP must contain the following components: cover letter, title page, blinded manuscript, and Manuscript Submission Form. The review of manuscripts lacking any of these parts may be delayed until the submission is complete. Manuscripts must conform to standard English usage and are subject to editing in conformance with the policies of the Journal. For reference, authors may consult the American Medical Association's Manual of Style. AMA Manual of Style:

A Guide for Authors and Editors. Iverson C, Christiansen S, Flanagin A, et al. 10th ed. All text files must be prepared using Microsoft Word, double spaced with Times New Roman 12-point font. New York: Oxford University Press, 2007 (AMA-10). After the title page, number pages consecutively throughout. Other than on the title page and Manuscript Submission Form(s), blinding is the responsibility of the author. All files (cover letter, title page, blinded manuscript file, figures, Manuscript Submission Form(s), and supplementary materials) must be uploaded separately during the submission process. Files should be labeled with appropriate and descriptive file names (e.g. SmithText.doc, SmithFig1.eps). Acronyms must be spelled out on first use in text, and where used in tables or figures, in each of their legends. Use the generic term for a drug. When it is necessary

to refer to the proprietary name, list it in parentheses after the generic term, followed by the register mark.

When using direct quotations, cite the page number for the quotation along with the source in the reference list. The manuscript file should be uploaded in its native format, such as .doc. Do not upload any text files as .pdf or .xls. Follow internationally accepted rules and conventions; use the international system of units (SI). If other units are mentioned, please give their equivalent in SI.

LANGUAGE

Manuscripts should be written in English, and American usage is preferred. Papers with serious deficiencies in English may be returned without review.

COMPONENTS

Cover Letter

A cover letter is required for all articles and should be uploaded as a separate file. This letter should outline the significance of the work and should make reference to any other publications that utilize the same data set (see Divided Publication).

Title Page

Title: The manuscript title should be concise and informative, as titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible. Titles should be less than 100 characters and a maximum of 15 words. A running title of less than 40 characters should also be included.

Author names and affiliations: Include the full names of all authors and their highest academic degree. Where the family name may be ambiguous (e.g., a double name), please indicate this clearly.

Include all authors' academic or professional affiliations written out in paragraph form (not footnoted) along with the corresponding author's complete contact information (name, address, telephone and fax numbers, and e-mail address). Corresponding author: Clearly indicate who will handle correspondence at all stages of review, production, and publication.

Ensure that phone numbers (with country and area code) are provided in addition to the e-mail address and the complete postal address. Contact details must be kept up to date by the corresponding author. Multiple corresponding authors are not allowed.

Acknowledgements: Include an acknowledgement paragraph that includes any funding directly related to the content of the manuscript, any necessary attribution/credit information, and the name(s) of the study statistical expert(s), if applicable. Academic or professional affiliations and degree(s) must be included for any nonauthor individuals listed in the acknowledgement. Presentation information (if applicable): Example: This study was presented as an abstract at the American Academy of Child and Adolescent Psychiatry's 60th Annual Meeting, Orlando, FL, October 22-27, 2013.

Keywords: A maximum of 5 keywords should be included. For optimum discoverability, use MeSH vocabulary (see https://www.nlm.nih.gov/mesh/).

Text

Text should begin on the second numbered page, and should be divided into the following sections: Abstract, Introduction, Method, Results, Discussion, References, and Tables (if required). All components must be in a single file, except any figures, which should be uploaded separately. As noted below, this formatting is not required for Clinical Review articles, but the suggested components should be included where applicable.

Abstract

Abstract: A structured abstract, by means of appropriate headings, should provide the context or background for the research and should state its purpose, basic procedures (selection of study participant or laboratory animals, observational and analytical methods), main findings (giving specific effect sizes and their statistical significance, if possible), and principal conclusions. It should emphasize new and important aspects of the study or observations. The structured abstract for New Research articles should be a maximum of 250 words and must be formatted with sections entitled as follows: Objective, Method, Results, Conclusions.

The structured abstract for Review articles should be a maximum of 250 words and must be formatted with sections entitled as follows: Objective, Method, Results, Conclusion. The Method section should provide data sources and study selection (the number of articles reviewed and the selection process). This formatting is not required for Clinical Review articles.

Introduction: Include the purpose of the study, a review of recent relevant literature, and an a priori hypothesis.

Method: The guiding principle of the Method section should be clarity about how and why a study was done in a particular way. The

Method section should aim to be sufficiently detailed such that others with access to the data would be able to reproduce the results. Include the participants/patients and, if appropriate, include information on whether parts of these data have been published elsewhere; sampling frame, sampling, and recruitment strategies; and inclusion and exclusion criteria. Consider inclusion of determination of sample size (include power calculation).

Reporting guidelines have been developed for different study designs; examples include CONSORT (www.consort-statement.org) for randomized trials, STROBE for observational studies (http://strobe-statement.org/), PRISMA for systematic reviews and metaanalyses (http://prisma-statement.org/), and STARD for studies of diagnostic accuracy (www.stard-statement.org/). Authors are strongly encouraged to follow these guidelines because they help authors describe the study in enough detail for it to be evaluated by editors, reviewers, readers, and other researchers evaluating the medical literature. Authors of Review manuscripts are encouraged to describe the methods used for locating, selecting, extracting, and synthesizing data. Good sources for reporting guidelines are the EQUATOR Network (www.equator-network.org/home/) and the NLM's Research Reporting Guidelines and Initiatives (www.nlm.nih.gov/services/research_report_guide.html).

Include information about sample composition including demographic details. Use current and codable occupational categories, four educational attainment categories (without HS diploma, HS graduate without college education, some college education, degree from 4-year college or more), and five race/ethnicity categories (e.g., US Bureau of Census). For measures, authors should describe variables measured and instruments used. Authors must provide sufficient information about rating scales and other measures so that readers can access them for their own use; unpublished instruments may be made available via supplemental material at the request of the editor.

If a manual-based treatment is used, authors must include information on how to obtain the manual. The online-only content feature may be used to provide access. For studies that involve testing, imaging, or other procedures, sufficient information should be given to allow other investigators to replicate the study. When devices or software are mentioned, please provide the name of the manufacturer followed by city and state of the manufacturer's headquarters.

Data Analysis: Describe all analyses with names of specific statistical tests used and how these correspond to the hypotheses postulated in the introduction. Justify and clearly reference the use of unusual statistical techniques. If multiple comparisons are unavoidable, use an appropriate adjustment to control type I error. State whether tests were one- or two-tailed.

Results: Summarize statistics and when reporting significant results, include the statistical test used, the value of the test statistic, degrees of freedom, and p values. When appropriate, report effect sizes and/or confidence intervals on the main findings.

Discussion: Include the clinical implications, limitations, and conclusions of the manuscripts findings, but do not use subheadings.

References

Citation in text

Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal

communications are not recommended in the reference list, but may be mentioned in the text. If these references are included in the reference list they should follow the standard reference style of the journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication.' Citation of a reference as 'in press' indicates that the item has been accepted for publication.

Data references

This journal encourages you to cite underlying or relevant datasets in your manuscript by citing them in your text and including a data reference in your Reference List. Data references should include the following elements: author name(s), dataset title, data repository, version (where available), year, and global persistent identifier. Add [dataset] immediately before the reference so we can properly identify it as a data reference. The [dataset] identifier will not appear in your published article.

Reference list

Indicate references by consecutive superscript Arabic numerals in the order in which they appear in the text. The numerals are to be used outside periods and commas; inside colons and semicolons. For further detail and examples, please refer to the AMA Manual of Style,

A Guide for Authors and Editors, Tenth Edition, (see http://www. amamanualofstyle.com/). Journal names should be abbreviated according to the List of Title Word Abbreviations: http://www.issn.org/2-22661-LTWA-online.php.

Sample reference to a journal publication:

1. Van der Geer J, Hanraads JAJ, Lupton RA. The art of writing a scientific article. J Sci Commun. 2010;163:51–59.

Sample reference to a book:

2. Strunk W Jr, White EB. The Elements of Style. 4th ed. New York, NY: Longman; 2000.

Sample reference to a chapter in an edited book:

3. Mettam GR, Adams LB. How to prepare an electronic version of your article. In: Jones BS, Smith RZ, eds. Introduction to the Electronic Age. New York, NY: E-Publishing Inc; 2009:281–304.

Tables and Figures

The combined number of tables and figures should not exceed 5 and should comprise no more than a total of 5 double-spaced manuscript pages. Number items consecutively in Arabic numerals according to the order of citation in the text. All items must be cited. If a table, figure, or any data therein have been previously published, a footnote must give full credit to the original source, and permission from the copyright holder to reproduce the material must be provided. Tables should be cited in the text, numbered consecutively (i.e., Table 1, Table 2, Table 3) in the order of their mention, and include brief descriptions. Place tables after the reference list in the blinded manuscript file. Tables that constitute a single column are actually lists and should be included in the text as such. Table footnotes should use superscript lowercase letters rather than symbols. Figures should be cited in the text, numbered consecutively (i.e., Figure 1, Figure 2, Figure 3) in the order of their mention, and include brief descriptions. The preferred file format for figures and graphics is EPS, TIFF, or PDF. Please upload high quality versions of each figure individually (i.e., two figures should be uploaded separately as Figure 1 and Figure 2). Parts/panels in composite figures should be labeled with capital letters (A, B, C). Each figure should be consistent in color, size, and font, and be designed proportionally so that each item within it is to scale (particularly numbers, letters, and symbols) so it can later be sized as needed without loss of legibility or quality. Figure titles and legends should be included on a separate page in the manuscript file following the reference list and any tables, rather than in the figure file itself. Color illustrations are accepted. Although the cost of color printing must be paid by the author, authors may choose, at no cost, for illustrations to be reproduced in black and white in the print journal and appear in color for the online version. Color illustrations are printed at a rate of $650 (US dollars) for the first figure, and $100 for each additional figure. Authors may supply black-and-white versions of color figures for printing purposes. Complete instructions for electronic artwork preparation and submission can be found at http://www.elsevier.com/artwork. Professional illustration services are available from Elsevier's Web-Shop at http://webshop.elsevier.com/illustrationservices. JAACAP does not endorse any such services. Use of such services has no bearing on the editor's ultimate decision.

Appendix 5
MRP Proposal

DOCTORATE IN CLINICAL PSYCHOLOGY

SUBMISSION FRONT PAGE

Matriculation Number: 2166402B

Name of Assessment:	Major Research Project Proposal
Title of Assessment:	**Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents in the West of Scotland**
Submission Date:	Friday 5th August 2016
Version Number:	5
Word Count:	4611
	(Abstract word count: 214)
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For Office Use Only

Date Received:

Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents Living in the West of Scotland

Abstract

Background

Mental health is not just the absence of mental illness, but also the presence of mental wellbeing. To date the concept of mental wellbeing of adolescents has not been sufficiently researched. Although the Mental Health Continuum-Short Form (MHC-SF) (which measures psychological, social and emotional wellbeing) has been validated for use with adults; no studies have examined its psychometric properties for use with adolescents in the UK.

Aims

Primarily this study aims to establish the psychometric properties of the MHC-SF in a sample of adolescents living in the West of Scotland. As a secondary aim, the study will examine the associations between mental wellbeing and levels of deprivation in the West of Scotland.

Method

A representative sample of adolescents currently in year groups S2-S4 will be recruited from secondary schools within the West of Scotland. The MHC-SF and four compactor scales, together with socio-demographic information will be incorporated into a self-report questionnaire, which will be completed by all participants. The study will employ a quantitative repeated measures (test-retest) design.

Applications

The MHC-SF is a dedicated measure of mental wellbeing. Establishing its psychometric merit in a West of Scotland adolescent sample will confirm its suitability for use with this population. This is important as understanding and measuring the wellbeing of adolescents is a national priority.

Introduction

Mental health has been increasingly recognised as a complete state of being (Suldo and Shaffer, 2008), with growing consensus that it would be optimally understood by placing equal emphasis on the absence of mental illness and the presence of positive aspects of wellbeing (World Health Organisation, 2004). Keyes' (2005a) dual-factor model of mental health describes mental illness and mental wellbeing as related yet distinct dimensions. The Royal Society in the UK defined mental wellbeing as 'a positive and sustainable state that allows individuals, groups or nations to thrive and flourish' (Huppert, Baylis and Keverne, 2004). In the same way as mental illness is thought to be comprised of a cluster of symptoms, mental wellbeing is thought to be a syndrome comprised of symptom components (Keyes, 2002; 2003; 2005a).

To provide a comprehensive understanding of an individual's current mental health functioning, it follows that mental wellbeing should be assessable using robust measurement instruments (Huebner, Gilman and Suldo, 2007). Keyes (2006) operationalised mental wellbeing theory in the development of the Mental Health Continuum (MHC) measurement instrument. Keyes (2007) described individuals presenting with high levels of wellbeing as 'flourishing', those with low levels as 'languishing', and classified individuals who do not fit the criteria for either as 'moderately mentally healthy'. Flourishing is not only conceptualised as a desired end state, but is considered a protective factor that buffers against mental illness (Keyes, Dhingra and Simoes, 2010; Keyes and Simoes, 2012; Lamers et al., 2015).

Adolescence is arguably one of the most critical and intense periods of development, which goes on to have significant implications into and throughout adulthood (Keyes, 2009). Although development is inevitable during this period, flourishing is not (Keyes, 2006). Research and policy alike are increasingly highlighting the importance of enhancing mental wellbeing, by fostering positive adolescent development (Keyes, 2006; Scottish Government, 2012a; WHO, 2013). Despite an increased focus on adolescent mental wellbeing, research has remained largely adult-centric (Keyes, 2006).

Bornstein et al. (2003) highlighted the need to develop well-validated theoretically consistent tools for measuring mental wellbeing in adolescents, in order to effectively monitor mental wellbeing and evaluate interventions within this population (Clarke et al., 2011). The MHC-SF is well validated

for use with adults (Guo et al., 2015; Lamers et al., 2010; Westerhof and Keyes, 2010). A literature search identified psychometric studies of the MHC-SF with American (Keyes, 2005b; 2006), Chinese (Guo et al., 2015), Eygptian (Salama-Younes, 2011), South Korean (Lim, 2014) and Polish (Karas, Cieciuch and Keyes, 2014) samples. Although the MHC-SF has been used in studies that have recruited adolescent populations in the UK (e.g. Clarke et al., 2011), the psychometric properties of the MHC-SF have not been investigated to ascertain whether the measure is reliable and valid for this population. This study will therefore seek to validate the MHC-SF in a West of Scotland adolescent sample. It is anticipated that examining the psychometric properties of the MHC-SF in a representative sample of West of Scotland adolescents will provide some insight into the relationship between mental wellbeing and levels of deprivation within this population.

Aims

Primarily this study aims to establish the psychometric properties of the MHC-SF with adolescents in the West of Scotland, through examination of its reliability and validity for use with this population. Secondary aims are to examine the distribution of mental wellbeing across a large representative sample of adolescents attending schools in the West of Scotland, and to investigate associations between mental wellbeing and sociodemographic variables such as deprivation.

Hypotheses

5. The factor structure of the MHC-SF with a West of Scotland adolescent sample will confirm the three-dimensional structure of subjective wellbeing (psychological, social and emotional), as found in previous research with adolescent samples (Guo et al., 2015; Karas, Cierciuch and Keyes, 2014; Lim, 2014).

6. The MHC-SF will be a reliable measure of mental wellbeing in a West of Scotland adolescent sample:

    6.1 Similar to findings in previous research (Guo et al., 2015; Karas, Cierciuch and Keyes, 2014; Lim, 2014), the MHC-SF will demonstrate 'good' internal consistency, as measured using Cronbach's alpha coefficient (Cronbach, 1951).

    6.2 Similar to findings in previous research (Guo et al., 2015; Karas, Cierciuch and Keyes, 2014; Lim, 2014), the three MHC-SF subscales (psychological, social and emotional wellbeing) will demonstrate 'acceptable' internal consistencies using Cronbach's alpha coefficient (Cronbach, 1951).

    6.3 Test-retest reliability of the MHC-SF will be moderate according to measure of Intraclass Correlation Coefficient (Hinkle, Wiersma & Jurs, 2003); although the

MHC-SF intends to demonstrate temporal stability, it is designed to reflect and be sensitive to changes in mental wellbeing.

7. The MHC-SF will demonstrate construct validity in a West of Scotland adolescent sample:

    7.1 Concurrent validity of the MHC-SF will be confirmed through positive correlations of the MHC-SF with alternative measures of wellbeing, including the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) and the World Health Organisation-Five (WHO-5).

    7.2 Discriminant validity of the MHC-SF will be confirmed through low to moderate negative correlations of the MHC-SF with measures of mental illness, specifically the GHQ-12 and SDQ.

8. Exploratory factor analysis of items from the MHC-SF and GHQ-12 will confirm the dual-factor model of mental health (Keyes' 2005a), where mental health and mental illness are two related yet distinct dimensions.

9. There will be an association between the MHC-SF and the Scottish Index of Multiple Deprivation (SIMD):

    9.1 There will be a significant correlation between scores on the subscales of the MHC-SF and overall Scottish Index of Multiple Deprivation (SIMD) ranks (Scottish Government, 2012b).

    9.2 There will be an association between categorical wellbeing diagnosis according to the MHC-SF and quintile rank on the SIMD (Scottish Government, 2012b).

Plan of Investigation

Participants

Participants will be adolescents, recruited from a sample of the 30 mainstream schools within the West of Scotland. A whole school year and class group sampling frame will be used to recruit participants from year groups S2-S4. The sample will therefore be aged between 13 and 16 years old; however, as with Clarke et al. (2011) there may be a minority percentage aged 12 or 17 years old.

Inclusion/Exclusion Criteria

Inclusion criteria:

- Attending a West of Scotland secondary school (see Table 2).
- Currently in school years S2-S4.

Exclusion criteria:

- Attending a West of Scotland Additional Support Needs (ASN) secondary school.

Recruitment Procedures

Sampling methods have been chosen to maximise the potential of obtaining a representative sample of adolescents in relation to different levels of deprivation in the West of Scotland, according to the SIMD (Scottish Index of Multiple Deprivation). A detailed explanation of this sampling method (i.e. rationale for which schools are selected) can be found in Appendix B.

Measures

Participants will provide basic demographic information (school name, age, ethnicity, religion school year, gender and postcode) before completing a battery of five self-report measures. Participants will provide their postcode in order to examine deprivation within the sample, using the Scottish Index of Multiple Deprivation (SIMD) (The Scottish Government, 2012b). The five questionnaires include the Mental Health Continuum-Short Form (MHC-SF), Warwick-Edinburgh Mental Well-being Scale (WEMWBS), World Health Organisation-5 Wellbeing Index (WHO-5), General Health Questionnaire-12 and the Strengths and Difficulties Questionnaire, which are detailed below (*1-5*). The questionnaires will take approximately 30-45 minutes to complete. Participants will be asked to complete the MHC-SF at a second time point, two weeks later.

1. Mental Health Continuum - Short Form (MHC-SF)

The 14 item self-report MHC-SF (Keyes, 2006) is a shortened version of the MHC Long Form,

which measures social, emotional and psychological mental wellbeing on three subscales. Participants rate the frequency of which they have experienced symptoms of wellbeing over the last month, on a 6-point Likert scale (Never to Everyday). Total scores on the MHC-SF range from 0-70, with higher scores indicating increased levels of flourishing. Total scores can be classified into three categories of mental health; languishing, moderately mentally healthy or flourishing. The scale has been validated for use with adolescents aged 12-18 in America (Keyes, 2005b), 14-17 in South Korea (Lim, 2014), 16-19 in Poland (Karas, Cieciuch and Keyes, 2014) and 11-19 in China (Guo et al., 2015), as well as in a sample of Egyptian athletes between 12-18 years old (Salama-Younes, 2011). The MHC-SF has been shown to correlate with the Warwick-Edinburgh Mental Well-being Scale in a UK sample of adolescents aged 13-16 (Clarke et al., 2011).

2. Warwick-Edinburgh Mental Well-being Scale (WEMWBS)

The WEMWBS (Tennant et al., 2007) is 14-item self-report measure of mental wellbeing, which covers eudaimonic (self-realisation and positive functioning) and hedonic (happiness, pleasure attainment and pain avoidance) aspects of wellbeing. It was initially validated in sample aged between 16-75+ years old (Tennant et al., 2007), but has also demonstrated its validity for use with adolescents aged 13-16 years old in the UK (Clarke et al., 2011).

3. World Health Organisation-5 Wellbeing Index (WHO-5)

The WHO-5 is a short 5-item self-report measure, derived from longer instruments (WHO-10 and WHO-28). The WHO-5 was first presented as part of a project on measures of well-being in primary care services by the WHO Regional Office in Europe in 1998, as a measure of positive subjective wellbeing. The WHO-5 avoids symptom related language and contains only positively worded items. The respondent rates the extent to which each item has applied to them on a five point Likert scale, from 5 (all of the time) to 0 (none of the time), across a two week period. In a systematic review, Topp et al., (2015) concluded that the WHO-5 has adequate validity. It has also been validated in an adolescent sample in Germany (Allgaier et al. 2012) and the Netherlands (de Wit et al., 2007). This measure was used within an adolescent sample in UK to validate the WEMWBS measure of wellbeing (Clarke et al., 2011).

4. The Strengths and Difficulties Questionnaire (SDQ)

The SDQ (Goodman, Meltzer and Bailey, 1998) is a brief self-report behavioural screening questionnaire for children aged 11-16. The SDQ items ask positive and negative questions about 25 different attributes, which load on to five subscales (hyperactivity, conduct problems, emotional symptoms, peer problems and prosocial behaviours); each subscale has five corresponding items. Respondents indicate how much each attribute applies to them across the last six months, on a three-point Likert scale (Not True – Certainly True).

The SDQ has been validated in a British adolescent sample (Goodman, 2001) and has been used in a UK sample to validate the WEMWBS (Clarke et al., 2011).

5. General Health Questionnaire-12 (GHQ-12)

The 12-item self-report GHQ-12 (Goldberg and Williams, 1988) is an abridged version of the 60-item GHQ. The instrument provides an indication of current mental wellbeing. It is designed to assess healthy functioning and the presence/development of new distressing symptoms. It is extensively validated for use with adults (Werneke et al., 2000), but its validity for use with adolescent samples is still emerging (Baksheev et al., 2011; Tait, French and Hulse, 2003). A review carried by Tait, Hulse and Robertson (2001) identified 82 papers which used the instrument in adolescent samples. They concluded that the measure is best validated for use with adolescent populations in the UK. Levin, Walsh and McCartney (2014) used the GHQ-12 in a recent study with adolescents in Glasgow and the measure has been used in other validation studies of wellbeing measures in Scotland (Clarke et al., 2011).

Design

This study will employ a quantitative repeated measures design (test-retest), in order to determine the psychometric properties of the MHC-SF.

Research Procedure

Means of data collection will be determined following discussions with the Head Teacher of each participating school, to allow them opportunity to influence how and when data collection will occur. Schools will be asked to send Research Information Sheets and corresponding Consent Forms to the parents of each pupil deemed eligible for participation in the study in line with their standard procedure for written communication with families. The Principal Investigator will be available to go into each secondary school to collect data from multiple participants at one time; however, other options may potentially include data collection by Educational Psychology colleagues as collaborators in the research. Participants will be asked to participate at a time during the school day that will be predetermined in consultation with the school. This is likely to involve the Principal Investigator collecting data from multiple participants at one time. A second MHC-SF questionnaire will be left with an appropriate member of education staff, in order for participants to compete the measure again two weeks later. The Principal Investigator will be available to collect this data, should this be the school's preferred option. The measure will be matched across time points using the participant's participant number, age, gender and postcode. To increase engagement, it will be possible for a 'career in clinical psychology' talk to be offered. After collecting data from 50 participants, the recruitment strategy will be reviewed and revised according to the length of time taken to collect data.

Data Analysis

Data analysis will be quantitative. To confirm the three-factor structure of the MHC-SF (psychological, social and emotional wellbeing), confirmatory factor analysis will be employed. Cronbach's alpha will be used to examine the internal consistency of the MHC-SF and its three subscales. Test-retest reliability of the MHC-SF will be determined using Pearson's Correlation Coefficient. Correlational analysis will be utilised to determine the construct validity of the MHC-SF, i.e. to measure concurrent validity of the MHC-SF against alternative measure of wellbeing and discriminant validity of the MHC-SF against measure of mental illness. The study will use exploratory factor analysis to confirm the dual-factor model of mental health. Last, correlations will be explored to investigate the associations between summary scores of the MHC-SF and SIMD rank scores (Scottish Government, 2012b). Between groups comparisons will be used to investigate any differences in MHC-SF categories according to SIMD quintiles (Scottish Government, 2012b).

Justification of sample size

There are multiple recommendations and guidelines concerning what will constitute an adequately powered sample when conducting factor analysis. It has been suggested that a minimum of 150 (Hutcheson & Sofroniou, 1999), 200 (Guilford, 1954) or 250 (Cattell, 1978) are required. However, for the purpose of the current study, a subject-to-variable ratio of 10:1 will be employed (Nunnally, 1978). Although this project will use both confirmatory and exploratory factor analysis, the larger sample will be necessary for exploratory factor analysis (EFA). EFA will be carried out on 26-items, including those from the MHC-SF (14-items) and the GHQ-12 (12-items), indicating a minimum sample size of 260 (26x10) participants. This sample would be considered fair-good (Comrey and Lee, 1992). A recent study carried out by Petrillo et al. (2015) examined the test-retest reliability of the MHC-SF in an Italian sample; 169 participants completed the MHC-SF at a second time point. This study aims to obtain a comparable number of participants to Petrillo et al. (2015). Hence, accounting for a 35% dropout rate, 260 participants would enable recruitment of an equivalent number of participants (169).

Setting and Equipment

Data will be collected from participants within their individual school environments. Discussion with the Head Teacher will determine specific times/physical settings for data collection (e.g. within assembly, study period or lesson). It is anticipated that the school will have facilities/writing equipment conducive to filling in the questionnaire battery.

Financial Issues

Costs for this project will be minimal; all measures are freely available for use without purchase and/or consent has been given for their use with small research samples.

Ethical Issues

Health and Safety

No researcher safety issues are anticipated as a result of conducting this research project. Risks to participants will include the detection of unrecognised symptoms of mental illness, identified through scores on the GHQ-12 and SDQ measures. These screening measures are not diagnostic instruments; as such, they do not have any formal diagnostic/formal clinical meaning when used out of context, without a clinical interview or comprehensive assessment. To ensure that support is available to participants who identify as experiencing difficulties, advice for accessing supports will be included on the participant information sheet. This will direct participants to their General Practitioner and provide contact numbers for NHS 24, Breathing Space and the Samaritans (as well as details for downloading the 'Safe Spot' App). Information will be sought from each school regarding specific supports available through education (e.g. guidance teachers, school counsellors or counselling services such as 'Lifelink'); this information will be included on information sheets for each school. Guidance teachers are able to make referrals to CAMHS (Child and Adolescent Mental Health Services) as per standard education procedures, should they be concerned about the mental health of any pupil. These difficulties are most likely to be picked up by changes to their everyday functioning. For further details of health and safety issues see Appendix D.

Ethical Approval

Permission to carry out this research will be sought through the Glasgow University College Ethics Committee and from the relevant Education Authorities in the West of Scotland. Permission to proceed with research in individual schools will then be confirmed with individual Head Teachers. A Plain-English Summary (Appendix E) will allow service user feedback regarding this proposal.

Informed Consent

All adolescent participants will be facilitated to give informed consent. They will be provided with a participant information sheet and the study and where possible the study will be explained again by the Principal Investigator. Participants will be made aware of their right to withdraw. It is not a legal requirement when a competent adolescent provides their own consent, for parental assent to be given (ScotCRN, 2012); however, to align with best practice, parental assent will also be sought through opt in methodology.

Confidentiality

To ensure confidentiality, the raw dataset will be anonymised. Participant name will not be collected; however, participants will be asked their school, age, gender and postcode data will be requested to determine level of deprivation according to the SIMD (Scottish Government, 2012b). Postcodes will be converted into deprivation quintiles, which will be recorded in the raw dataset. The dataset will be password protected.

Practical Applications

Establishing the psychometric properties of the MHC-SF in an adolescent sample within West of Scotland will enable conclusions to be draw about its utility for use with this population. Should the psychometric properties appear robust, there is subsequent scope to use the scale with this population to understand, assess and monitor mental wellbeing clinically and in research studies. This is important given the global, national and local drive to enhance mental wellbeing in adolescents. This study will also give a representative indication of the association between mental wellbeing and deprivation in West of Scotland.

Project Time Scale

	Month														
	May '16	**June '16**	**July '16**	**Aug. '16**	**Sep. '16**	**Oct. '16**	**Nov. '16**	**Dec. '16**	**Jan. '17**	**Feb. '17**	**Mar. '17**	**Apr. '17**	**May '17**	**June '17**	**July '17**
RESEARCH PROPOSAL															
Research Proposal															
Deadline		***1st***													
GOVERNANCE															
Ethics application				**Submit**											
Research application				**Submit**											
Education Board Ethics				**Submit**											
INITIAL REPORT PREPARTION															
Write method															
Literature search															

Write introduction															
DATA COLLECTION															
Recruit participants															
Collect data															
EVALUATION OF OUTCOME															
Data entry															
Statistical analysis															
Write up results															
Write discussion															
FINALISE REPORT															
Finalise report															
Write abstract															

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Appendix 6

Glasgow University Ethics Approval

University of Glasgow | College of Medical, Veterinary & Life Sciences

Dr Dorothy McKeegan

Senior Lecturer

Dr Dorothy McKeegan
College Ethics Officer

R303 Level 3
Institute of Biodiversity Animal Health and Comparative Medicine
JarrettBuilding
Glasgow G61 1QH Tel: 0141 330 5712
E-mail:Dorothy.McKeegan@glasgow.ac.uk

5th December2016

Dear Dr McLeod,

MVLS College Ethics Committee

Project Title: Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents in the West of Scotland

Project No: 200160029«Principal_Investigator»

The College Ethics Committee has reviewed your application and has agreed that there is no objection on ethical grounds to the proposed study. It is happy therefore to approve the project, subject to the following conditions:

- Project end date:31July 2017
- The data should be held securely for a period of ten years after the completion of the research project, or for longer if specified by the research funder or sponsor, in accordance with the University's Code of Good Practice in Research:
  (http://www.gla.ac.uk/media/media_227599_en.pdf)
- The research should be carried out only on the sites, and/or with the groups defined in the application.
- Any proposed changes in the protocol should be submitted for reassessment, except when it is necessary to change the protocol to eliminate hazard to the subjects or where the change involves only the administrative aspects of the project. The Ethics Committee should be informed of any such changes.
- You should submit a short end of study report to the Ethics Committee within 3 months of completion.

Yours sincerely
Dr Dorothy McKeegan

Dorothy McKeegan

Appendix 7

Renfrewshire Council Research Permission

Your Ref:
My Ref: TMcE/AL
Contact: Tony McEwan
Tel: 0141 618 7198
Fax: 0141 842 5655
E-mail: tony.mcewan@renfrewshire.gov.uk
Date: 22nd December 2016

E-mail: r.bower.1@research.gla.ac.uk

Dear Ms Bower

Re: Research Proposal: Adolescent Subjective Wellbeing

Thank you for your application in relation to the above.

I am pleased to give you consent to approach Renfrewshire schools to participate in your research. However, please note that while I can grant permission to approach our schools, they are under no obligation to participate.

I should be grateful if you could provide me with a copy of your findings when they have been finalised.

Yours sincerely

Tony McEwan
Education Manager (planning and performance)

Appendix 8

North Lanarkshire Research Permission

Tel: 01236 812235
E Mail: mcgheep@northlan.gov.uk
Date: 10th February 2017

Rebecca Bower
Trainee Clinical Psychologist
University of Glasgow
Mental Health and Wellbeing
Admin Building
1055 Great Western Road
Glasgow
G12 0XH

Education, Youth and Communities

North Lanarkshire Council
Municipal Buildings
Kildonan Street
Coatbridge ML5 3BT
www.northlanarkshire.gov.uk.

Dear Rebecca

Research Project: Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents in the West of Scotland.

Thank you for returning the completed application form. I am pleased to inform you that approval has been granted at Authority level for you to approach the heads of secondary schools, to ask if the school is willing to participate in your project.

When you consult with the head teacher you should provide a copy of this letter as confirmation of North Lanarkshire Council's authorisation but I would remind you that it is the head of establishment who has the final veto over whether his school will participate in the research project.

When you have completed your research you should provide the school, if requested, with a copy of your findings.

May I take this opportunity to wish you every success with your project. If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

Philip McGhee
Continuous Improvement Officer
mcgheep@northlan.gov.uk

Isabelle Boyd, Assistant Chief Executive, Education, Youth and Communities, PO Box 14, Civic Centre, Motherwell ML1 1TW

Appendix 9

Participant characteristics

Characteristic		Time Point 1		Time Point 2	
		N	%	N	%
Gender	Female	398	50.4	314	51.9
	Male	390	49.4	290	47.9
	Missing	2	.3	1	.2
School year	S2	330	41.8	270	44.6
	S3	287	36.3	217	35.9
	S4	173	21.9	118	19.5
Age	12	1	.1	1	.2
	13	276	34.9	229	37.9
	14	295	37.3	227	37.5
	15	188	23.8	126	20.8
	16	29	3.7	21	3.5
	Missing	1	.1	1	.2
SIMD Quintile	1	103	13.0	83	13.7
(1, most– 5, least deprived)	2	211	26.7	152	25.1
	3	149	18.9	113	18.7
	4	103	13.0	87	14.4
	5	124	15.7	97	16.0
	Missing	100	12.7	73	12.1
Ethnicity	White Scottish	701	88.7	539	89.1
	White Irish	4	.5	4	7
	White Other British	25	3.2	20	3.3
	Mixed	21	2.7	13	2.1
	Asian Pakistani	4	.5	2	.3
	Asian Indian	7	.9	6	1.0
	Asian Chinese	2	.3	1	.2
	Other Asian	2	.3	2	.3
	Black Caribbean	1	.1	1	.2
	Other	10	1.3	6	1.0
	Prefer not to answer	2	.3	1	.2
	Missing	11	1.4	10	1.7
Religion	Christianity	347	43.9	280	46.3
	Islam	10	1.3	7	1.2
	Sikhism	8	1.0	7	1.2
	Other religion	13	1.6	11	1.8
	No religion	373	47.2	277	45.8
	Prefer not to answer	36	4.6	20	3.3
	Missing	3	.4	3	5

N.b. Whole year and class group sampling meant slight deviation from 13-16 yr age range; one participant was aged 12.

Appendix 10
MRP Questionnaire Battery

Mental Health Continuum-Short Form Research

Please create a 5-digit code by following the instructions below:

1) The first two digits will be the last two letters of your mother's name.
2) The second two digits will be the date you were born.
3) The last digit will be the second letter of your street.

*For example, if your mother's name is Joan**ne**, you were born on the **third** of March and you lived on C**a**stle Street, your code would be '**N E 0 3 A**'.*

What is your 5-digit code?

___ ___ ___ ___ ___

What is the name of your school?

_____

What school year are you in?

S2 ☐ S3 ☐ S4 ☐

How old are you?

12 ☐ 13 ☐ 14 ☐ 15 ☐ 16 ☐ 17 ☐

What is your gender?

Male ☐ Female ☐

What is your home postcode?

___ ___ ___ ___ ___ ___

What best describes your religion, if any?

Christianity ☐ Hinduism ☐ Islam ☐ Judaism ☐
Sikhism ☐ Other religion ☐ No religion ☐ Prefer not to answer ☐

What is your ethic group?

A: White Scottish ☐ Irish ☐ Other British ☐

B: Mixed Any mixed background ☐

C: Asian; Asian Scottish; Asian British

Pakistani ☐ Indian ☐ Chinese ☐ Bangladeshi ☐ Any other Asian background ☐

D: Black; Black Scottish; Black British

Caribbean ☐ African ☐ Any other Black background ☐

E: Other Ethnic background Any other background ☐ Please state which: _____

F: Prefer not to answer ☐

Adolescent MHC-SF

Please answer the following questions are about how you have been feeling during the past two weeks. Place a tick in the box that best represents how often you have experienced or felt the following:

During the past two weeks, how often did you feel …	NEVER	ONCE OR TWICE	ABOUT ONCE A WEEK	2 OR 3 TIMES A WEEK	ALMOST EVERY DAY	EVERY DAY
1. happy						
2. interested in life						
3. satisfied						
4. that you had something important to contribute to society						
5. that you belonged to a community (like a social group, your school, or your neighborhood)						
6. that our society is becoming a better place for people like you						
7. that people are basically good						
8. that the way our society works made sense to you						
9. that you liked most parts of your personality						
10. good at managing the responsibilities of your daily life						
11. that you had warm and trusting relationships with other children						
12. that you had experiences that challenged you to grow and become a better person						
13. confident to think or express your own ideas and opinions						
14. that your life has a sense of direction or meaning to it						

General Health Questionnaire

Has not been included for copyright reasons.

Warwick Edinburgh Mental Well-being Scale (WEMWBS)

Below are some statements about feelings and thoughts.

Please tick (*V)* the box that best describes your experience of each over the **last 2 weeks** **STATEMENTS**	**None of the time**	**Rarely**	**Some of the time**	**Often**	**All of the time**
I've been feeling optimistic about the future	1	2	3	4	5
I've been feeling useful	1	2	3	4	5
I've been feeling relaxed	1	2	3	4	5
I've been feeling interested in other people	1	2	3	4	5
I've had energy to spare	1	2	3	4	5
I've been dealing with problems well	1	2	3	4	5
I've been thinking clearly	1	2	3	4	5
I've been feeling good about myself	1	2	3	4	5
I've been feeling close to other people	1	2	3	4	5
I've been feeling confident	1	2	3	4	5
I've been able to make up my own mind about things	1	2	3	4	5
I've been feeling loved	1	2	3	4	5
I've been interested in new things	1	2	3	4	5
I've been feeling cheerful	1	2	3	4	5

WHO (Five) Well-Being Index (1998 version)

Please indicate for each of the five statements which is closest to how you have been feeling over the last two weeks.

Notice that higher numbers mean better well-being.

Example: If you have felt cheerful and in good spirits more than half of the time during the last two weeks, put a tick in the box with the number 3 in the upper right corner.

	Over the last two weeks	All of the time	Most of the time	More than half of the time	Less than half of the time	Some of the time	At no time
1	I have felt cheerful and in good Spirits	5	4	3	2	1	0
2	I have felt calm and relaxed	5	4	3	2	1	0
3	I have felt active and vigorous	5	4	3	2	1	0
4	I woke up feeling fresh and rested	5	4	3	2	1	0
5	My daily life has been filled with things that interest me	5	4	3	2	1	0

Strengths and Difficulties Questionnaire

S 11-17

For each item, please mark the box for Not True, Somewhat True or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain or the item seems daft! Please give your answers on the basis of how things have been for you over the last six months.

Your Name ..... Male/Female

Date of Birth.....

	Not True	Somewhat True	Certainly True
I try to be nice to other people. I care about their feelings	☐	☐	☐
I am restless, I cannot stay still for long	☐	☐	☐
I get a lot of headaches, stomach-aches or sickness	☐	☐	☐
I usually share with others (food, games, pens etc.)	☐	☐	☐
I get very angry and often lose my temper	☐	☐	☐
I am usually on my own. I generally play alone or keep to myself	☐	☐	☐
I usually do as I am told	☐	☐	☐
I worry a lot	☐	☐	☐
I am helpful if someone is hurt, upset or feeling ill	☐	☐	☐
I am constantly fidgeting or squirming	☐	☐	☐
I have one good friend or more	☐	☐	☐
I fight a lot. I can make other people do what I want	☐	☐	☐
I am often unhappy, down-hearted or tearful	☐	☐	☐
Other people my age generally like me	☐	☐	☐
I am easily distracted, I find it difficult to concentrate	☐	☐	☐
I am nervous in new situations. I easily lose confidence	☐	☐	☐
I am kind to younger children	☐	☐	☐
I am often accused of lying or cheating	☐	☐	☐
Other children or young people pick on me or bully me	☐	☐	☐
I often volunteer to help others (parents, teachers, children)	☐	☐	☐
I think before I do things	☐	☐	☐
I take things that are not mine from home, school or elsewhere	☐	☐	☐
I get on better with adults than with people my own age	☐	☐	☐
I have many fears, I am easily scared	☐	☐	☐
I finish the work I'm doing. My attention is good	☐	☐	☐

Appendix 11
MHC-SF Scoring: Continuous and Diagnostic Categories

The Mental Health Continuum-Short Form (MHC-SF) Scoring

Continuous Scoring: Sum, 0-70 range (use 10 point categories if desired). Categorical Diagnosis: a diagnosis of flourishing is made if someone feels 1 of the 3 hedonic well-being symptoms (items 1-3) "every day" or "almost every day" and feels 6 of the 11 positive functioning symptoms (items 4-14) "every day" or "almost every day" in the past month. Languishing is the diagnosis when someone feels 1 of the 3 hedonic well-being symptoms (items 1-3) "never" or "once or twice" and feels 6 of the 11 positive functioning symptoms (items 4-8 are indicators of Social well-being and 9-14 are indicators of Psychological well-being) "never" or "once or twice" in the past month. Individuals who are neither “languishing” nor “flourishing” are then coded as “moderately mentally healthy.”

Symptom Clusters and Dimensions:

Cluster 1; Items 1-3 = Hedonic, Emotional Well-Being Cluster 2; Items 4-8 = Eudaimonic, Social Well-Being Item 4 = Social Contribution Item 5 = Social Integration Item 6 = Social Actualization (i.e., Social Growth) Item 7 = Social Acceptance Item 8 = Social Coherence (i.e., Social Interest) Cluster 3; Items 9-14 = Eudaimonic, Psychological Well-Being Item 9 = Self Acceptance Item 10 = Environmental Mastery Item 11 = Positive Relations with Others Item 12 = Personal Growth Item 13 = Autonomy Item 14 = Purpose in Life

*SPSS Syntax for creating the categories for the categorical diagnosis *Assumes item responses have been coded as follows: never=0, once or twice=1, about once a week=2, about 2 or 3 times a week=3, almost every day=4, every day=5

count hiaff=mhc1 mhc2 mhc3(4,5). count loaff=mhc1 mhc2 mhc3(0,1). count hifunc=mhc4 mhc5 mhc6 mhc7 mhc8 mhc9 mhc10 mhc11 mhc12 mhc13 mhc14(4,5). count lofunc=mhc4 mhc5 mhc6 mhc7 mhc8 mhc9 mhc10 mhc11 mhc12 mhc13 mhc14(0,1). recode hiaff (1,2,3=1) (else=0) into hiaffect. recode hifunc (6,7,8,9,10,11=1) (else=0) into hifunct. recode loaff (1,2,3=1) (else=0) into loaffect. recode lofunc (6,7,8,9,10,11=1) (else=0) into lofunct.

if hiaffect=1 and hifunct=1 mhc_dx=2. if loaffect=1 and lofunct=1 mhc_dx=0. if hiaffect=1 and hifunct=0 mhc_dx=1. if hiaffect=0 and hifunct=1 mhc_dx=1. if loaffect=0 and lofunct=1 mhc_dx=1. If loaffect=1 and lofunct=0 mhc_dx=1.

variable labels mhc_dx 'MHC-SF Three Category Diagnosis of Positive Mental Health'. value labels mhc_dx 0 'Languishing' 1 'Moderate' 2 'Flourishing'. compute mhc_total = mhc1 + mhc2 + mhc3 + mhc4 + mhc5 + mhc6 + mhc7 + mhc8 + mhc9 + mhc10 + mhc11 + mhc12 + mhc13 + mhc14. compute mhc_ewb = mhc1 + mhc2 + mhc3. compute mhc_swb = mhc4 + mhc5 + mhc6 + mhc7 + mhc8. compute mhc_pwb = mhc9 + mhc10 + mhc11 + mhc12 + mhc13 + mhc14. c14.

Appendix 12
Descriptive and psychometric details about validation questionnaires

Warwick-Edinburgh Mental Well-being Scale (WEMWBS)

The WEMWBS (Tennant et al., 2007) is 14-item self-report measure of mental wellbeing, which covers eudaimonic (self-realisation and positive functioning) and hedonic (happiness, pleasure attainment and pain avoidance) aspects of wellbeing. It was initially validated in sample aged between 16-75+ years old (Tennant et al., 2007), but has also demonstrated its validity for use with adolescents aged 13-16 years old in the UK (Clarke et al., 2011).

World Health Organisation-5 Wellbeing Index (WHO-5)

The WHO-5 is a short 5-item self-report measure, derived from longer instruments (WHO-10 and WHO-28). The WHO-5 was first presented as part of a project on measures of well-being in primary care services by the WHO Regional Office in Europe in 1998, as a measure of positive subjective wellbeing. The WHO-5 avoids symptom related language and contains only positively worded items. The respondent rates the extent to which each item has applied to them on a five point Likert scale, from 5 (all of the time) to 0 (none of the time), across a two week period. In a systematic review, Topp et al., (2015) concluded that the WHO-5 has adequate validity. It has also been validated in an adolescent sample in Germany (Allgaier et al. 2012) and the Netherlands (de Wit et al., 2007). This measure was used within an adolescent sample in UK to validate the WEMWBS measure of wellbeing (Clarke et al., 2011).

The Strengths and Difficulties Questionnaire (SDQ)

The SDQ (Goodman, Meltzer & Bailey, 1998) is a brief self-report behavioural screening questionnaire for children aged 11-16. The SDQ items ask positive and negative questions about 25 different attributes, which load on to five subscales (hyperactivity, conduct problems, emotional symptoms, peer problems and prosocial behaviours); each subscale has five corresponding items. Respondents indicate how much each attribute applies to them across the last six months, on a

three-point Likert scale (Not True – Certainly True). The SDQ has been validated in a British adolescent sample (Goodman, 2001) and has been used in a UK sample to validate the WEMWBS (Clarke et al., 2011).

General Health Questionnaire-12 (GHQ-12)

The 12-item self-report GHQ-12 (Goldberg & Williams, 1988) is an abridged version of the 60-item GHQ. The instrument screens minor psychiatric disorders, by assessing whether the present state differs from the person's normal. It is designed to assess healthy functioning and the presence/development of new distressing symptoms. It is extensively validated for use with adults (Werneke et al., 2000), but evidence for its validity for use with adolescent samples is still emerging (Baksheev et al., 2011; Tait, French & Hulse, 2003). A review carried out by Tait, Hulse and Robertson (2001) identified 82 papers which used the instrument in adolescent samples; they concluded that the measure demonstrates validity for use with adolescent populations in the UK. Levin, Walsh and McCartney (2014) used the GHQ-12 in a recent study with adolescents in Glasgow and the measure has been used in other validation studies of wellbeing measures in Scotland (Clarke et al., 2011).

Appendix 13

Parent/Guardian Information Sheet

Project Title: **Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents Living in the West of Scotland**

Parent Information Sheet

Introduction

My name is Rebecca Bower. I am a Trainee Clinical Psychologist at the University of Glasgow. I am required to undertake a research study as part of my training, and am doing so under the supervision of Drs Ross White & Hamish McLeod, Senior Lecturers at the University of Glasgow.

I would like to invite your child to take part in our research project. This sheet includes information on why the research is being done and what it would involve. It is hoped that this will help you decide whether you would like your child to be part of this research. If you would like to know more, please feel free to contact me, Dr Ross White, or Dr Hamish McLeod using the details provided at the end.

Why is the research being done?

High levels of mental wellbeing allow people to achieve their full potential, cope with everyday stresses well, and be involved in their community. The World Health Organisation and the Scottish Government currently see improving mental wellbeing as really important, particularly for teenagers. Enhancing mental wellbeing is important, as it buffers against mental illness.

One questionnaire that has been developed to measure mental wellbeing is the Mental Health Continuum-Short Form (MHC-SF). Research has confirmed that this is a good questionnaire to use with adults; however, research still needs to be completed to see whether it is a good questionnaire to use with teenagers in Scotland. It is important to find this out, as the teenage years are a very important time of development, which will impact on life as an adult.

What is the Mental Health Continuum-Short Form (MHC-SF)?

The MHC-SF is a questionnaire that people can complete by themselves. It measures three different parts of mental wellbeing; this includes whether a person is currently experiencing positive feelings (emotional wellbeing), and whether they are managing and coping in their everyday life (psychological wellbeing) as well as in the wider community (social wellbeing).

Why is my child being asked to take part?
We want to know whether the MHC-SF is a robust questionnaire to use with adolescents aged between 13 and 16 years old in Glasgow. Your child has been asked to take part as they are attending a Glasgow City Council secondary school and are currently in S2-S4.

Does my child have to take part?
Not at all, it is up to you to decide. The study has been described on this information sheet, which you can keep to help you make your decision. If you don't want your child to take part, we will ask you to sign the enclosed form. This means that your child will not be asked if they would like to take part. If you don't sign and send the enclosed form back to school, we will assume you agree for your child to take part in the research. Your child will be asked to sign a form to say that they want to take part too. You are free to withdraw your child from the study at any time, without giving a reason. Your child will also be able to decide for themselves if they want to stop at any time.

What would my child have to do if they took part?
Your child would be asked to complete five questionnaires, which will take between 30-45 minutes to fill in. The questionnaires will ask questions about their mental wellbeing, their general health and their strengths and difficulties. Your child would be asked to complete just one of these questionnaires (the MHC-SF) again two weeks later. This second session will take a lot less time.

Are there any risks or disadvantages of taking part?
It might be that while filling in the questionnaires, your child becomes concerned about their own wellbeing. If this happens, both you and your child will have access to information about supports that can be accessed for them. Details of these contacts are enclosed with this information sheet.

What are the possible benefits of the research?
The World Health Organisation and the Scottish Government currently see improving mental wellbeing as really important, particularly for teenagers. If the study shows that the MHC-SF is a good way of measuring wellbeing in teenagers in Glasgow, this will mean that researchers and clinicians can feel more confident in measuring the mental wellbeing of teenagers using the MHC-SF. As such, we will be better able to understand and improve the mental wellbeing of teenagers.

Will my child taking part in the study be kept confidential?
Yes. We will follow ethical and legal practice and all information about your child will be handled in confidence.

More details on confidentiality
The paper questionnaires and personal information (school, ethnicity, postcode, gender and religion) provided by your child) will be kept in a locked filing cabinet. Consent forms will be kept separately from completed questionnaires; as such, it will not be possible to identify the information your child has given. All the information will be kept private, so only the researchers will have access to it. Once the study has finished and it has been written up as a report, the information will be destroyed.

What if there's a problem?

If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions (contact details below). If you remain unhappy and wish to complain formally, you can do this through the Glasgow University complaints procedure, by contacting the Vice Principal for Research, Professor Miles Padgett (Miles.Padgett@glasgow.ac.uk).

What will happen to the results of the research study?

I will be writing up a report of the study as part of my course work, towards a doctorate in clinical psychology. We may also publish the report in an academic journal. No reports of the study will contain personal details, just an overall summary of the information we get from everyone.

Who has reviewed the study?

This research has been looked at by two independent groups of people, whose jobs are to protect your safety, rights, wellbeing and dignity. This study has been reviewed and given favourable opinion by the University of Glasgow Medical Veterinary and Life Sciences Research Ethics Committee. Approval has also been provided by the relevant governance and ethics groups for your child's school.

If you would like any further information on the study or to discuss anything on this information sheet, please contact either:

Rebecca Bower
Trainee Clinical Psychologist

University of Glasgow
Mental Health and Wellbeing
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1055 Great Western Road
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G12 0XH
E-mail: r.bower.1@research.gla.ac.uk

Dr Ross White/Dr Hamish McLeod
Senior Lecturers

University of Glasgow
Mental Health and Wellbeing
Admin Building
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow
G12 0XH
E-mail: Ross.White@glasgow.ac.uk
E-mail: Hamish.Mcleod@glasgow.ac.uk
Tel: 0141 211 3900

List of Supports

This is a list of people who you can contact should you have any concerns about the mental wellbeing of your child:

1) Your local GP (General Practitioner)

You can contact your registered GP/Doctor if you have any concerns about your child's mental wellbeing. The Doctor will meet with you and your child to assess their needs and can make a referral to other services if they think this is appropriate.

2) NHS 24

You can contact NHS 24 at any time by calling **111**. You should use this number if your doctor's surgery is closed and you feel the concerns about your child can't wait until it re-opens.

You can also signpost your child to the following services if you think they might be helpful:

3) Breathing Space

You or your child might find it helpful to speak to someone confidentially. Breathing Space is available to listen to any concerns you might have as a 'first step' in getting help and support. They can give you advice about where to access further support. They can be on **0800 83 85 87**.

4) Chidline

Your child can contact Childline free at any time on **0800 1111** and speak to a counsellor. Alternatively they can speak one-to-one with a counsellor online at www.childline.org.uk, or send an email.

4) Safe Spot' App

SafeSpot is a mobile telephone App that can be downloaded, and is designed to help your child through tough spots. It gives your child their own personalised coping plan, useful strategies and tools to help, and directions to local resources. The App aims to

equip young people with all the information, advice and access to services that they need to manage their own mental health and deal with any challenges that life may throw at them.

Your child's school also provides the following resources and services:

6) ***Completed following conversation with the Head Teacher of each school.***

7) ***Completed following conversation with the Head Teacher of each school.***

8) ***Completed following conversation with the Head Teacher of each school.***

These are some websites that might be helpful for your child to look at too:

Moodjuice

Moodjuice (**www.moodjuice.scot.nhs.uk**) is designed to help your child think about emotional problems and work towards solving them. There are booklets that your child can print off and work through in their own time. This website covers lots of different areas, which means they can look and see which ones apply to them.

Depression in Teenagers

Depression in Teenagers (**www.depressioninteenagers.com**) has a number of activities to help your child spot the signs and symptoms of depression. It gives self-help tips, advice on helping friends, and suggestions of where to go for further information, advice and support.

Stress and Anxiety in Teenagers

Stress and Anxiety in Teenagers (**www.stressandanxietyinteenagers.com**) will help your child to spot the signs and symptoms of stress and anxiety, and to take practical steps to deal with them.

Appendix 14
Parent/Guardian Opt-Out Form

Project Title: Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents Living in the West of Scotland

Parent Consent Form

*Please only sign and send the following form back to school if you **do not** want your child to participate in the research study:*

If you are NOT happy for your child to take part, please complete this section and return to your child's school:

Your name (print): _____

Your child's name (print): _____

Class Teacher: _____

Please sign: _____

Date: _____

Thank you for your help

Appendix 15
Participant Information Sheet

Project Title: **Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents Living in the West of Scotland**

Young Person Information Sheet

Introduction

My name is Rebecca Bower. I am a Trainee Clinical Psychologist at the University of Glasgow. I am required to undertake a research study as part of my training, and am doing so under the supervision of Dr Ross White and Dr Hamish McLeod, who are Senior Lecturers at the University of Glasgow. I would like to invite you to take part in our research project. This sheet includes information on why the research is being done and what it would involve.

What's it about?

We are asking you to take part in this research to see whether the 'Mental Health Continuum-Short Form (MHC-SF) is a valid and useful questionnaire to use to measure mental wellbeing with teenagers in Glasgow.

Why have I being invited to take part?

We want to know whether the MHC-SF is a good questionnaire to use with young people aged between 13 and 16 years old in Glasgow. To do that, we need to test the questionnaire with pupils in S2, S3 or S4 in secondary schools in the West of Scotland.

What will happen to me if I take part?

If you're up for taking part you will be asked to complete five questionnaires, which will take between 30-45 minutes to do. They will ask questions about your mental wellbeing, your general health and your strengths and difficulties. You will be asked to complete just one of these questionnaires (the Mental Health Continuum – Short Form) again two weeks later; this one will take a lot less time.

Do I have to take part?

Not at all, it's up to you. If you do, I will ask you to sign a form saying you agree to take part. You will be given a copy of this information sheet to keep. You are free to stop taking part at any time during the research without giving a reason.

What are the possible benefits of taking part?

If you take part you will be helping researchers and health professionals know whether the MHC-SF questionnaire is a valid and useful way of measuring mental wellbeing. This means that they will better be able to understand and improve the mental wellbeing of people the same age as you. We will also learn more about the overall mental wellbeing of teenagers your age in the West of Scotland.

Will anyone else know that I am participating?

We have already asked your parents if it's okay for you to take part, so they will know you have been invited to take part. Any information you give us will be kept without your name on it, so no-one will know what responses you have provided.

What should I do if completing these questionnaires makes me upset?

If you feel upset by any of the questionnaires that you complete, it's important that you have the opportunity to talk to someone about this. The best person might be your guidance teacher, parent or doctor, but they aren't the only people you can speak to. I have included a list of other supports that are available to you with this information sheet. Have a read over this to see which one might be best for you. It's important you seek help if you are upset.

Who is organising the research?

I am doing this research project as part of my course in clinical psychology at the University of Glasgow.

Has anyone approved the study?

The College of Medical, Veterinary and Life Sciences Ethics Committee at the University of Glasgow has looked over the study and approved it. The study has also been reviewed by the Council, who make decisions about what research is carried out in your school.

Thanks for reading this - please feel free to ask any questions you might have.

Rebecca Bower
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Glasgow
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Getting Support

This is a list of different ways you can get support for difficult feelings that may have come about from completing the questionnaires. Or, it may be that you have been concerned about your wellbeing for a while and wanted someone to speak to.

1) Your local GP (General Practitioner)

You can contact your GP if you are worried about your wellbeing. The Doctor will meet with you for a consultation, where they will assess your needs. They can make a referral to other services if they think that'd be helpful for you.https://www.google.co.uk/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjbnPnpz7bOAhUHuxQKHf5rBdwQjRwIBw&url=https%3A%2F%2Fwww.lgbtyouth.org.uk%2Fnews%2Fnational-lgbt-youth-awards-2012-closed&bvm=bv.129389765,d.ZGg&psig=AFQjCNHblMqMpQXx9l_eBjgRBLktVOYGuQ&ust=1470910773658593

2) NHS 24

You can contact NHS 24 at any time by calling **111**. You should use this number if your doctor's surgery is closed and you feel you can't wait until it re-opens.

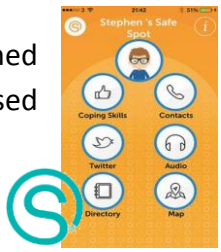
3) Breathing Space

You might find it helpful to speak to someone confidentially. Breathing Space is available to listen to any concerns you might have as a 'first step' in getting help and support. They can give you advice about where to access further support. You can contact them on **0800 83 85 87**.

4) Childline

You can talk to Childline in your own way and off the record, about whatever's getting to you or whatever is on your mind. They will support you, guide you, help you find ways to cope and help you make decisions that are right for you. You can contact them free and privately on **0800 1111** and speak to a friendly counsellor. You can also in to the website (www.childline.org.uk) and speak one-to-one with a counsellor, or email them.

5) 'Safe Spot' App



SafeSpot is an App that can be downloaded to your phone. It is designed to help you through tough spots. It will give you your own personalised coping plan, useful strategies and tools to help. The App will also give you information, advice and directions to local resources. The App

will help you manage your own mental health and deal with any challenges that life throw at you.

You can also use the supports available to you through your school:

6) ***Completed following conversation with the Head Teacher of each school.***

7) ***Completed following conversation with the Head Teacher of each school.***

8) ***Completed following conversation with the Head Teacher of each school.***

These are some websites that might be helpful to look at too:

Moodjuice

Moodjuice (**www.moodjuice.scot.nhs.uk**) is designed to help you think about emotional problems and work towards solving them. There are booklets you can print off and work through in your own time. This website covers lots of different areas. You can look and see which ones apply to you.

Depression in Teenagers

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Stress and Anxiety in Teenagers

Stress and Anxiety in Teenagers (**www.stressandanxietyinteenagers.com**) will help you to spot the signs and symptoms of stress and anxiety, and to take practical steps to deal with them.

Appendix 16

Participant Consent Form

Project Title: Psychometric Evaluation of the Mental Health Continuum-Short Form (MHC-SF) with Adolescents Living in the West of Scotland

Young Person Consent Form

*Please read the following statements and **circle 'yes' if you agree** or **'no' if you don't agree**:*

- Have you read (or had read to you) about this project? Yes / No
- Has somebody else explained this project to you? Yes / No
- Do you understand what this project is about? Yes / No
- Have you asked all the questions you want? Yes / No
- Have you had your questions answered in a way you understand? Yes / No
- Do you understand it's OK to stop taking part at any time? Yes / No
- Are you happy to take part? Yes / No

Please don't write your name if:

1) You have circled 'no' to <u>any</u> of the questions.
2) You don't want to take part.

If you <u>do</u> want to take part, please write your name below:

Your name: _____
Date:_____

The person who explained this project to you needs to sign too:

Print Name _____
Sign _____
Date _____

☺ Thank you for your help ☺

Appendix 17
Sample Size Calculation

There are multiple recommendations concerning what constitutes an adequately powered sample when conducting factor analysis. According to Comrey and Lee (1992), the sample used in this study (n=790) is 'very good' (>500). It meets several guidelines for minimum sample size, 150 (Hutcheson & Sofroniou, 1999), 200 (Guilford, 1954) and 250 (Cattell, 1978). Additionally, the sample satisfies sample size requirements based on Nunnally's (1978) subject-to-variable ratio of 10:1. Specifically, CFA carried out on 26-items, including those from the MHC-SF (14-items) and GHQ-12 (12-items), necessitates a minimum sample size of 260 (26x10) participants to achieve power. This study's sample is more than double the required size and is therefore adequately powered. The MHC-SF was completed at time point two by 605 participants; this exceeds the size of Petrillo et al.'s (2015) Italian sample, where 169 participants were included in test-retest analysis of the MHC-SF. It is also in excess of the sample (n=212) used for test-retest analysis in Clark et al.'s (2011) study, which examined the psychometric properties of a measure of mental wellbeing in a UK adolescent sample.