Abstract

Mindfulness, namely present-oriented attention that is non-judgmental in nature, and grit, namely perseverance and passion for long term goals, are psychological constructs that have recently received considerable attention within the West. Given the theoretical importance and heretofore lack of research into how these two constructs relate to each other, the present study aimed to examine how mindfulness and grit relate to each other within Western and non-Western cultures. New Zealand (N = 343) and Thai (N = 233) university students completed a battery of questionnaires that assessed the variables of interest. Although both samples showed a positive association between grit and mindfulness at the construct level, results at the facet level showed several notable differences. Specifically, acting with awareness and non-judging were found to predict grit for NZ students more strongly than for Thai students. These findings suggest that mindfulness evidenced more robust relationships with grit in an individualistic culture than in a collectivist society.

Key words: Mindfulness, Grit, Positive Psychology, Cross-Cultural Comparison

The Association between Mindfulness and Grit: An East vs. West Cross-Cultural Comparison

Mindfulness, a concept adapted from the Buddhist tradition, has been increasingly studied within the West. It is typically described as an act of "paying attention in a particular way: On purpose, in the present moment, and nonjudgmentally" (Kabat-Zinn, 1994, p. 4). In the literature, mindfulness can be conceptualized as a state or a trait; the present study, however, focused on mindfulness as a trait. To date, self-report is the chief method used to measure trait mindfulness. The most comprehensive questionnaire currently used within the literature is the Five Facet Mindfulness Questionnaire (FFMQ), developed by Baer, Smith, Hopkins, Krietemeyer, and Toney (2006). It conceptualizes mindfulness as a multi-faceted construct and thus assesses five different aspects of mindfulness, namely: a) observing – observation of mental or physical experiences; b) describing - the use of language to label one's internal experiences; c) acting with awareness – attention of one's present activities; d) non-judging of inner experience - the ability to hold a nonevaluative stance towards one's thoughts and feelings; and e) non-reactivity to inner experience - the ability to let thoughts and feelings come and go without becoming entangled in them.

Mindfulness questionnaires such as the FFMQ have been developed and mainly tested in the West. Given that the roots of mindfulness are embedded within the Buddhist tradition, it is imperative to examine whether the Western conceptualization and measurements of mindfulness are similar to those in a culture which is heavily influenced by Buddhism. Theravada Buddhism is the de facto state religion of Thailand, therefore, Christopher, Christopher, and Charoensuck (2009) conducted a study which compared how mindfulness, as measured by the Kentucky Inventory of Mindfulness (KIMS) and the Mindfulness Attention Awareness Scale (MAAS), is experienced by Thai university students in comparison to American students. The authors found that American and Thai students endorsed similar levels of mindfulness as measured by the MAAS. However, although they did not compare KIMS overall scores, they found that American students endorsed higher levels of specific facets of the KIMS measure, i.e., observing and accepting without judgment, than did Thai university students.

The apparent difference in the non-judging facet of mindfulness may reflect the cultural differences between Western and Eastern cultures. Eastern cultures are described as collectivistic, where harmony of the society is prioritized over individuals' goals and values, while Western cultures are typically described as individualistic, where importance is placed on individuals' goals and values. According to Kitayama, Markus, Matsumoto, and Norasakkunkit (1997), self-criticism is adaptive and an integral part of communal social relationships within collectivistic cultures as it fuels individual's effort to improve oneself in order to function

harmoniously with others. This argument may provide an explanation as to why individuals from a collectivistic culture, such as Thailand, were found to be less accepting and more judging of themselves than those from individualistic cultures where harmony is less valued than individual differences.

It is important to know that Christopher et al. (2009) utilised The MAAS and KIMS which evidence some important differences from the FFMQ. In contrast to the FFMQ, the MAAS conceptualizes mindfulness as a single construct which solely focuses on present-oriented attention. The KIMS is very similar to the FFMQ in that it conceptualizes mindfulness as a multi-faceted construct and includes four factors that are almost identical to corresponding facets of the FFMQ, i.e., observing, describing, acting with awareness, and accepting without judgment. However, the FFMQ incorporates an additional factor that describes non-reactivity towards inner experiences which has been shown to be an important mindfulness facet in relation to other psychological outcomes (Baer et al., 2006; De Bruin, Topper, Muskens, Bogels, & Kamphuis, 2012). Thus with five different facets, the FFMQ is able to provide a more comprehensive view of mindfulness.

Another important psychological construct that has caught the attention of many scholars in recent years is grit, which is defined as passion and perseverance for long-term goals (Duckworth, Peterson, Matthews, & Kelly, 2007). It is proposed to encapsulate two important facets, one highlighting consistency of interest in long term goals and the other emphasizing persistence of effort in pursuing those long term goals.

In the Western literature, grit has been discussed as being related to the growth mindset (Duckworth, 2016; Hochanadel & Finamore, 2015; Laursen, 2015; Perkins-Gough, 2013). The growth mindset is one of the two types of mindset identified by Carol Dweck (1999), which describes individuals who hold the belief that intelligence is malleable and can be cultivated through effort and hard work. Research has shown that in comparison to individuals with a fixed mindset, those that believe that intelligence is a fixed attribute, individuals with a growth mindset are not easily discouraged by setbacks and tend to continue to work through obstacles. As one can see, the description of the growth mindset conceptually overlaps with grit, which describes tenacity and perseverance in working towards long term goals.

Within the cross-cultural literature on academic outcomes, Asian Americans have consistently been found to accrue better academic outcomes than their European-American counterparts (e.g., Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987; Kao & Thompson, 2003). Their superior academic performance has been attributed to the cultural influence of Confucianism, which prioritizes perseverance and hard-work over innate abilities (Zhang & Carrasquillo, 1995). Supporting this claim, Heine et al. (2001) reported that Japanese students who failed on a task persisted more on a follow-up task than those who succeeded, while the opposite pattern

occurred for the North American students. Similarly, Jose and Bellamy (2012) showed that perseverance demonstrated by Asian children is driven by parents' encouragement of the growth mindset. These findings suggest that Eastern cultures, particularly those influenced by Confucianism, encourage individuals to develop a growth mindset, more so than Western cultures. Given that grit and the growth mindset have been suggested to be conceptually interlinked, it is plausible that individuals from Eastern cultures may exhibit higher levels of grit in comparison to those from Western cultures. However, similar to mindfulness, grit is a concept developed in the West that has yet to be fully explored in non-Western cultures. Therefore, more research is needed to fully understand grit within non-Western cultures.

Measurement invariance is an important issue when considering cross-cultural comparisons of psychological constructs. A measure is judged to possess measurement invariance if two or more groups of participants respond to the questionnaire similarly (Cheung & Rensvold, 2002; Milfont & Fischer, 2010). Determining measurement invariance is a critical first step before the measure can be used to compare means and associations across groups. Without this first step, it cannot be discerned whether the differences found between groups reflect true differences or differences due to response sets or biases. The three most commonly tested measurement invariance levels are configural invariance, metric invariance, and scalar invariance. Establishment of configural invariance suggests that the groups of comparison responded to the items in a way that reflect the same factor structure. This step is a basic requirement for the other measurement invariance levels. Metric invariance indicates that the items' loadings onto its designated factor are similar across groups, while scalar invariance indicates that the intercepts of items (i.e., means) are the same across groups (for a more in depth discussion on invariance testing please refer to Krägeloh, Bergomi, Siegert, & Medvedev, 2017; Milfont & Fisher, 2010). However, despite the general importance of measurement invariance testing, most of the studies that have examined mindfulness and grit cross-culturally have not performed this crucial step before using the measures to compare means and associations across cultural groups.

Both mindfulness and grit are characteristics that have received attention in the literature. However, we have not found any published studies that describe how these two constructs are related to each other. On the other hand, suggestions about this potential association can be discerned in several studies. In the literature, mindful individuals have been shown to positively frame stressful situations, which help them to better cope with the situation (Garland, Gaylord, & Fredrickson, 2011; Garland, Gaylord, & Park, 2009). Therefore, they are more resilient and are less affected by stressful situations (Aikens et al., 2014; Weinstein, Brown, & Ryan, 2009). In an analogous fashion, gritty individuals persevere in working towards their long-term goals despite

failure and adversity (Duckworth et al., 2007), thus, their ability to remain resilient and cope with stress may be reflective of mindful characteristics. Based on these observations, it is plausible that grit and mindfulness may be positively associated, i.e., gritty individuals are likely to also report higher levels of mindfulness.

Based on the discussion provided above, the present study aimed to examine mindfulness and grit, and the relationship between the two constructs, across culture. Particularly, the present study proposed four hypotheses and one research question. First, as early findings on mindfulness in non-Western contexts, specifically Thailand (Christopher et al., 2009), have suggested that the overall level of mindfulness may be similar to that of a Western sample, it was hypothesized that Thai and NZ university students would endorse similar levels of the overall construct of mindfulness (Hypothesis 1). Second, given Christopher et al.'s (2009) findings and arguments put forth by Kitayama et al. (1997), it was hypothesized that NZ students would endorse higher levels of the mindfulness facet of non-judging than Thai students as they should engage in less self-criticism (Hypothesis 2). Third, as the growth mindset, which is conceptually related to grit, is highly endorsed within Eastern cultures, it was predicted that Thai university students would endorse higher levels of grit than NZ university students (Hypothesis 3). Lastly, because mindfulness has been found to function in a way that is similar to the West, i.e., positively relate to cognitive control and negatively relate to depression and maladaptive emotional regulatory strategy (Sugiura et al., 2012), it was hypothesized that overall mindfulness and grit would be positively related to each other within both NZ and Thai cultural groups (Hypothesis 4). Given the importance of measurement invariance in cross-cultural investigation, the present study first sought to establish measurement invariance of the FFMQ and the Grit Scale before going on to compare mindfulness and grit across cultural groups. In regards to the relationships between the facets of mindfulness and the facets of grit, no specific predictions were made as no previous research has investigated associations at this level. Therefore, this part of the present study was exploratory, and thus was treated as a research question: how do the five facets of mindfulness relate to the two components of grit?

Method

Participants

The Western cultural group was represented by 343 New Zealand university students, who were taking psychology courses, recruited from Victoria University of Wellington (260 females, 81 males, 2 information missing) aged between 18 and 60 years ($M = 21.38$, $SD = 5.90$). The students participated in the study as part of their research methods course, and no extra course credit was given. The Eastern cultural group consisted of 233 Thai university students recruited from various universities from Thailand (169 females, 60 males, 4

information missing) aged between 18 and 33 years (M = 20.41, SD = 1.57). The majority of Thai students (98.3%) attended Thammasat University. Thai students were recruited by two means. One hundred and seventy-seven students participated in the study as part of their psychological course at Thammasat University, where they were given extra course credit for their participation. The other 56 Thai students were recruited via flyers. They were informed that by completing the survey, their name would be entered in a prize draw for a movie voucher. There were no significant differences in the mean of mindfulness and grit between the two Thai student groups, therefore, they were merged into one group that represented Thai university students.

Procedure

Both NZ and Thai university students completed a battery of questionnaires consisting of the variables of interest, i.e., mindfulness and grit, alongside other variables not relevant for the present study. The NZ students completed an online version of the survey while Thai students completed the survey via two means, either by completing a paper and pencil version or by completing the survey online. The questionnaires administered to the Thai students were translated into the Thai language using the back-translation technique (Hambleton, 2001; Van de Vijver & Hambleton, 1996). A Thai Theravada Monk who has acquired a master's degree from the U.S. translated the English version to the Thai language. In return, another Thai layperson, who also studies Buddhism and has experience in translating English books into the Thai language, translated the Thai version back to English. The first author, who is fluent in both Thai and English and has wide and deep knowledge of Buddhism, acted as the moderator and communicated with both of the translators to settle any differences noted in the translation process.

Measures

Five Facet Mindfulness Questionnaire – Revised (FFMQ-R). The present study used a revised version of the 32-item version of the Five Facet Mindfulness Questionnaire (FFMQ-SF: Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011) to assess mindfulness. The FFMQ-R employs five subscales (facets) that are identical to the original version, however, each of the facets contains exactly five items: three positively worded, e.g., "I notice the smells and aromas of things", and two negatively worded items, e.g., "I tell myself I shouldn't be feeling the way I'm feeling". This revised scale corrected the previous version's use of unequal numbers of items per facet as well as unequal ratios of positively worded to negatively worded items for each facet (for further description please refer to Raphiphatthana, Jose, & Kielpikowski, 2015). Participants responded to each item using a 5-point Likert scale that ranged from 1 (never or very rarely true) to 5 (very often or always true). Facet scores were calculated by averaging the scores across the individual items for each

facet after reverse-coding the two negatively worded items. Higher facet scores indicate higher endorsement of that particular facet. The FFMQ-R (Raphiphatthana, et al., 2015) yielded similar psychometric properties and reliabilities to that of the original 32-item version of the FFMQ, which are deemed to be acceptable (Bohlmeijer et al., 2011).

The Grit Scale. The 12-item Grit scale (Duckworth et al., 2007) was used in the present study to measure levels of grit. The scale includes two subscales, one assesses consistency of interest which contains 6 reverse-coded items, and another assesses perseverance of effort which contains 6 positively-worded items. Participants responded to items such as "My interests change from year to year" (reverse-coded), and "I am diligent" by using a 5-point Likert scale ranging from 1 (not at all like me) to 5 (just like me). The items in the consistency of interest subscale were reverse-coded prior to the calculation of the overall scale and subscale score. The overall subscale score was calculated by averaging the scores across the individual items within the subscale. Likewise, the overall grit score was calculated by averaging the scores of all items within the scale. Higher scores indicate higher levels of endorsement of grit and its two components. Previous research with North American samples has demonstrated good internal reliability for each of the subscales (consistency of interest, $\alpha = .84$; perseverance of effort, $\alpha = .78$) (Duckworth et al., 2007).

Data Analyses

First, measurement invariance of the FFMQ-R and the Grit Scale was tested across the Thai and NZ samples using Multigroup Confirmatory Factor Analysis (MGCA). In the case that measurement invariance was established, the next step was to determine the differences in the mean levels of the overall construct of mindfulness and grit as well as their sub-facets between the Thai and NZ samples. Then the relationships between the five facets of mindfulness and the two components of grit were examined via path analysis conducted in AMOS (Arbuckle, 2006), with a path model assessing relationships for each cultural group separately. Lastly, the two path models, one representing the two cultural groups, were then compared for equivalence using an omnibus test.

Overall, the total amount of missingness for both NZ and Thai samples was very low. Specifically, only 1.84% of data in total was missing from the NZ sample, while the Thai sample exhibited 0.19% of missing data. In addition, we confirmed that the missing data occurred at random by running the Little chi-square test which yielded non-significant findings for both samples (NZ: $\chi^2 = 1235.288$, df = 1225, p = .413; Thai: $\chi^2 = 163.774$, df = 169, p =.599). The few missing values were imputed using Expectation-Maximization imputation

(Dempster, Laird, & Rubin, 1977). The data for both samples were found to be normally distributed, with all variables demonstrating skewness and kurtosis within standard limits, thus no transformations were necessary.

Results

Testing the Factor Structure of the Two Measures

We initially conducted confirmatory factor analysis (CFA) using AMOS (Arbuckle, 2006) to confirm the five-factor structure of the FFMQ-R within both NZ and Thai samples. On the basis of several reasons, parcels of items rather than individual items were used in the conducted CFAs. First, as item parcelling is a technique commonly used within the literature to determine the factor structure of the FFMQ (e.g., Baer et al., 2006; de Bruin, Topper, Muskens, Bogels, & Hamphuis, 2012), it seems fitting that the present study also uses such technique. Moreover, as discussed by Little, Cunningham, Shahar, and Widamon, (2002), parcelling of items has several advantages over CFAs performed on all individual items. First, parcels of items manifest greater reliability than individual items, thus they serve as more stable indicators, which reduces the risk of spurious correlations. Second, in comparison to individual items, parcels have been shown to yield stronger loadings on the latent construct. And third, due to including more scale points than single item Likert scores (which are technically ordinal data), parcel scores more closely approximate continuous measurement of the latent construct. However, on the other side, concerns about multidimensionality of parcel scores has been raised regarding the items parcelling technique (Bandalos, 2002). In order to address this issue, we examined internal consistency reliabilities (i.e., Cronbach's alphas) of the facets contained in the FFMQ-R and the Grit Scale. Results showed that all items within a facet correlated highly with each other (indicated by high αs) for both measures, which suggests unidimensionality of the facets. Moreover, previous studies have demonstrated unidimensionality of the FFMQ (Baer et al., 2006) and the Grit Scale (Duckworth et al. 2007), which provides further assurance for the present study to use the parcelling technique for both measures.

However, we first conducted CFA with item level data, i.e. non-parcelled items, to examine a non-hierarchical five-factor model (1st order model) where the five facets of mindfulness were allowed to intercorrelate. Given that this type of CFA does not account for redundant error, it was unsurprising that the model yielded unacceptable fit indices. Given this finding and the advantages of using items parcelling as mentioned above, we subsequently conducted CFA with parcelled items to examine the factor structure of the non-hierarchical model. Items one and three were parcelled into the first indicator, while items two and five were parcelled to form the second indicator. Item 3 was treated as a stand-along item and was the third indicator. This parcelling technique was applied to each of the facets. The analysis yielded good model fit indices for both

the NZ sample: χ^2/df = 2.509; CFI = .934; TLI = .914; RMSEA = .066; sRMR = .053 and the Thai sample: χ^2 /df = 1.456; CFI = .942; TLI = .923; RMSEA = .044; sRMR = .057. Second, in order to test whether the five facets are constituents of an overall latent factor of mindfulness, we conducted a hierarchical model (2nd order model), where the five latent facets loaded onto the overarching mindfulness factor. We found no significant loss of fit in this 2nd order model for both the NZ sample: χ^2/df = 2.701; CFI = .921; TLI = .902; RMSEA = .071; sRMR = .066, and the Thai sample: χ^2/df = 1.463; CFI = .937; TLI = .923; RMSEA = .045; sRMR = .061. These findings indicate that both NZ and Thai university students' data support the five-factor model as described by Baer et al. (2006).

We employed the same analytic strategy to the grit scale. First, we conducted a 1st order CFA using item parcels as indicators for the two components of grit. In this model, the two components of grit, consistency of interest and perseverance of effort, were allowed to intercorrelate. Resulting good model fit indices were obtained for both the NZ sample: χ^2/df = 1.229; CFI = .998; TLI = .996; RMSEA = .026; sRMR = .028 and the Thai sample: χ^2/df = 1.470; CFI = .991; TLI = .983; RMSEA = .045; sRMR = .044, which supported the two-factor structure of the Grit scale as described by Duckworth et al. (2007) in both cultural groups. In regards to 2nd order CFA, due to the two sub-factor structure of the grit scale, additional constraints were required for the model to converge at the 2nd order level. In particular, constraints were imposed on the variances of the two factors of grit to be equal. The model yielded the same set of model fit indices as that of the 1st order model, for both Thai and NZ university students.

Did Participants Respond Similarly to the Two Measures Between the Two Cultures?

Multigroup Confirmatory Factor Analysis (MGCFA) was conducted using AMOS (Arbuckle, 2006) to examine whether measurement invariance for both the FFMQ-R and the Grit Scale across the Thai and NZ samples could be confirmed. MGCFA runs three models sequentially for each scale in order to test for three levels of invariance, namely configural, metric, and scalar. Metric invariance is required for meaningful investigation of relationships between the variable of interest with other variables, while scalar invariance must be met to allow for meaningful mean comparisons of the variable of interest across groups (Cheung & Rensvold, 2002). The non-hierarchical models were first tested for invariance, followed by invariance testing of the hierarchical or 2nd order model, for the FFMQ-R and the Grit Scale. The model fit indices for the three levels of invariance testing for both non-hierarchical and 2nd order models, of both the FFMQ-R and the Grit Scale, are reported in Table 1.

The 1st order five-factor structure of the FFMQ-R, where the five facets were allowed to intercorrelate, with no constraints imposed on parameter estimates, was simultaneously fitted across the Thai and NZ samples. The unconstrained model yielded good model fit indices: χ^2 = 317.390; df = 160; CFI = 0.936; GFI = .927; RMSEA = 0.041. Likewise, the 1st order model of the Grit Scale also yielded good model fit indices when simultaneously fitted across the two cultural groups: χ^2 = 21.591; df = 16; CFI = 0.995; GFI = .987; RMSEA = 0.025. These results indicate that both measurement tools demonstrate configural invariance, which suggests that the five-factor structure of the FFMQ-R and the two-factor structure of the Grit Scale were similar across the two cultural groups.

Next, metric invariance was examined for both measures, wherein the parcelled items' loading onto their particular factor was constrained to be equal across Thai and NZ samples. As shown in Table 1, the ΔCFI and ΔGFI from the unconstrained (Model 1) to the more constrained model (Model 2) yielded values less than 0.01, for both the FFMQ-R and the Grit Scale. This result indicates that the parcelled items' loadings were similar across the two cultural groups, demonstrating metric invariance for both measures.

And last, scalar invariance was tested, where constraints were imposed upon items' intercepts to be equal across the two cultural groups, in addition to the previously imposed constraints on items' loadings. As shown in Table 1, the non-hierarchical model of the FFMQ-R and the Grit Scale demonstrated scalar invariance, as the model fit indices of the scalar model (Model 3) in comparison to that of the metric model (Model 2), specifically the CFI and GFI, did not change beyond the adopted criteria, i.e., more than .01 (Cheung & Rensvold, 2002). This set of results suggests that factors within the FFMQ-R and the Grit Scale manifested the same intervals and zero points across the two cultural groups, which further implies that they were operationalized in the same way across Thai and NZ samples. These results suggest that meaningful mean group comparisons of the sub-factors of mindfulness and grit could be made between Thai and NZ samples.

The 2nd order models of the FFMQ-R and the Grit Scale were also tested for equivalence across the two cultural groups. As can be seen in Table 1, when the 2nd order model of the FFMQ-R, where the five facets loaded onto the overall construct of mindfulness, was simultaneously fitted across the Thai and NZ sample with no constraints (Model A), the model yielded good model fit indices, demonstrating configural invariance. This result suggests that the hierarchical five-factor structure of the FFMQ-R was similar across the two cultural groups. Next, metric invariance was tested by constraining the 1st order loadings (the items' loadings onto their particular facet, Model B), and the 2nd order loadings (the five facets' loadings on the overall mindfulness construct, Model C), to be equal across group. The fit of the overall model, specifically CFI and GFI, did not

change more than 0.01, from Model A to Model B or from Model B to Model C, suggesting that the items' loadings and the facets' loadings were similar across the two cultural groups (Cheung & Rensvold, 2002). And last, scalar invariance was tested by constraining facets' intercepts (Model D) and items' intercepts (Model E) to be equal across the two cultural groups, on top of the previously imposed constraints on the pathway loadings. Again, no significant loss of fit was seen from Model C to model D or from Model D to Model E, indicating that the items and facets within the FFMQ-R manifested the same intervals and zero points across the two cultural groups, all of which implies that these factors were operationalized in the same way across Thai and NZ university samples.

The same analytic strategy was applied to the Grit Scale. However, as noted above, the base model failed to converge and two additional constraints were required for the unconstrained model (Model A) to run simultaneously across the two cultural groups, i.e., the variances of the two grit components were set to be equal and the variance of the overall grit construct was set to 1. Consequently, we were only able to test for metric invariance but not scalar invariance, at the 2nd order level. Metric invariance was tested by imposing constraints on the 1st order pathways (Model B) and 2nd order pathways (Model C) of Model A. As can be seen in Table 1, these sequential placing of constraints did not significantly change the CFI or GFI, which indicated metric invariance. This set of results suggests that the two subfactors related to the overall construct of grit in a similar way across Thai and NZ university samples, and thus the latent grit construct could be used to relate to other constructs across both cultures. However, as scalar invariance could not be tested, the mean of the latent grit construct could not be compared across the two groups.

Were Differences in Means and Associations Found Between the Two Cultures?

Internal reliability was evaluated with Cronbach's alphas. Results showed that for the NZ sample, most of the variables yielded a Cronbach's alpha above .70, which indicates acceptable internal reliability, with one facet (acting with awareness) exhibiting a Cronbach's alpha approaching this value ($\alpha = .67$). The internal reliabilities for the Thai sample were not as high, in comparison, as most of the Cronbach's alphas for this group fell in the range of .60 and .70, which are nevertheless usually deemed to be acceptable.

The FFMQ-R was found to exhibit scalar invariance, both at the 1st and 2nd order level, therefore we were able to compare the means of the overall construct and the facets of mindfulness across the two cultural groups using SEM mean testing (Byrne, 2010). As predicted, the 2nd order model showed that both Thai and NZ students endorsed similar levels of the overall mindfulness as revealed by the non-significant mean comparison ($B = .04$, $SE = .02$, $p = .052$). When investigated at the 1st order level, the two cultural groups exhibited several

significant mean group differences at the facet level. As predicted in Hypothesis 2, in comparison to Thai students, NZ students reported higher levels of non-judging (B = .31, SE = .07, p < .001), and describing (B = .17, SE = .09, p = .045). However, they were found to endorse lower levels of acting with awareness relative to Thai students (B = -.25, SE = .05, p < .001). Mean differences were not found for the other two mindfulness facets (Non-react: B = .07, SE = .07, p = .36, Observing: B = -.07, SE = .07, p = .24). In regard to grit, we were not able to establish scalar invariance at the 2nd order level, therefore a mean comparison at the overall construct level could not be made. On the other hand, as the 1st order model demonstrated scalar invariance, we were able to conduct mean comparisons at the facet level across the two cultural groups. Unexpectedly, NZ students endorsed higher levels of perseverance of effort relative to Thai students (B = .28, SE = .05, p < .001). No mean difference was found for consistency of interest between the two groups (B = -.08, SE = .06, p = .159).

Last, as predicted (Hypothesis 4), the overall construct of mindfulness was found to positively and significantly correlate with the overall construct of grit separately for both the NZ (r(334) = .46, p < .001) and the Thai samples (r(233) = .31, p < .001). However, the correlation between the two constructs was significantly stronger for the NZ sample than for the Thai sample (p < .001). Moreover, several notable differences in the zero-order correlations between the five facets of mindfulness and the two components of grit were observed between the Thai and NZ samples. For the Thai sample, the mindfulness facets of describing, non-reacting, and non-judging did not yield significant relationships with consistency of interest. Additionally, non-judging and observing also did not significantly correlate with perseverance of effort. In contrast, for the NZ sample, almost all of the five facets of mindfulness, except observing, significantly and positively correlated with the two components of grit. These apparent differences in zero-order correlations were explored more systematically in the following path model examining the strengths of association among facets by the two cultural group.

How Were Mindfulness Facets Related to Grit Facets?

The unique relationships between the five facets of mindfulness and the two facets of grit were examined through path model analysis conducted in AMOS (Arbuckle, 2006). A single model was constructed, as depicted by Figure 1, wherein the five facets of mindfulness predicted the two components of grit in a fully saturated model, for the two groups of the Thai and NZ samples. Results from the path analysis for both samples are reported in Table 3. As can be seen, we found several similarities between the two samples, i.e., non-reacting and describing were found to significantly and positively predict higher levels of perseverance of effort for both cultural groups. However, at the same time several differences were noted. More specifically, four significant differences were obtained when equality constraints, using a chi-square difference test with 1 df,

were performed on all 10 paths in order to determine the equivalence or difference between the two cultural groups. This test showed that acting with awareness predicted consistency of interest more strongly in the NZ sample than the Thai sample. In addition, while the mindfulness facets of acting with awareness and non-judging predicted perseverance of effort in the NZ sample, they did not do so in the Thai sample. And last, while observing negatively predicted consistency of interest in the NZ sample, it did not yield any significant relation to grit for the Thai sample. These results suggest that, at least in terms of grit as a correlate, New Zealanders benefit more from acting with awareness and non-judging than Thai students.

Discussion

In the present study we sought to examine how dispositional mindfulness and grit are experienced and relate to each other across different cultures. Once measurement invariance was established for both scales, the FFMQ and the Grit Scale, across Thai and NZ samples, we then proceeded with further analyses. First, we found that Thai and NZ students endorsed similar levels of overall mindfulness, and as predicted, NZ students exhibited higher levels of describing and non-judging than the Thai students when the comparison was made at the facet level. Surprisingly, we found contrary to prediction, NZ students endorsed slightly higher levels of the perseverance of effort component of grit than Thai students. Moreover, as hypothesised, overall mindfulness was found to positively relate to overall grit in both cultural groups; however, the association was found to be stronger for the NZ sample. When examined at the facet level, several differences in the association between mindfulness and grit were noted. Specifically, acting with awareness was found to be more highly associated with consistency of interest for the NZ sample relative to the Thai sample. In addition, acting with awareness and non-judging both positively predicted perseverance of effort for the NZ sample, but not for the Thai sample. And last, while observing did not relate to any component of grit for the Thai sample, it negatively predicted consistency of interest within the NZ sample. These results will now be discussed in more depth.

Did the Two Scales Function Similarly in the Two Cultural Contexts?

Measurement invariance was examined using Multigroup Confirmatory Factor Analysis (MGCFA). Results showed that both 1st and 2nd order factor structure of the FFMQ-R met all three essential types of measurement invariance, i.e., configural, metric, and scalar, across the Thai and NZ samples. Although scalar invariance could not be established for the Grit Scale at the 2nd order model; we were able to demonstrate configural and metric invariance for the 2nd order model, and all of the essential measurement invariances for the 1st order model. Given that no other studies within the field have conducted measurement invariance testing on both of the FFMQ and Grit Scale, this study is the first to examine and show equivalence of the structure of

both of the scales across Western and non-Western cultures. This result indicates that the Western conceptualization of mindfulness as a five-faceted construct and grit as a two-faceted construct also translate into a non-Western culture, specifically the Thai culture.

However, it is important to note that the Cronbach's alphas for the FFMQ, particularly the non-judging and observing facets, within the Thai sample were weaker than the comparable ones in the NZ sample. These results suggest that although the overall structure of the FFMQ and the Grit scale may be generally interpreted similarly by Thai and NZ individuals, as indicated by measurement invariance testing, some differences in interpretation at the cultural level may occur within the facet level.

Did We Find Mean Group Differences in Grit and Mindfulness Between the Two Cultures?

Following measurement invariance testing, we compared the means of mindfulness across the two cultural groups. As predicted, we found that Thai and NZ students reported similar levels of overall mindfulness. This finding is similar to that of Christopher et al. (2009), who found mindfulness levels, as measured by the MAAS, to be similar between Thai and American students. However, when investigated at the sub-facet level, we found several differences, such that Thai students reported higher levels of acting with awareness but lower levels of non-judging and describing relative to NZ students.

Before these results are discussed further, we would like to note that 81.5% of the current Thai sample identified as Buddhist, which is close to the percentage reported by the National Statistical Office of Thailand (2000). Furthermore, 57% of the Thai students reported to meditate regularly. Though we did not obtain the corresponding information from the NZ sample, it is likely that the percentage of meditators among this sample would be lower because the NZ culture is described as bi-cultural, composed of European and indigenous Maori, neither of which strongly embrace the Buddhist tradition. Given this additional information, it is not surprising that in comparison to NZ students, Thai students endorsed higher levels of acting with awareness which is one of the core aspects of mindfulness. However, this finding seems to be somewhat inconsistent with the other findings, i.e., NZ students reported endorsing higher levels of describing and non-judging.

Upon consideration of the literature, we discerned several reasons that may underlie these interesting findings. As previously noted, the main school of Buddhism in Thailand is Theravada. Consequently, the meditation techniques that are widely taught in Thailand are influenced by the *Pāli Canon* – the standard collections of scriptures in the Theravadan Buddhist tradition (an anthology of texts from the *Pāli Canon*, in english, can be found here – Shaw, 2006) . In such scriptures, mindfulness, i.e., sati, means 'keeping or holding in mind', which does not explicitly include the ability to describe experiences. Sati emphasizes the awareness of

bodily sensations or quality of the mind rather than encouraging the use of language to describe thoughts or feelings (Chakma, 2015; Gethin, 2015). Therefore, our finding that Thai students' level of describing was lower than for NZ students may be attributable, at least in part, to the type of meditation that is practiced in Thailand.

Moreoever, the present finding regarding the non-judging facet is similar to that of the previous studies which found Thai students (Christopher et al., 2009) and Japanese students (Sugiura et al., 2012) to report lower levels of non-judging than American students. Within the cross-cultural literature, Kitayama and colleague (1997) proposed that self-criticism is adaptive within collectivistic cultures as it motivates individuals to modify one's behaviour in order to maintain harmonious relations with others. From this perspective, in Thai and Japanese cultures, where harmony within society is of the utmost importance, self-criticism may be highly endorsed and motivate Thai and Japanese individuals to be more judging and critical of themselves. In contrast, in cultures where individual freedom is celebrated, such as in the NZ and American cultures, individuals may feel less pressure to conform. Therefore, they may be less judging of their thoughts and feelings given that individuality is more often accepted.

In regard to grit, as scalar invariance could not be tested for the 2nd order model, we were unable to compare the mean of the overall grit construct across the two cultural groups. However, we were able to demonstrate scalar invariance at the 1st order model, thus we were able to conduct mean group comparisons at the subfacet level. Contrary to Hypothesis 3, NZ students endorsed higher levels of perseverance of effort than Thai students. This result is surprising insofar as previous findings within the cross-cultural literature have consistently shown that Asians and Asian Americans expend greater academic effort and display higher levels of task persistence relative to their American counterparts (e.g., Heine et al., 2001; Hsin & Xie, 2013; Jose & Bellamy, 2012).

One possible explanation for this discrepancy is response bias. Although self-report is a valid and reliable method, it is nevertheless influenced by social norms. Given that modesty and self-criticism are important aspects of many Asian cultures, particularly those influenced by Confucianism, such social norms may influence Asians' self-evaluation. Indeed, Eaton and Dembo (1997) found that Asian American students reported lower levels of self-efficacy relative to their Western counterparts, despite their superior performance. Likewise, Heine, Takata, and Lehman (2000) found that Japanese were less likely than their American counterparts to self-enhance in their performance rating (see a meta-analysis by Heine & Hamamura, 2007). Therefore, it is possible that Thai students may have been harsher on themselves and evaluated themselves as less hardworking than they actually are.

Were Grit and Mindfulness Positively Related in Both Cultures?

The chief hypothesis of the present study was that grit and mindfulness would be positively related in both cultures. Regardless of the differences found in the mean levels of the constructs in question, as predicted, the two constructs were found to be positively associated with each other in both cultural groups. This finding suggests that in both cultures, gritty individuals tend to also be more mindful and vice versa. However, equality constraint testing showed that the two constructs exhibited a stronger positive relationship within the NZ sample than the Thai sample. Moreover, when the relationship was examined at the facet level, several differences were noted between the two cultural groups. In particular, within the NZ sample, acting with awareness positively predicted both components of grit, while this mindfulness facet only weakly predicted consistency of interest for the Thai sample. This result suggests that, to a certain extent, paying attention in the present moment may be helpful in maintaining students' interest in long-term goals for both cultures. However, NZ students appeared to benefit more from such a present-oriented attentional mind-set than Thai students in terms of grit. Given that Asian parents are more involved and have higher expectations for their children compared to Western parents (Glick, & White, 2004; Yamamoto & Holloway, 2010), it may be that Thai students' tenacity with regard to long-term goals may be driven more by other factors such as parental expectations and encouragement than by paying attention to events and mood states in the moment.

In addition, non-judging was found to predict the perseverance of effort aspect of grit for NZ students, but it did not do so for the Thai students. Within the cross-cultural literature, there has been much discussion regarding the formation of the self-concept, particularly the role of self-enhancing versus self-critical motivation in Asians' and Americans' achievement motivations. Positive self-perceptions are very important for Western individuals. In particular, self-efficacy and self-esteem in the West have been shown to be highly relevant to students' academic performance (Caprara et al., 2008; Lane, Lane, & Kyprianou, 2004). Having a non-judgemental stance may help NZ students to be less harsh on themselves when they make mistakes or experience setbacks. This positive self-perception, at least among Western participants, may therefore serve to fuel individuals' motivation and enable them to remain resilient in the face of adversity.

In contrast, Heine et al. (2001) argues that rather than focusing on the positive aspects of selves, individuals from East Asia tend to pay attention to the negative and improvable aspects of selves and the identification of such aspects motivates improvement on weaknesses. This argument is supported by their findings illustrating that Japanese who failed on a task persisted more on the follow-up task than those who succeeded, while Americans evidenced the opposite trend. Moreover, a large number of studies have shown that

Westerners tend to self-enhance while East Asians do not (for a meta-analysis see Heine & Hamamura, 2007). Consequently, Thai students' motivation to persevere may benefit from being self-critical and identifying aspects of the self that need improvement rather than striving to retain a positive perception of self in the face of failure. Therefore, non-judging may help Western individuals to remain resilient in the face of setbacks by helping them to maintain positive self-perception, while this process may not be culturally germane to the Thai students.

Interestingly, observing was found to negatively predict consistency of interest in the NZ sample, but it did not relate to grit in the Thai sample. The mindfulness facet of observing, in the Western literature, has been consistent in its association with other maladaptive psychological constructs. Among non-meditators, observing has been found to positively predict hyperarousal anxiety (Desrosiers, Klemanski, & Nolen-Hoeksema, 2013; Raphiphatthana et al., 2015), as it may overlap with the construct of anxious vigilance. Baer et al. (2008) have suggested that without meditation training, individuals may observe in a non-mindful way, which may elicit negative consequences such as anxiety. It is possible that NZ university students, who are likely to be non-meditators, may observe in a non-mindful way, and this stance may have negatively influenced their ability to sustain interest in their long term goals. In contrast, for the Thai student sample where 57% of the sample meditate regularly, observing may not elicit such negative consequences.

Taken together, the present findings indicate that although mindfulness was related to grit in both Thai and NZ samples, the two traits were more closely linked for NZ students than they were for Thais. Moreover, the differences found at the facet level on the relationship between mindfulness and grit highlights that different aspects of mindfulness may have different associated outcomes for individuals from different cultures. These differences, therefore, underscore the importance of considering cultural influence on the facet-level functions of mindfulness. These findings have further practical implications for mindfulness-based stress reduction therapy, as the current findings suggest that we should be aware of the subtle differences in the manifestation of mindfulness and its associated benefits across individuals from different cultural backgrounds.

Limitations and Future Directions

It is important to note that although the FFMQ met the criteria for measurement invariance (Cheung & Rensvold, 2002) in the present study, the internal consistency for certain subscales, i.e., acting with awareness, non-judging, and observing, were lower for the Thai sample than for the NZ sample. These results suggest that the internal consistency of some mindfulness facets were not as strong within the Thai sample as among the NZ sample. This finding is consistent with other studies that have examined psychometric properties of the FFMQ

in Asian samples (Deng, Liu, Rodriquez, & Xia, 2011; Sugiura et al., 2012). Regardless, together with previous findings, the present study suggests that the overall conceptualization of mindfulness as a five-factor solution was similarly endorsed by both Asian and Western individuals.

An important limitation of the study is that the Thai-language questionnaires that were used were not previously validated within this culture, which raises the concern of whether the measures' construct validity was adequate within the Thai culture. However, as both the FFMQ-R and the Grit Scale demonstrated measurement invariance across NZ and Thai cultural groups, this result suggests that both of the questionnaires were conceptualized by the Thais in a way that was similar to that of the New Zealanders. This finding implies that, at the very least, the Thai questionnaires were consistent with the validated English version at the psychometric level. Nonetheless, it is important for future studies to validate these Thai versions of the FFMQ-R and the Grit Scale in order to provide more confidence in the future use of such scales.

We acknowledge differences in how Thai and NZ students completed the questionnaire. Most Thai students completed the questionniare on paper, while NZ students completed the questionnaire online. This difference in measure completion was necessitated by constraints in the collection of data in Thailand. This difference in the mode of questionnaire completion may have caused bias in how participants in the two cultures responded to the questionnaires. Moreoever, incentivisation also differed across cultural groups as the majority of the Thai students received extra course credit for their participation, and some received a movie voucher, while NZ students did not receive any kind of incentive to participate in the study. We believe that the effects on the data of these differences were minor as invariance testing identified basic similarity between the two groups.

Additionally, the present study only assessed meditation practice and experience within the Thai sample. Therefore, although it is assumed that the Thai sample would consist of more meditators than the NZ sample, this question could not be explicitly tested here. Furture studies should obtain such information from both of their samples, because, as previously mentioned, meditators seem to engage in and benefit from mindfulness in ways that are different from non-meditators (Baer et al., 2008). Also, because the present study only obtained meditation practice information from the Thai students, we could not discern whether the differences found here between the Thai and NZ samples were due to differences in meditation practice or cultural background. Additionally, it would be fruitful for future studies to also obtain information regarding well-being, social desirability, and distress caused by self-criticism, as these data may provide further insight into the comparability of mindfulness and grit across the two cultural groups.

Moreoever, although the present study was based on reasonably good-sized sample sizes for both cultures, university students may not be the best sampling frame for the general Thai and NZ populations due to the selective nature of the sample (i.e., uniform emerging adult age and well educated). Also, as there are many factors that potentially affect cross-cultural comparisons, we do not wish to overgeneralise or overstate the main conclusions of the study. Lastly, due to the concurrent nature of the present data, our interpretations about which variables affected other variables were limited. A previous study by Raphiphatthana, Jose, and Salmon (in press) examined the relationship between mindfulness and grit longitudinally within NZ university students, and found mindfulness to predict change in grit over time, but not vice versa. This result suggests that, at least for NZ students, mindfulness may serve as an antecedent of grit. It would be fruitful for future research to determine whether a similar finding would be replicated in other cultures, e.g., in Thailand.

Compliance with Ethical Standards

Funding

This project did not receive any funding.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The IRP approval for this study was provided Victoria University of Wellington.

Informed consent

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

Authors' Contributions

BR: designed and excuted the study, conducted data analyses and wrote the paper. PEJ: collaborated with the design, data analyses and writing of the paper. PC: collaborated with data collection.

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Table 1

Invariance test for the FFMQ-R and the Grit Scale across NZ and Thai cultural groups

	Models	χ^2	df	χ^2/df	RMSEA	CFI	GFI	Comparison	ΔCFI	ΔGFI
FFMQ-R	1. Unconstrained (configural invariance)	317.390	160	1.984	.041	.936	.927			
1st order	2. Measurement weights (metric invariance)	332.019	170	1.953	.041	.934	.925	2 vs. 1	-.002	-.002
	3. Structural covariance (scalar invariance)	364.264	185	1.969	.041	.927	.918	3 vs. 2	-.007	-.007
FFMQ-R	A. Unconstrained (configural invariance)	354.622	170	2.086	.043	.925	.919			
2nd order	B. Measurement weights (1st order metric invariance)	370.792	180	2.06	.043	.923	.916	2 vs. 1	-.002	-.003
	C. Structural weights (2nd order metric invariance)	381.892	184	2.076	.043	.920	.914	3 vs. 2	-.003	-.002
	D. Structural covariance (2nd order scalar invariance)	388.618	185	2.101	.044	.917	.913	4 vs. 3	-.003	-.001
	E. Structural residuals (1st & 2nd order scalar invariance)	399.632	190	2.103	.044	.915	.910	5 vs. 4	-.002	-.003
Grit	1. Unconstrained (configural invariance)	21.591	16	1.349	.025	.995	.987			
Scale	2. Measurement weights (metric invariance)	25.109	20	1.255	.021	.996	.985	2 vs. 1	.000	- .002
1st order	3. Structural covariance (scalar invariance)	29.138	23	1.267	.022	.995	.984	3 vs. 2	-.001	-.001
Grit	1. Unconstrained (configural invariance)	21.596	17	1.270	.022	.996	.987			
Scale	2. Measurement weights (1st order metric invariance)	25.424	21	1.211	.019	.996	.985	2 vs. 1	.000	-.002
2nd order	3. Structural weights (2nd order metric invariance)	29.138	23	1.267	.022	.995	.984	3 vs. 2	-.001	-.001

Table 2

Bivariate Correlations and Descriptive Statistics for the FFMQ-R and the Grit Scale for the Two Cultures Separately

Cultural groups		1	2	3	4	5	6	α	Mean (SD)
Thai	1. FFMQ (Des)							.74	3.00 (0.78)
	2. FFMQ (Non-r)	.18**						.65	2.92 (0.72)
	3. FFMQ (Non-j)	.28**	.32**					.62	3.15 (0.65)
	4. FFMQ (Obs)	.13	-.00	.03				.60	3.76 (0.66)
	5. FFMQ (Act-a)	.34**	.35**	.36**	.19**			.65	3.57 (0.64)
	6. Grit (Consistency)	.12	.08	.08	.15*	.20**		.79	2.83 (0.68)
	7. Grit (Perseverance)	.28**	.25**	.06	.09	.23**	.33**	.77	3.14 (0.61)
NZ	1. FFMQ (Des)							.83	3.08 (0.85)
	2. FFMQ (Non-r)	.28**						.83	2.99 (0.88)
	3. FFMQ (Non-j)	.35**	.55**					.74	3.32(0.76)
	4. FFMQ (Obs)	.15**	.15**	.17**				.71	3.68 (0.7)
	5. FFMQ (Act-a)	.38**	.35**	.37**	.30**			.67	3.28 (0.62)
	6. Grit (Consistency)	.21**	.26**	.25**	-.08	.37**		.75	2.75 (0.77)
	7. Grit (Perseverance)	.32**	.35**	.40**	.11	.43**	.41**	.83	3.54 (0.65)

Note. *p < .05. **p < .01.

Table 3

Comparison of the Relationships between the Five Facets of Mindfulness and the Two Components of Grit between the Thai and NZ samples

	NZ sample		Thai sample		Equality Constraint test
	β	p value	β	p value	p value
Acting-awareness ---> Consistency of Interest	.34	.001	.15	.044	.013
Acting-awareness ---> Perseverance of Effort	.28	.001	.11	.118	.033
Non-reacting ---> Consistency of Interest	.12	.043	.02	.834	.279
Non-reacting ---> Perseverance of Effort	.12	.030	.21	.002	.238
Observing ---> Consistency of Interest	-.22	.001	.12	.077	.000
Observing ---> Perseverance of Effort	-.05	.329	.04	.502	.258
Non-judging ---> Consistency of Interest	.07	.235	.00	.998	.454
Non-judging---> Perseverance of Effort	.20	.001	-.11	.099	.000
Describing ---> Consistency of Interest	.06	.298	.06	.420	.975
Describing ---> Perseverance of Effort	.11	.027	.23	.000	.149

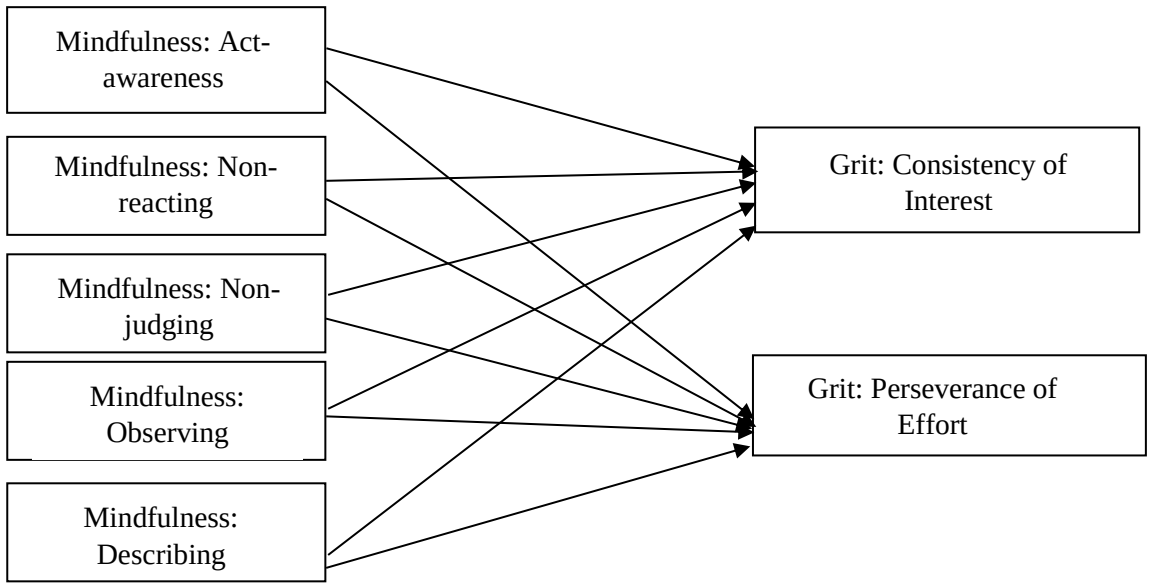

Figure 1. Path model illustrating the relationships between the five facets of mindfulness and the two components of grit that are compared across NZ and Thai cultural groups.