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Development of a 20-item Five Facet Mindfulness Questionnaire Short Form: Factorial confirmation, validity and reliability.

Ross B. Wilkinson[1] and Jichun Hao[2]

Abstract

Mindfulness has become a prominent clinical and research interest in psychology and self-report measures of dispositional mindfulness, such as the Five-Facet Mindfulness Questionnaire (FFMQ), have been widely adopted. While multiple short forms of the FFMQ have been developed, most are in languages other than English and few have had in-depth psychometric examinations. The current series of studies reports an independent confirmatory factor analysis of the FFMQ and the development of an English language, 20-item short form. The structure of the shortform was examined across multiple samples of university students (n= 939) and community members (n=508) and measurement invariance evaluated across age and gender. The Five-Facet Mindfulness Questionnaire – Newcastle Short Form (FFMQ-NSF) was found to retain the factorial structure of the FFMQ while retaining appropriate convergent and discriminant validity and test-retest stability. Results indicate that the FFMQ-NSF may be an efficient tool to assess dispositional mindfulness and its aspects in a wide range of individuals.

Keywords: Mindfulness, short-form, assessment, confirmatory factor analysis, invariance testing

1. Introduction

Interest in mindfulness interventions and individual differences in mindfulness has grown rapidly in recent years. Accordingly, more effort has been made to understand its operationalisation and conceptualisation in clinical and non-clinical populations. Existing self-report measures of dispositional mindfulness vary in their definition of mindfulness and psychometric properties. The Five Facet Mindfulness Questionnaire (FFMQ) developed by Baer and colleagues (Baer et al., 2006) has become one of the most widely used measures with established reliability and validity. However, there has been uncertainty expressed as to its factorial structure (Park, et al., 2013) and it has been criticised for its length and for the inclusion of problematic items (Watson-Singleton et al., 2018).

The aim of this project was four-fold: 1) To validate the factorial structure of the FFMQ with an Australian sample; 2) to develop an English language short form of the FFMQ with an Australian community sample, and to; 3) replicate the psychometric structure of this short form with an alternative Australian sample and to examine measurement invariance across age and gender; 4) to evaluate test-retest reliability. Three studies will be carried out for the four aims respectively.

1.1 Mindfulness

In the contemporary context, mindfulness has been defined as the "awareness that emerges through paying attention, on purpose, in the present moment, and non-judgmentally to things as they are" (Williams et al., 2007, p. 47). Both awareness and attention are argued to be key components of mindfulness. Awareness is the background state that detects and monitors inner processes such as emotions and cognitions, whereas attention involves actively and selectively bringing current experience to the focal point (Brown & Ryan, 2003). Bishop et al. (2004) named this combination of awareness and attention to the present moment 'self-regulated attention', the first component of their two-component model of mindfulness.

[1] School of Psychology, Behavioural Science Building, University of Newcastle, NSW 2308, Australia. Email: Ross.Wilkinson@newcastle.edu.au
[2] School of Psychology, University of Newcastle

The second component, acceptance, is a particular (i.e., non-judgmental, accepting, and curious) position towards these inner processes (Bishop et al., 2004). Traditionally this particular stance to experience is cultivated by meditation practice and refers to the noticing of and curiosity towards events in the stream of consciousness. Mindfulness has been related to intrapersonal processes ranging from creativity and personality to conscientiousness (Lebuda et al., 2015; Rau & Williams, 2016), as well as interpersonal processes, such as relationship satisfaction and communication (Davis & Hayes, 2011).

Despite its recent and widespread clinical adoption, discussion around the nature of mindfulness still spans the literature (Rau & Williams, 2016). Mindfulness has been seen as a dispositional trait, a flexible state, and/or a set of cultivated skills (Brown & Ryan, 2003; Schutte & Malouff, 2011). This is reflected in the diversity of the self-report measures and their underlying models that have emerged to assess mindfulness (Siegling & Petrides, 2016). Measures such as the Freiburg Mindfulness Inventory (FMI; Walach et al., 2006) and Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) are based on the idea that mindfulness is a unitary construct that centres on enhanced and receptive awareness. However, this one-factor conceptualisation has been criticised for being too simplistic and under-representative (Baer, et al., 2006). Instead, multidimensional measures, such as the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) and the Toronto Mindfulness Scale (TMS; Lau et al., 2006) are argued to be more appropriate. Overall, an agreement on the number of dimensions to best represent dispositional mindfulness has not been reached and further empirical examination of measurement factor structures in relation to the construct has been advocated (Rau & Williams, 2016).

1.2 The FFMQ

The FFMQ (Baer et al., 2006) is one of the most widely used self-report measures of dispositional mindfulness (Van Dam et al., 2018). It has 39 items selected from a factor analysis of items from five previously developed mindfulness questionnaires. It is comprised of five subscales or 'facets': Observing (Observe), Describing (Describe), Acting with Awareness (Awareness), Non-Judging of Inner Experience (Non-Judge), and Non-reactivity to Inner Experience (Non-React). Observe measures the extent to which one notices and attends to internal and external stimuli, including sensations, perceptions, thoughts, and feelings. Describe pertains to labelling internal experiences with words. Awareness stresses focusing on one's current activities, in contrast to automatic pilot. Non-Judge captures how one evaluates sensations, cognitions, and emotions. Lastly, Non-React represents allowing thoughts and feelings to come and go, without being absorbed in them. Based on confirmatory factor analyses (CFA), these five facets have been found to correlate with each other, or alternatively, load on one, second-order general mindfulness factor (Baer et al., 2006). However, some questions remain over the adequacy of Baer et al.'s CFAs given that they were based on a relatively small sample of 268 university students and the parcelling of items (Tran et al., 2013).

A review of extant mindfulness measures concluded, from 12 studies using the FFMQ, that its internal consistency and construct validity were adequate, with internal consistency coefficients for the five subscales ranging from .67 to .93 (Park et al., 2013). However, there was less clarity around its factor structure, especially with respect to Observe (Park et al., 2013). It has been reported that this facet has low (Giovannini, et al., 2014; Tran et al., 2013) or non-significant (Baer et al., 2006) factor loadings on the overall mindfulness factor in different samples.

1.3 Short Forms of the FFMQ

To date there are six published short versions of the FFMQ. Bohlmeijer, et al. (2011), examining the FFMQ on a Dutch clinical sample with depression (n = 376), found that neither the correlated five-factor model nor the hierarchical model met the criteria for a good fit. They selected 24 items for a short form resulting in an improved model fit. Tran et al. (2013) tested a German version on an Austrian community sample (n = 640) followed by an Austrian student sample (n = 333). They argued that some items in the FFMQ were redundant due to their overlapping content (such as items 2 with 37, and items 12 with 16) and that the item parcelling used by Baer et al. (2006) possibly obscured the weak psychometric properties of some items. They developed a 20-item short form with the correlated five-factor model demonstrated satisfactory fit in both samples.

Hou, et al. (2013) translated the FFMQ into Chinese and developed a 20-item short form in Hong Kong, which was tested in a community sample (n = 230) with some (30%) with meditation experience and a clinical sample (n = 156) with no meditation experience. Hou et al. noted some items in Non-Judge and Non-React had poor factor loadings but didn't specify the items or the size of the loadings. Two non-significant facet inter-correlations were found between Observe and Awareness and between Describe and Non-Judge for both samples.

For both samples, the correlated model was also a better fit than the hierarchical model. Duan and Li (2016) tested the FFMQ on community and student samples from China, and reduced the scale to a 12-item, three-facet (Describe, Awareness, and Non-Judge) inventory. Their analysis yielded an acceptable fit for both the hierarchical and correlated model, but still with three factor loadings below .40.

Gu et al. (2016) tested a 15-item FFMQ on a British clinical sample (n = 238) before and after a Mindfulness based cognitive therapy program. The best fitting model, pre-intervention, was the correlated five-factor model, but post-intervention, both the hierarchical four-factor model and the correlated four-factor model were a better fit. However, the small number of items in this version may limit the reliability and stability of subscale scores. Finally, Watson-Singleton et al. (2018) recruited a clinical sample of African Americans (n = 283) and selected 20 items for their short form. Their results demonstrated an acceptable model fit for the correlated model, but low test-retest reliability over six weeks, ranging from .22 to .54 for the five facets.

The majority of the short forms were developed with non-English speaking samples, with the exception of Gu et al. (2016) and Watson-Singleton et al. (2018). However, these two versions were based on clinical samples, which may limit their suitability for non-clinical samples. More importantly, across the six short forms there is a lack of convergence with respect to the items employed, except for Item 30 (see Appendix A for a comparison of the items from the six different short forms of the FFMQ) and it remains unclear which items from the FFMQ should comprise a short form suitable for general use.

Importantly, no short form has been cross-validated on an alternative sample by establishing measurement invariance with multi-group CFA. Before a measure can be employed in different populations, researchers must demonstrate that the instrument operates in the same way, or has similar factorial structures, across different groups, but this practice is often ignored by researchers (Byrne & Campbell, 1999). Lastly, a handful of studies reporting the test-retest reliability of the FFMQ and short forms, measured from two weeks to four months apart, provide inconclusive evidence of its stability. Reliability estimates ranged from .44 to .72 for Awareness, .54 to .74 for Observe, .22 to .81 for Describe, .32 to .84 for Non-Judge, and .24 to .64 for Non-React (e.g., Hou et al., 2014; Watson-Singleton et al., 2018). Estimates of test-retest stability over a longer time frame will be of further importance for the use of any newly developed short-form that purports to measure consistent characteristics.

1.4 The Current Research

The aim of this research is to develop a reliable and valid short form of the FFMQ that can be employed with non-clinical populations. To accomplish this, three studies will be presented. Firstly, an empirical basis for selecting items for the short form will be established by confirming the factor structure of the full FFMQ with data from an Australian sample. Secondly, the factor structure of the new shortform will be evaluated and then confirmed with an independent sample. Thirdly, measurement invariance across gender and age groups will be evaluated to establish the measure's structure in different sub-samples. Finally, test-retest data will be evaluated to establish stability of the short form and its subscales over a six-month period.

2. Study One

The aim of this study is to confirm the structure of the full scale FFMQ based on an Australian student and community sample (Sample 1).

2.1 Method

2.1.1 Procedure.

Ethical approval was granted by the University of Newcastle Human Research Ethics Committee (H-2014-0210, H-2016-0138). Participants' responses to the FFMQ were collected as part of a larger, online study on relationships and psychological health. Eligible undergraduate psychology students were recruited through a university online system and received credit for participation. Participants from the general population were recruited via the Hunter Medical Research Institute volunteer register, the Relationships and Psychological Health (RAPH) Lab website and Facebook posts. Volunteers from the general population were given the option of being entered in a lottery for a AUD$50 gift voucher. Participation was restricted to Australian residents aged 18 years or older. The questionnaire was administered using LimeSurvey software on a local server. In addition to the FFMQ, participants completed other self-report measures along with questions on demographic and background information. Completion time was approximately 45 minutes with a full completion rate of 72%.

2.1.2 Participants.

After data screening, 511 participants remained (400 females). Among them, 214 were undergraduate psychology students and 297 were members of the general population. Their mean age was 31.3 years (range = 18 to 82 years). The majority identified as European Australian (n = 429) and did not regularly meditate (n = 442).

2.1.3 Measures.

The FFMQ contains 39 items answered on a 1 ('never or very rarely true') to 5 ('very often or always true') point scale to measure the five facets of dispositional mindfulness: Observe (8 items), Describe (8 items), Awareness (8 items), Non-Judgement (8 items), and Non-Reactivity (7 items). Scale scores were calculated by recoding as necessary and summing all the items in that subscale (Baer et al., 2006). Higher scores reflect a higher level of trait mindfulness. Baer et al. (2006) have shown support for the construct validity of the FFMQ, and the subscales have been found to have acceptable to excellent internal consistency (a =.75 to .91, Baer et al., 2006). An overall Mindfulness score has been posited based on either all five facets or four facets, excluding Observe (Baer et al., 2006; Williams et al., 2014).

2.1.4 Data analysis.

Data were screened for univariate and multivariate outliers using the procedures outlined by Tabachnick and Fidell (2007) and Byrne (2012). SPSS version 26 was used to prepare the data. CFAs were conducted using Mplus 8 (Muthén&Muthén, 2012). Because individual items rather than packets were employed, the weighted least squares mean- and variance-adjusted estimator (WLSMV) was employed as it is more suitable for ordered-categorical items with five or less answer options (Bandalos, 2014; Finney & DiStefano, 2006). The tested models were evaluated using several fit indices including the comparative fit index (CFI, Bentler, 1990), the χ^2, the root mean squared error of approximation and its 90% confidence interval (RMSEA, 90%CI, Browne &Cudeck, 1993), and the Tucker-Lewis Index (TLI, Tucker & Lewis, 1973),along with factor weights and structural covariances. Hu and Bentler (1999) recommended cut-off values of .95 for CFI and TLI and .06 for RMSEA as indicating good fit. Browne and Cudeck (1993) suggest less stringent standards of CFI greater than .90 and RMSEA lower than .08 as indicating acceptable fit. We applied the common rule of thumb that differences in fit-indices of > .009 for the CFI and TLI indicate meaningful differences in model fit between nested models (Byrne, 2012; Schermelleh-Engel et al., 2003). We planned to test five models: a single factor model where all items load on one mindfulness factor; a 5-factor model where the items load on their proposed five factors with covariances freed between the factors; a 5-factor model as above with covariances between Observe and the other factors fixed to zero; a hierarchical model where the five factors further load on a second-order mindfulness factor; a bi-factor model with the five factors and a global mindfulness factor.

2.2 Results

FFMQ scale descriptive statistics are reported in Table 1. The means and standard deviations are similar to those reported by Baer et al. (2008). As can be seen from Table 2, the single factor model was clearly an unacceptable fit. The 5- factor model was an acceptable fit with the RMSEA close to .060, and both the CFI and TLI below .9. However, the modification indices indicated that freeing the residual covariances between items 5 and 13, and items 34 and 38, could improve model fit. As these items are all on the Awareness facet and have similar themes, we felt it acceptable to include these covariances as reflecting wording similarity without violating the integrity of the measurement model. Freeing these residual covariances (5-factor modified model) substantially improved model fit (ΔCFI and ΔTLI > .01). Thus, this modification was included in all further item level CFAs of the FFMQ.

The model with correlations between Observe and the other facets fixed at zero (4+1-factor) was an unacceptable fit, supporting the inclusion of Observe as part of the FFMQ measurement structure. Thus, we saw no reason to exclude Observe from further CFAs. Neither the 5-factor hierarchical model nor the bi-factor model improved model fit over the 5-factor model. However, while the correlations between the factors (Table 3) in the 5-factor model are only small to moderate in size (.141 to .492), when considered as factor loadings in the hierarchical model they range from moderate (.449) to strong (.722). In conjunction with the acceptable hierarchical and bi-factor model fit statistics, this indicates that the measurement model with a global 'Mindfulness' factor should still be considered viable.

For the sake of comparison, we also conducted a CFA of a 5-factor model using parcels of items and employing maximum likelihood estimation similar to that conducted by Baer et al. (2006). This model was also an acceptable fit, χ^2 = 261.06 (df = 80, p<.001), RMSEA = .067 (90%CI = .058-.076, p>.001), CFI = .956, TLI = .943.

2.3 Conclusion

Using an item-level CFA approach to evaluating the fit of the various models to this data, we conclude that, similar to Baer et al (2006), the correlated 5-factor (or facet) model best represents the measurement structure. This provides a replication of a number of studies evaluating the structure of the FFMQ across a number of different populations. However, both the bi-factor model and the hierarchical models also produced acceptable fits, suggesting that the use of a global mindfulness score is also supportable. Standardised loadings for the 5-factor model are presented in Table 4.

Table 1 *Descriptive Statistics for the FFMQ and its Facets*

Scale	Mean	SD	Skewness (SE)	Kurtosis (SE)
Observe	26.53	5.33	-.064 (.108)	.037 (.216)
Describe	27.57	6.54	-.129 (.108)	-.438 (.216)
Act with Awareness	25.36	5.47	-.076 (.108)	-.046 (.216)
Non-Judgement	26.58	6.75	-.288 (.108)	-.201 (.216)
Non-Reactivity	21.57	4.64	-.117 (.108)	-.062 (.216)
Total	127.61	19.71	.017 (.108)	.375 (.216)

Table 2 *FFMQ CFA Fit Statistics*

Model	χ^2 (df, *p)*	RMSEA (90% CI, *p)*	CFI	TLI
1-factor	8934.659 (702, <.001)	.151 (149-.154, <.001))	.583	.560
5-factor	2021.630 (692, <.001)	.061 (.058-.064, <.001)	.933	.928
5-factor modified*	1781.023 (690, <.001)	.056 (.052-.059, < .001)	.945	.941
4+1-factor	2857.597 (6943, <.001)	.078 (.075-.081, <.001)	.891	.883
5-factor hierarchical	1914.978 (695, <.001)	.059 (.055-.062, <.001)	.938	.934
Bifactor	1919.855 (665, <001)	.061 (.058-.064, <.001)	.936	.929

* Item 38 with 34 and Item 5 with 13

Table 3 *FFMQ 5-Factor Modified Model Facet Correlations*

	Observe	Describe	Act with Awareness	Non-Judgement
Describe	.393			
Act with Awareness	.223	.409		
Non-Judgement	.141	.361	.475	
Non-Reactivity	.435	.351	.478	.492

Table 4 *Standardised FFMQ 5-Factor CFA Loadings*

Item	Observe	Describe	Act with Awareness	Non-Judgement	Non-Reactivity
15. I pay attention to sensations, such as the wind in my hair or sun on my face.	.789				
36. I pay attention to how my emotions affect my thoughts and behaviour.	.715				
20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.	.677				
31. I notice visual elements in art or nature, such as colours, shapes, textures, or patterns of light and shadow.	.621				
26. I notice the smells and aromas of things.	.605				
6. When I take a shower or bath, I stay alert to the sensations of water on my body.	.597				
1. When I'mwalking, I deliberatelynotice the sensations of my body moving.	.570				
11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.	.416				
12. It's hard for me to find the words to describe what I'm thinking.		.899			
16. I have trouble thinking of the right words to express how I feel about things.		.875			
37. I can usually describe how I feel at the moment in considerable detail.		.839			
7. I can easily put my beliefs, opinions, and expectations into words.		.834			
2. I'm good at finding words to describe my feelings.		.801			
22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.		.789			
27. Even when I'm feeling terribly upset, I can find a way to put it into words.		.767			
32. My natural tendency is to put my experiences into words.		.713			
8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.			.819		
18. I find it difficult to stay focused on what's happening in the present.			.786		
13. I am easily distracted.			.763		
23. It seems I am "running on automatic" without much awareness of what I'm doing. I			.757		
28. I rush through activities without being really attentive to them.			.743		

Item	Observe	Describe	Act with Awareness	Non-Judgement	Non-Reactivity
38. I find myself doing things without paying attention.			.722		
5. When I do things, my mind wanders off and I'm easily distracted.			.704		
34. I do jobs or tasks automatically without being aware of what I'm doing.			.587		
30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.				.884	
14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.				.860	
35. When I have distressing thoughts or images, I judge myself as good or bad, depending on what the thought/image is about.				.810	
39. I disapprove of myself when I have irrational ideas.				.809	
25. I tell myself that I shouldn't be thinking the way I'm thinking.				.803	
3. I criticize myself for having irrational or inappropriate emotions.				.769	
10. I tell myself I shouldn't be feeling the way I'm feeling.				.738	
17. I make judgments about whether my thoughts are good or bad.				.685	
9. I watch my feelings without getting lost in them.					.760
24. When I have distressing thoughts or images, I feel calm soon after.					.731
29. When I have distressing thoughts or images, I am able just to notice them without reacting.					.704
33. When I have distressing thoughts or images, I just notice them and let them go.					.702
19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.					.678
21. In difficult situations, I can pause without immediately reacting.					.651
4. I perceive my feelings and emotions without having to react to them.					.588

3. Study Two

The aim of this study is to develop a 20-item, English language short form of the FFMQ that is consistent with the long-form with respect to measurement structure, validity, and reliability.

3.1 Method

The data employed are the responses to the full FFMQ collected from the participants described in Study One. Item selection for the short form was based on a consideration of previously published FFMQ short forms (See Appendix B for a comparison of item inclusions) and criteria such as a maximum of four items per facet, content coverage, size of item loadings (>.60) from the full form CFA, adequacy of model fit, and minimal cross-loadings (Marsh et al., 2005). Table 6 shows the items selected for inclusion in the Five-facet Mindfulness Questionnaire – Newcastle Short-Form (FFMQ-NSF). The Cronbach's α coefficients were similar to those generated by the full scale version: Awareness = .83, Describe = .89, Non-React = .75, Non-Judge = .87, Observe = .77, and Mindfulness = .86. To check the convergent and discriminate validity of the short form, responses from a number of other self-report measures from Study One are included here for comparison.

The Self-Compassion Scale Mindfulness Subscale (SCS-M) (Neff, 2003) is a 4-item measure of mindfulness versus 'over-identification' as a component of self-compassion. Items are rated on a scale from 1 (Almost Never) to 5 (Always Always) and content represents responses of equanimity and curiosity with respect to experiences. Neff (2003) reports good reliability (α = .75) and validity of the overall scale and its subscales.

The Difficulties in Emotion Regulation Scale(DERS) (Gratz & Roemer, 2004) is a 36-item measure of emotion regulation deficits. Each item is rated for frequency on a scale from 1 (almost never) to 5 (almost always). Internal consistency for the total scale is very high (α = .93) and correlations with negative behavioural outcomes support its validity (Gratz & Roemer, 2004).

The Depression Anxiety Stress Scales 21 (DASS-21) is a 21-item measure of negative emotional symptoms. Each item is rated on a 4-point scale from 0 (Did not apply to me at all) to 3 (Applied to me very much, or most of the time). The total scale is considered a reliable (α >.90) and valid indicator of overall psychological distress (Lovibond & Lovibond, 1995).

3.2 Results

The same approach to CFA was employed as that reported in Study One. Similar to the CFA for the full scale, freeing the covariance between items 5 and 13 produced a well-fitting model although this did not produce a significant change in the CFI compared to either the unmodified 5-factor model or the hierarchical model (Table 5). It is notable that the bi-factor model was an unsatisfactory fit for the short-form, unlike for the full form. Table 6 shows that no factor loading was below .648. Table 7 shows the pattern of correlations between the facets for the 5-factor modified model. Observe is moderately correlated with Non-Reactivity but weakly correlated with the other facets. The correlations between the other facets are moderate.

Table 8 shows the intercorrelations between the FFMQ-NSF total score, facet totals, and the validity measures. The total score shows strong convergent validity with the SCS-M and strong discriminant validity with the incompatible constructs of emotion dysregulation (DERS) and psychological distress (DASS21). Observe has the weakest validity pattern with the poorest level of discriminant validity with the DERS and DASS21 and low convergent validity with the SCS-M. The remaining FFMQ-NSF facets were moderately to strongly correlated with the DERS and DASS21, although the Act with Awareness facet showed poor convergence with the SCS-M. Non-Reactivity has the strongest relationship of the mindfulness facets with the SCS-M scale, consistent with the equanimity theme of both subscales.

3.3 Conclusion

The items selected for the short form produced a CFA consistent with the full form of the FFMQ. The resulting facets and total score demonstrated good to high internal consistency. Further, the facets and total score, with the exception of Observe, demonstrated appropriate convergent and discriminant validity with other measures of mindfulness, emotion regulation, and psychological distress.

Table 5 *FFMQ-NSF CFA Fit Statistics*

Model	χ^2 (df, *p)*	RMSEA (90% CI, *p)*	CFI	TLI
1-factor	4104.230 (170,<.001)	.213 (.207-.218, <.000)	.633	.590
5-factor	463.34 (160, < .001)	.061 (.054-.067, =.003)	.972	.966
5-factor modified	385.92 (159, < .001)	.053 (.046-.060, =.235)	.979	.975
5-factor hierarchical	476.92 (165,<.001)	.061 (.054-.067, =.003)	.971	.967
Bi-factor	1488.52 (159, <.001)	.128 (.122-.134, <.000)	.876	.852

Table 6 *Standardised FFMQ-NSF 5-Factor Model CFA Loadings*

Item Number (Original Item Number)	Observe	Describe	Act with Awareness	Non-Judgement	Non-Reactivity
6 (15). I pay attention to sensations, such as the wind in my hair or sun on my face.	.790				
10 (20). I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.	.761				
13 (26). I notice the smells and aromas of things.	.682				
15 (31). I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.	.650				
2 (7). I can easily put my beliefs, opinions, and expectations into words.		.821			
4 (12). It's hard for me to find the words to describe what I'm thinking. (R)		.916			
9 (16). I have trouble thinking of the right words to express how I feel about things. (R)		.896			
18 (37). I can usually describe how I feel at the moment in considerable detail.		.776			
1 (5). When I do things, my mind wanders off and I'm easily distracted. (R)			.830		
5 (13). I am easily distracted. (R)			.877		
7 (18). I find it difficult to stay focused on what's happening in the present. (R)			.772		
19 (38). I find myself doing things without paying attention. (R)			.650		
12 (25). I tell myself that I shouldn't be thinking the way I'm thinking. (R)				.800	
14 (30). I think some of my emotions are bad or inappropriate and I shouldn't feel them. (R)				.888	
17 (35). When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about. (R)				.822	
20 (39). I disapprove of myself when I have irrational ideas. (R)				.818	
3 (9). I watch my feelings without getting lost in them.					.743
8 (19). When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.					.672
11 (24). When I have distressing thoughts or images, I feel calm soon after.					.712
16 (33). When I have distressing thoughts or images, I just notice them and let them go.					.648

Table 7 *FFMQ-NSF 5-Factor Model Factor Correlations*

	Observe	Describe	Act with Awareness	Non-Judgement
Describe	.245			
Act with Awareness	.109	.407		
Non-Judgement	.191	.374	.387	
Non-Reactivity	.395	.383	.472	.525

Cronbach's alphas reported on diagonals. All correlations are significant at .05.

Table 8 *FFMQ-NSF Total, Facet, Convergent, and Discriminant Validity Correlations*

Scale	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Total	*.863*								
2. Observe	.508*	*.770*							
3. Describe	.682*	.195*	*.888*						
4. Act with Awareness	.652*	.078	.345*	*.823*					
5. Non-Judgment	.695*	.140*	.318*	.324*	*.871*				
6. Non-Reactivity	.708*	.302*	.303*	.364*	.411*	*.742*			
7. SCS – Mindfulness	.617*	.296*	.365*	.298*	.438*	.632*	*.850*		
8. DERS	-.717*	-.183*	-.497*	-.470*	-.618*	-.541*	-.636*	*.944*	
9. DASS21	-.519*	-.066	-.270*	-.410*	-.499*	-.343*	-.482*	.668*	*.931*

* p<.01; Cronbach's alphas in italics on diagonal. SCS = Self-Compassion Scale (Neff, 2003), DERS = Difficulties in Emotion Regulation Scale (Gratz & Roemer, 2004), DASS21 = Depression Anxiety Stress Scale 21 item version (Lovibond & Lovibond, 1995)

4. Study Three

The aim of this study is to replicate the measurement structure of the FFMQ-NSF in an independent sample, to establish measurement invariance with respect to sample, age, and gender, and to assess test-retest reliability.

4.1 Method

The data employed comes Study One (Sample 1) and from a combination of participant responses to the FFM-NSF from three online studies conducted between 2015 and 2019 (Samples 2 and 3). Ethical approval was granted by the University of Newcastle Human Research Ethics Committee (H-2016-0177, H-2018-0141, H-2018-0293). For Sample 2, 936 undergraduate students (n = 725) and general community members (n = 211) between the ages of 18 and 57 (Mean = 22.11, SD = 5.50) participated. Of this total sample 746 (79.7%) were female and 190 (20.3%) were male. Participants responded to the FFMQ-NSF as part of longer questionnaires measuring a range of constructs. Only responses to the FFM-NSF will be examined here. Participants in Sample 3 were 90 undergraduate students (Female = 56) aged between 18 and 28 years who completed the FFMQ-NSF online on two occasions approximately six months apart as part of a larger study.

A multi-group, CFA-based, measurement invariance testing approach was employed to establish whether the modified 5-factor measurement model for Sample 1 data is replicated in the independent, Sample 2 data set, and whether there are significant age and gender differences in the FFMQ-NSF measurements for the combined samples. Comparisons of increasingly restrictive, nested equivalence models were carried out through a series of analyses to evaluate measurement invariance (Byrne, 2008; Cheung &Rensvold, 2002). The first step evaluated evidence for 'configural' invariance, requiring that the number of factors, and the items that load on to each factor, were similar across groups. In the next step 'metric' invariance was evaluated by comparing the fit of the configural invariance model to the fit of a nested model in which the factor loadings were constrained equal across groups.

The absence of a meaningful decrement in fit between the configural invariance model and more constrained model supports metric invariance. Finally, 'scalar' invariance was evaluated by additionally constraining item intercepts and comparing model fit to the metric model. A finding that the metric and scalar models do not differ meaningfully in fit supports scalar invariance. A meaningful decrement in model fit between models was based on a criterion of ΔCFI > .01 (Cheung &Rensvold, 2002).

4.2 Results

The configural model fit statistics for the comparison between Sample 1 and Sample 2 indicated that the 5-factor modified model was a good fit to the data and that the measurement structure is similar across both data sets (Table 9). Table 10 shows the factor intercorrelations produced for Sample 2. Increasing the restriction of equivalence to scalar produced no meaningful decrement in model fit (configural versus scalar ΔCFI <.01). Thus, we conclude that the samples produce the same factor and item configuration, item loadings and item intercepts and that appropriate measurement invariance is established. After combining Samples 1 and 2, we also established measurement invariance with respect to both age and gender (Tables 11 and 12 respectively). Table 13 presents norms for the FFMQ-NSF based on the combined samples.

To establish measurement stability over time, both Pearson and intra-class, test-retest correlations (ICCs) for the two administrations of the FFM-NSF with Sample 3 were conducted (Table 14). Single measures ICCs are reported. Following Cicchetti (1994), values between .60 and .74 were interpreted as good and values >.75 as excellent. The test–retest reliabilities of the FFMQ facets and total scores ranged from good to excellent with single measure ICCs ranging from .622 (Observe) to .88 (Describe). Paired samples *t* tests showed no significant changes in scores over time.

4.3 Conclusion

The results of the Study 3 show that the FFMQ-NSF produced measurement invariant results when comparing two samples of responses. Thus, the acceptable measurement characteristics of the FFMQ-NSF were replicated with a large independent sample. Further, using the combined sample, the FFMQ-NSF was found to be measurement invariant with respect to both age and gender. Importantly, the FFMQ-NSF scales all produced good internal consistency and an appropriate level of stability over a six-month period.

Table 9 FFMQ-NSF – *Sample 1 (n = 511) versus Sample 2 (n = 936) Measurement Invariance CFA Fit Statistics*

Model	χ^2 (df, *p)*	RMSEA (90% CI, *p)*	CFI	TLI	Δ CFI
Configural	1081.28 (318, <.001)	.058 (.054-.061, <.001)	.968	.962	-
Metric	1097.88 (333, <.001)	.056 (.053-.060, =.002)	.968	.964	.000
Scalar	1314.57 (388, <.000)	.057 (.054-.061, <.001)	.961	.962	.007

Table 10 FFMQ-NSF 5-Factor Model Factor Correlations for the combined samples

	Observe	Describe	Act with Awareness	Non-Judgement
Describe	.156			
Act with Awareness	-.070	.408		
Non-Judgement	-.041	.308	.459	
Non-Reactivity	.253	.298	.309	.442

Item 5 with Item 13 = .604

Table 11 *FFMQ-NSF – Younger (< 22 years; n = 745) versus Older (n = 702) - Measurement Invariance CFA Fit Statistics*

Model	χ^2 (df, *p)*	RMSEA (90% CI, *p)*	CFI	TLI	Δ CFI
Configural	1092.84 (318, <.000)	.058 (.054-.062, <.001)	.968	.962	-
Metric	1095.39 (333, <.001)	.056 (.053-.060, =.003)	.968	.964	.000
Scalar	1200.27 (388, <.000)	.054 (.050-057, =.035)	.966	.967	.002

Table 12 *FFMQ-NSF – Female (n = 1146) versus Male (n = 301) - Measurement Invariance CFA Fit Statistics*

Model	χ^2 (df, *p)*	RMSEA (90% CI, *p)*	CFI	TLI	Δ CFI
Configural	1008.86 (318, <.000)	.055 (.051-.059, =.019)	.971	.965	-
Metric	1027.49 (333, <.001)	.054 (.050-.057, =.051)	.971	.966	.000
Scalar	1086.98 (388, <.000)	.050 (.046-053, =.513)	.970	.971	.001

Table 13 *Norms and reliabilities for the FFMQ-NSF Scales based on the combined samples (N=1447)*

Statistic	Mindfulness	Observe	Describe	Act with Awareness	Non-Judgement	Non-Reactivity
Mean	62.97	13.68	13.30	11.39	12.32	11.85
SD	9.92	3.21	3.27	3.13	2.05	2.91
Cronbach's α	.836	.777	.846	.816	.810	.746

Table 14 *FFMQ-NSF Test-retest (6 months) Pearson and Intra-class Test-retest (6 months) Correlations for Sample 3*

Scale	Pearson Coefficient	Intra-Class Coefficient *
Mindfulness	.746	.741
Observe	.628	.622
Describe	.792	.788
Act with Awareness	.641	.639
Non-Judgement	.680	.675
Non-Reactivity	.638	.633

*Two-way random effects using absolute agreement

5. General Discussion

The primary aim of this research was to develop an English language, 20-item short form of the FFMQ that had sufficient items and psychometric properties to be comparable in structure and measurement characteristics to the 39-item version. We conclude that this was successfully achieved. Using the full version of the FFMQ with an Australian sample of community and university student volunteers, the 5-factor structure proposed by Baer et al. (2006) was supported using an item level CFA. Further, models with one second-order global mindfulness factor or a separate mindfulness bi-factor were also supported. These results are consistent with a number of other studies reporting similar results across a range of language groups (e.g., Christopher et al., 2012; Giovannini, et al., 2014; Gu et al., 2016; Hou et al., 2013) but inconsistent with other studies that have not found support for the FFMQ structure (e.g., Bohlmeijer et al., 2011).

On the basis of the successful replication of the 39-item version, items loadings generated in the CFA, the range of items employed in extant short forms of the FFMQ, and domain sampling considerations, 20-items were selected for inclusion in the FFMQ-NSF. The 5-factor and hierarchical structures were supported, but not the bi-factor model, in the CFAs. Item loadings were all above .60, factor interrelationships were similar to the full form, and reliabilities for the facets and total score were good. The short form scales, except for Observe, all showed appropriate convergent and discriminant validity against measures of mindfulness, emotion regulation, and psychological symptoms.

In the final study, the factor structure of the FFMQ-NSF was replicated in a large, independent sample of community and student participants. Scalar level measurement invariance was demonstrated across the two samples indicating that the measurement model was effectively equivalent. Using the combined samples, multi-group CFAs demonstrated that the measurement model performed similarly across sub-samples of gender and age with no differences in item loadings or mean structure. Finally, results of the test-retest sub-study showed an appropriate level of stability for the FFMQ-NSF across a six-month period.

While this series of studies have provided initial support for the FFMQ-NSF, more work remains to be done. The participants employed in the current studies were predominantly non-meditators as there were insufficient numbers to adequately examine differences in measurement structure across non-meditators and meditators.

This remains an important issue as previous research has shown that the Observe facet appears to operate quite differently in samples of experienced meditators (Baer et al., 2008). Further work also needs to be done in evaluating the performance of the FFMQ-NSF in clinical and/or cross-cultural samples. Studies where responses to the FFMQ and it short forms are quantitatively compared across diagnostic, cultural, and language groups are required to demonstrate that dispositional mindfulness and its facets are self-reported in similar ways. Until measurement equivalence is established it is inadvisable to make comparisons between different groups when it has not been established that the FFMQ, or its derivatives, are measuring the same constructs in the same way.

5.1 Conclusion

The FFMQ-NSF appears to be a reliable and valid measure of mindfulness and its facets that is comparable to the full form FFMQ in psychometric qualities. It is hoped that by almost halving the number of items in the measure, while retaining its psychometric quality and utility, researchers and clinicians will be encouraged to use this efficient version of the FFMQ to assess and track characteristic aspects of mindfulness and how they relate to other constructs.

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Appendix A *Comparison of the Items of the Six Short Forms of the FFMQ*

Items	Bohlmeijer et al. (2011) (k = 24)	Tran et al. (2013) (k = 20)	Hou et al. (2014) (k = 20)	Gu et al. (2016) (k = 15)	Duan & Li (2016) (k = 12)	Watson-Singleton et al. (2018) (k = 20)
1.When I'm walking, I deliberately notice the sensations of my body moving.						
2. I'm good at finding words to describe my feelings.	X		X	X	X	X
3.I criticize myself for having irrational or inappropriate emotions.						
4. I perceive my feelings and emotions without having to react to them.						
5. When I do things, my mind wanders off and I'm easily distracted.		X	X		X	X
6. When I take a shower or bath, I stay alert to the sensations of water on my body.				X		X
7. I can easily put my beliefs, opinions, and expectations into words.	X		X		X	X
8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.		X	X	X	X	X
9. I watch my feelings without getting lost in them.	X	X				X
10. I tell myself I shouldn't be feeling the way I'm feeling.	X		X	X		
11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.				X		
12. It's hard for me to find the words to describe what I'm thinking.	X					
13. I am easily distracted.		X	X		X	X

Items	Bohlmeijer et al. (2011) (k = 24)	Tran et al. (2013) (k = 20)	Hou et al. (2014) (k = 20)	Gu et al. (2016) (k = 15)	Duan & Li (2016) (k = 12)	Watson-Singleton et al. (2018) (k = 20)
14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.		X		X		
15. I pay attention to sensations, such as the wind in my hair or sun on my face.	X	X	X	X		X
16. I have trouble thinking of the right words to express how I feel about things		X		X		
17. I make judgments about whether my thoughts are good or bad.	X		X		X	X
18. I find it difficult to stay focused on what's happening in the present.	X	X			X	X
19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	X	X	X	X		
20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.	X	X	X			X
21. In difficult situations, I can pause without immediately reacting.		X	X			
22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.	X	X				
23. It seems I am "running on automatic" without much awareness of what I'm doing.	X					
24. When I have distressing thoughts or images, I feel calm soon after.	X	X	X			
25. I tell myself that I shouldn't be thinking the way I'm thinking.	X	X	X		X	X
26. I notice the smells and aromas of things.	X	X	X			X
27. Even when I'm feeling terribly upset, I can find a way to put it into words.	X		X	X	X	X
28. I rush through activities without being really attentive to them.	X					
29. When I have distressing thoughts or images I am able just to notice them without reacting.	X			X		X
30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.	X	X	X	X	X	X
31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.	X	X	X			
32. My natural tendency is to put my experiences into words.		X	X		X	X

Items	Bohlmeijer et al. (2011) (k = 24)	Tran et al. (2013) (k = 20)	Hou et al. (2014) (k = 20)	Gu et al. (2016) (k = 15)	Duan & Li (2016) (k = 12)	Watson-Singleton et al. (2018) (k = 20)
33. When I have distressing thoughts or images, I just notice them and let them go.	X		X	X		X
34. I do jobs or tasks automatically without being aware of what I'm doing.	X			X		
35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.		X			X	X
36. I pay attention to how my emotions affect my thoughts and behavior.						
37. I can usually describe how I feel at the moment in considerable detail.		X				X
38. I find myself doing things without paying attention.	X		X	X		
39. I disapprove of myself when I have irrational ideas.	X					

Appendix B *Five Facet Mindfulness Questionnaire - Newcastle Short Form (FFMQ-NSF)*

Item	**Scale**	**Original Item No.**
1. When I do things, my mind wanders off and I'm easily distracted.*	A	5
2. I can easily put my beliefs, opinions, and expectations into words.	D	7
3. I watch my feelings without getting lost in them.	NR	9
4. It's hard for me to find the words to describe what I'm thinking.*	D	12
5. I am easily distracted.*	A	13
6. I pay attention to sensations, such as the wind in my hair or sun on my face.	O	15.
7. I find it difficult to stay focused on what's happening in the present.*	A	18.
8. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	NR	19.
9. I have trouble thinking of the right words to express how I feel about things*	D	16.

10. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.	O	20.
11. When I have distressing thoughts or images, I feel calm soon after.	NR	24.
12. I tell myself that I shouldn't be thinking the way I'm thinking.*	NJ	25.
13. I notice the smells and aromas of things.	O	26.
14. I think some of my emotions are bad or inappropriate and I shouldn't feel them.*	NJ	30.
15. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.	O	31.
16. When I have distressing thoughts or images, I just notice them and let them go.	NR	33.
17. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.*	NJ	35.
18. I can usually describe how I feel at the moment in considerable detail.	D	37.
19. I find myself doing things without paying attention.*	A	38.
20. I disapprove of myself when I have irrational ideas.*	NJ	39.

* = reversed coded, A = Act with Awareness, D = Describe, NR = None-React, 0 = Observe, NJ = Non-Judge