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Between Can't and Won't: The Relationship Between Trait Mindfulness, Stoic Ideology, and Alexithymia in Norway and New Zealand

Johannes Alfons Karl[1,2] · **Espen R. Lassen[3,4]** · **Stian Solem[3]** · **Ronald Fischer[5]**

Abstract

Objectives The aim of the present study was to provide cross-cultural insight into the relationship between mindfulness, alexithymia, and stoic ideology.

Method Using samples from New Zealand ($n = 330$) and Norway ($n = 326$), we estimated the facet-level network relationship of our target constructs, as well as the invariance of the estimated networks across cultural contexts.

Results Across cultural contexts, we found a consistent pattern of relationships in which both stoic ideology and alexithymia were negatively related to mindfulness. Negative relationships were especially pronounced between alexithymia and the mindfulness facets of Describing, Non-Judgement, and Acting with Awareness. This indicates that individual differences in these mindfulness facets might be more firmly rooted in difficulties identifying and describing emotions, compared to beliefs related to emotional suppression, as captured by stoic ideology. While the mindfulness facets showed overall expected patterns of relationships with both alexithymia and stoic ideology, Non-Reacting showed a divergent pattern. Non-Reacting was positively related to a tendency of Externally Oriented Thinking, as well as with Death-Acceptance, in both countries. Thus, this facet not only might capture Non-reactivity within the context of mindfulness, but also could potentially capture aspects of emotional avoidance.

Conclusions Overall, the study highlights that mindfulness could be influenced by both individual differences in emotion processing and cognitive beliefs about emotion processing. This accentuates the importance of examining both individual differences in, and cognitive beliefs about emotion regulation in research regarding mindfulness.

Keywords Mindfulness · Stoic ideology · Alexithymia · Network · Cross-cultural

Can one be both mindful and unaware of one's emotions? The answer becomes more tricky once mindfulness is examined beyond a state or practice, i.e., as a trait (Norman et al., 2019). Mindfulness-based interventions are applied as treatment approaches addressing difficulties in identification and

✉ Johannes Alfons Karl
   johannes.a.karl@gmail.com

1 Victoria University of Wellington, Wellington, New Zealand

2 Graduate School of Business, Stanford University, Stanford, USA

3 Department of Psychology, Norwegian University of Science and Technology, Trondheim, Norway

4 Section for Implementation and Treatment Research, Norwegian Center for Violence and Traumatic Stress Studies, Oslo, Norway

5 Instituto D'Or de Pesquisa & Ensino, Rio de Janeiro, Brazil

description of emotions, with clinical research showing a negative longitudinal relationship between mindfulness and such emotional difficulties (Fang & Chung, 2021). Originating from Eastern philosophical traditions, mindfulness has been incorporated into various therapeutic practices (MacKenzie & Kocovski, 2016), even into those which are derived from different philosophical traditions such as stoic philosophy (Beck, 1979; Cavanna et al., 2023; Ellis, 1962). Mindfulness practices, as well as practices based on stoic philosophy that underlie cognitive therapy, suggest that emotional awareness should improve if levels of mindfulness and stoic traits increase.

However, if trait mindfulness is disaggregated into facets, associations with emotion regulation difficulties vary substantially between facets. Some aspects of trait mindfulness are positively related to emotion regulation difficulties such as suppression (Himichi et al., 2021; Norman et al., 2023). Similarly, individual differences in stoic ideology (which focuses on emotional suppression, compared to

stoic philosophy which focuses on emotions embedded in an ethical system) have been shown to negatively relate to subjective well-being measures (Karl et al., 2022) and might conceptually counteract mindfulness. In sum, there appear to be complex facet-level relationships between trait mindfulness, stoic ideology, and alexithymia, as well as these variables' associations with important mental health outcomes.

Trait mindfulness is "the general tendency of a person to show characteristics of nonjudgmental awareness of present-moment experience in their everyday life." (Krägeloh, 2020, pp. 64–65). In a factor analysis of existing measures, Baer et al. (2006) identified five facets of mindfulness: Acting with Awareness, Non-Judgement, Non-Reacting, Observing, and Describing. Acting with Awareness involves the ability to be fully present and engaged in current experiences. Non-Judgment captures the tendency to accept thoughts and feelings without evaluation. Non-Reacting emphasizes responding calmly to internal and external stimuli. Observing involves objectively noticing experiences without attachment. Describing focuses on articulating internal experiences with clarity. The facets of the Five Facet Mindfulness Questionnaire (FFMQ) aim to capture latent individual differences in differential experience of mindfulness states (Kiken et al., 2015; Warren et al., 2022). Trait mindfulness has shown a range of beneficial outcomes on well-being and health variables, and has been an increasing topic of research over the last decade (Karl & Fischer, 2022d). Beyond this research on clinically relevant outcome variables, researchers have focused on the wider nomological network of individual differences in which mindfulness can be positioned. Core to this has been the research on differences in emotion processing. One aspect of emotion processing that has received attention are individual differences in alexithymia, and associated clinical outcomes.

Alexithymia is defined as the tendency to experience difficulties in allocating attention to, and accurately appraise one's emotional experiences, resulting in poorer emotional granularity (Preece et al., 2018, 2023). As an individual difference, alexithymia is a multi-dimensional construct with three empirical and theoretical interrelated facets: difficulties identifying feelings (negative or positive), difficulties describing feelings (negative or positive), and Externally Oriented Thinking relating to the general tendency to not focus on internal emotional states (Preece et al., 2023). Alexithymia can be captured using the Perth Alexithymia Questionnaire (Preece et al., 2018). In contrast to previous measures of mindfulness, such as the Toronto Alexithymia Scale which has often been used as a single score (Kooiman et al., 2002), the PAQ allows for a fine-grained differentiation of the facets of alexithymia. This enables nuanced investigations of the relationship of alexithymia facets and other constructs.

Stoic ideology is an emerging concept which captures individuals' beliefs around emotional suppression and non-expression, which is distinct from the philosophical approaches

underpinning stoicism as an ordered school of thought (Long, 2001). The Pathak-Wieten Stoicism Ideology Scale (PWSIS; Pathak et al., 2017) assesses naive stoic ideology composed of four facets, Stoic Taciturnity (the belief that emotions should not be expressed), Stoic Serenity (the belief that strong emotions should not be felt), Stoic Endurance (the belief that physical suffering should be endured), and Death Acceptance (accepting mortality, rather than fearing it). Little is known about the relationship between stoic ideology and mindfulness. The original authors of the PWSIS (Pathak et al., 2017) had indicated a conceptual overlap between philosophical stoicism and Buddhism highlighting the potential of positive relations of this measure and measures of mindfulness. In contrast to this, a number of studies have reported negative relationships between mindfulness and stoic ideology, especially in a health context (Chambers et al., 2016; Moore et al., 2013). In contrast, studies that focused on philosophically derived stoicism (in contrast to stoic ideology) have shown positive effects on burnout (Huecker, 2020) which raises the need to more deeply explore the concept of stoic ideology and how it is situated in the wider network of individual differences of emotion regulation.

Overall, mindfulness and alexithymia have been shown to be negatively related (Norman et al., 2019; Tamanaeifar et al., 2021). Nevertheless, the pattern is more complex when considering facet-level mindfulness. Of these, Describing is the most conceptually opposed domain to alexithymia. Somewhat surprisingly, not all facets of the FFMQ have shown an equal negative relationship with alexithymia (Sugiura et al., 2012; Veehof et al., 2011), with Non-Reacting often showing a weaker relationship and some facets even showing positive relationships to alexithymia (for example Observing). Individuals can also hold cognitive elaborated beliefs regarding emotion regulation, such as stoicism, which are conceptually closely connected to alexithymia. As noted above, the relationship between stoic ideology, stoic philosophy, and alexithymia may be more complex. To our knowledge, no empirical study has examined the association between stoic philosophy and alexithymia. In contrast, stoic ideology has shown robust positive associations with alexithymia (Judd et al., 2008), potentially due to their shared relationship with emotion suppression (Preece et al., 2023).

Much of the current research has utilized individual samples, which often ignores possible cultural differences. A significant portion of dispositional mindfulness research has been conducted in the USA, with relatively less research in other cultural contexts. It may be tempting to apply maximally divergent samples to study cultural effects. Although cultural differences are easily observable in such designs, these effects are difficult to explain due to the myriad of cultural, social, and economic variables that may play a role (van de Vijver & Leung, 2000). Thus, a viable alternative is to study samples that are culturally quite similar but differ in specific aspects (van de Vijver & Leung, 2021), for example New Zealand (NZ) and Norway. Both countries

show highly similar egalitarian and individualistic values and beliefs, as well as relatively similar emotion expression strategies (House et al., 2004; Smith et al., 1996). However, they do differ in one specific cultural dimension: indulgence – restraint (Heydari et al., 2021; Hofstede et al., 2010; Minkov, 2007). Societies relatively higher in indulgence tend to value relatively free gratification of desires, enjoy life, and prioritize having fun. More restrained societies emphasize greater control of immediate gratification of needs and emphasize stronger social norms around expressing one's desires. In nationally representative samples, Norway scores higher on restraint, whereas NZ tends to be more indulgent (Hofstede, 2001; Minkov, 2007). Conceptually, these cultural differences could be aligned with alexithymia, stoic ideology, and mindfulness. In more restrained contexts, one might expect a tighter clustering of emotion regulation strategies with stoic ideology, and possibly also a tighter integration of monitoring one's emotions (especially Acting with Awareness and Observing facets of mindfulness) applying more stringent emotion regulation. However, in indulgent contexts, these associations may be weaker due to fewer social incentives to monitor or control their emotions.

Importantly, studies on the facets of mindfulness and alexithymia have largely reported correlational results, and generally focused on mindfulness as a higher order construct. While informative on the overall patterns, this might obscure the relationships of individual facets due to their shared variance with other facets. Additionally, due to its immediate clinical relevance, researchers most commonly focus on alexithymia as an outcome of mindfulness. Nevertheless, in line with recent conceptualizations of trait mindfulness as representing an aggregate of mindfulness states (Warren et al., 2022), studies have shown that emotional experiences can influence state mindfulness (Karl & Fischer, 2022c) which might induce trait changes in mindfulness. Altogether, this highlights the necessity of examining the network of mindfulness, alexithymia, and stoic ideology at a facet level while not imposing directionality.

The recent developments in network analyses help to obtain a more refined perspective on the relationship between the facets while accounting for shared variance. In this approach, the facets are modelled as nodes with their unique relationship modelled as linking edges. Using a regularization approach allows for the robust extraction of a network model which is both specific (with close to zero, spurious relationships excluded) and also sensitive (including relationships that are core to describing the network). This approach has been shown as an efficient strategy to extract a sparse network that closely matches the true underlying model. It also allows investigation of the unique relationships of individual variables without the need to impose directionality, as would be necessary in a traditional SEM-based approach (Epskamp & Fried, 2018; Epskamp et al., 2018).

The current paper aimed to address these questions and examine how mindfulness is related to alexithymia (subclinical difficulties in emotional experience) and stoic ideology (cognitively elaborate ideologies focused on emotional non-experience) in two separate cultural contexts. Overall, mindfulness (especially Non-Reacting, Non-Judgement, and Describing) was hypothesized to be negatively related to both constructs, while alexithymia and stoic ideology were expected to be positively related.

Method

Participants

New Zealand

Participants were recruited through an introductory course to psychology at a New Zealand university and participants received course credits for participation. We initially recruited 330 undergraduate students for an online survey. To limit the potential identifiability of participants, we limited demographic data to age and gender. Of the initial participants, five participants opted out of the study. These participants were removed from the final dataset. Our sample was largely female (81.23%) with an average age of 19.95 years ($SD = 3.59$). While only a small percentage of our sample indicated meditation (18.46%) or yoga (21.54%) experience, more participants reported mindfulness (33.23%) experience. This data which was collected between 2020–07-28 and 2020–08-19 was part of a larger research project which has in part been published (Karl & Fischer, 2022a). None of the data presented in the current study have been utilized before.

Norway

The recruitment used convenience sampling and took place from the start of July 2022 to the middle of October 2022. Using social media advertisement, posters, and flyers distributed at a large university, participants were invited to answer an online survey. All participants provided written informed consent digitally and anonymously using a solution called Nettskjema.no before inclusion. By ensuring participants' anonymity, the Regional Committee for Medical and Health Research Ethics in Northern Norway concluded that an elaborated ethical evaluation was unnecessary. The sample consisted of 326 participants (73.93% females), with an average age of 25.49 years ($SD = 8.03$). While only a small percentage of the sample indicated meditation (15.64%) or yoga (19.33%) experience, more participants reported mindfulness (22.09%) experience. As most measures in this study have not previously been applied in Norwegian, they were

translated using a back-translation procedure conducted by ERL and SS. All measures were translated to Norwegian and were in turn translated back to English to check for agreement. All translation conflicts were resolved by ERL and SS using a committee approach. The full survey in Norwegian is accessible on the OSF.

Measures

Alexithymia

Alexithymia was measured using the Perth Alexithymia Questionnaire (Preece et al., 2018). Participants rated themselves on a 1 (*Strongly Disagree*) to 7 (*Strongly Agree*) scale on five dimensions of alexithymia: Negative-Difficulty Identifying Feelings ("When I'm feeling bad, I can't tell whether I'm sad, angry, or scared."), Positive-Difficulty Identifying Feelings ("When I'm feeling good, I can't tell whether I'm happy, excited, or amused."), Negative-Difficulty Describing Feelings ("When I'm feeling bad (feeling an unpleasant emotion), I can't find the right words to describe those feelings."), Positive-Difficulty Describing Feelings ("When I'm feeling good (feeling a pleasant emotion), I can't find the right words to describe those feelings."), Externally Oriented Thinking ("I tend to ignore how I feel."). This measure has shown good reliability, with α ranging from 0.87 to 0.90 for the subscales (Preece et al., 2018), and discriminant validity (Preece et al., 2024) in past research. Higher scores on this measure indicate higher alexithymia.

Trait Mindfulness

The FFMQ (Baer et al., 2006) consists of 39 items capturing five facets: Acting with Awareness, Non-Reacting, Non-Judging, Describing, and Observing. Participants rated their agreement on a 5-point Likert-type scale from 1 (*Never or very rarely true*) to 5 (*Very often or always true*) with higher scores indicating higher mindfulness. Example items are "When I'm walking, I deliberately notice the sensations of my body moving" and "I'm good at finding words to describe my feelings." This measure has shown good reliability, with α for the subscales in the range of 0.69–0.91 (Dundas et al., 2013), and convergent validity with other mindfulness constructs (Karl & Fischer, 2020).

Stoic Ideology

Stoic ideology was operationalized with the 12-item Pathak-Wieten Stoicism Ideology Scale (PWSIS Pathak et al., 2017). The scale measures four components on a 1 (*Disagree*) to 5 (*Agree*): Endurance (e.g., "I expect myself to hide my aches and pains from others."), Taciturnity (e.g., "I don't believe in talking about my personal problems."),

Serenity (e.g., "I would prefer to be unemotional."), and Death Acceptance (e.g., "I would not allow myself to be bothered by the fear of death."). Higher scores on this measure indicate higher stoic ideology. In past research, this scale has shown acceptable reliability with α ranging from 0.55 to 0.90 and validity in predicting well-being outcomes (Karl et al., 2022).

Practice

Participants reported whether they practiced either mindfulness ("Do you practice mindfulness?"), yoga ("Do you practice yoga?"), or meditation ("Do you practice meditation?") on a 0 (*No*)/1 (*Yes*) scale. Participants were rated as having experience in mindfulness if they indicated agreement with either the meditation or mindfulness item.

The reliability for all measures was acceptable. Reliability statistics and correlations between target variables are displayed in Tables 1 and 2, respectively. The invariance of all measures between countries was tested, and we found at least metric equivalence for each scale (Table 3, given with three decimals to allow for sufficient precision). All data collected and all analytical scripts are available on the Open Science Framework (OSF; https://osf.io/f35mb/).

Data Analyses

Global Network Invariance

To examine if the overall network differed by country, using a permutation-based approach (Borkulo et al., 2017), we tested the invariance of strength and edges between 1000 permutations of the regularized networks.

Country-Specific Networks

Next, a bootstrapped network model was fitted using the EBICglasso estimator to select the optimal level of the GLASSO γ parameter at which specificity and sensitivity of the network are optimal. To assess the stability of the obtained solution, the vulnerability of the resultant network to case-drop bootstrapping was examined. A network is considered robust if a statistic can be replicated with a correlation of 0.70 in 95% of the bootstraps if at least 25% of the sample is dropped (Costantini et al., 2019). In addition, we also examined the stability of the network to the dropping of nodes, which gives an indication how likely the network is to rewire in response to missing nodes. Last, community membership of each facet was estimated using a bootstrapped exploratory graph analysis (EGA) with a Louvain algorithm (Christensen, 2022; Garcia-Pardina et al., 2022; Jiménez et al., 2022). While often employed at an item level, recent research has highlighted the use of EGA approaches

Table 1 Reliability of scales in New Zealand and Norway

Measure	Country	α	ω
Mindfulness			
Observing	NO	0.77[0.73, 0.81]	0.78[0.74, 0.81]
Observing	NZ	0.83[0.80, 0.86]	0.83[0.81, 0.86]
Describing	NO	0.94[0.93, 0.95]	0.94[0.93, 0.95]
Describing	NZ	0.87[0.85, 0.90]	0.88[0.85, 0.90]
Awareness	NO	0.86[0.83, 0.88]	0.85[0.83, 0.88]
Awareness	NZ	0.88[0.86, 0.90]	0.89[0.87, 0.90]
Non-Judgement	NO	0.92[0.91, 0.94]	0.92[0.91, 0.94]
Non-Judgement	NZ	0.91[0.89, 0.92]	0.91[0.89, 0.92]
Non-Reacting	NO	0.81[0.78, 0.84]	0.82[0.79, 0.85]
Non-Reacting	NZ	0.84[0.82, 0.87]	0.85[0.82, 0.87]
Stoic ideology			
Endurance	NO	0.82[0.78, 0.85]	0.82[0.79, 0.85]
Endurance	NZ	0.86[0.84, 0.89]	0.86[0.84, 0.89]
Taciturnity	NO	0.80[0.76, 0.84]	0.80[0.77, 0.84]
Taciturnity	NZ	0.80[0.77, 0.84]	0.80[0.77, 0.84]
Serenity	NO	0.65[0.58, 0.72]	0.67[0.62, 0.73]
Serenity	NZ	0.68[0.62, 0.74]	0.69[0.64, 0.75]
Death Acceptance	NO	0.78[0.73, 0.82]	0.78[0.74, 0.82]
Death Acceptance	NZ	0.81[0.77, 0.84]	0.81[0.78, 0.85]
Alexithymia			
Negative Identifying	NO	0.92[0.91, 0.94]	0.92[0.91, 0.94]
Negative Identifying	NZ	0.88[0.86, 0.91]	0.89[0.87, 0.91]
Positive Identifying	NO	0.93[0.92, 0.95]	0.93[0.92, 0.95]
Positive Identifying	NZ	0.90[0.88, 0.92]	0.90[0.86, 0.92]
Negative Describing	NO	0.92[0.90, 0.93]	0.92[0.90, 0.93]
Negative Describing	NZ	0.90[0.89, 0.92]	0.91[0.89, 0.92]
Positive Describing	NO	0.93[0.91, 0.94]	0.93[0.92, 0.94]
Positive Describing	NZ	0.91[0.90, 0.93]	0.91[0.90, 0.93]
External Orientation	NO	0.92[0.91, 0.93]	0.92[0.91, 0.93]
External Orientation	NZ	0.90[0.89, 0.92]	0.90[0.89, 0.92]

to understand the clustering of constructs at higher-order levels (Golino et al., 2020; Jiménez et al., 2022), allowing a deeper insight into the organization of concepts. To examine the robustness of the emerging community solutions, we investigated the dimensional stability which indicates the emergence of a specific community structure across 1000 bootstraps with values of 1 representing perfect replication across all runs (Christensen et al., 2020). Finally, as the position of nodes in a graph is arbitrary, a multi-dimensional scaling (MDS) approach on each country's network was applied to achieve a positioning of nodes which can be visually interpreted (Jones et al., 2018).

Cross-Country Comparison of Networks

Three aspects of the networks were compared between countries: edge weights, clustering of variables, and overall structure of the graph. First, the *network comparison test*

(Borkulo et al., 2017) was employed to examine differences in edge weights, which used the previously regularized networks to examine the difference in edge weights between groups across 1000 resamples. Second, the MDS solution of Norway was rotated to maximum similarity with the solution derived in New Zealand. This enabled estimation of Tucker's Φ as an indicator of agreement between the overall structure of the graphs (Fischer & Karl, 2019). Finally, to compare the empirical clustering of the variables, we examined the equivalence of loadings of the individual facets onto empirically identified communities across 1000 iterations using the New Zealand solution as reference group.

Results

Network Invariance Between Countries

Overall, the results revealed that the networks of alexithymia, stoic ideology, and mindfulness differed significantly between the countries ($M = 0.27$, $p = 0.002$), but the global strength did not differ between these networks ($S = 0.06$, $p = 0.930$). This indicates that while the networks show substantial differences in arrangement of the edges, the overall density of connection in the networks does not differ. Based on this finding, the individual networks in each country were compared first.

Edges and Edge Differences Between Countries

Separated networks in each country were estimated first. The resultant graphs' edges showed very high stability and remained robust to the maximum of dropped cases (75%), indicating that a robust network was recovered in each country that was likely not influenced by sampling variations. Additionally, we found that the network was very stable to node drop in both countries with up to 40% of nodes dropped before correlation confidence intervals were approaching 0.70 (find the full graph in the Online Resource Fig. 1). Furthermore, simulated replicability of the network was examined to get an understanding of the specificity and sensitivity. Finally, the adequateness of the sample size was tested for each of the networks to achieve a specificity of 0.60 and a power of 0.80 using a Monte Carlo approach (Constantin et al., 2023). The network had an adequate sample size in Norway ($n_{Estimated} = 266$, see Fig. 2 in the Online Resource), but was slightly underpowered in New Zealand ($n_{Estimated} = 452$, see Fig. 3 in the Online Resource). Figure 1A and B display both countries' networks. Subsequently the invariance of the network edges between Norway and New Zealand was examined, using the network comparison test (Borkulo et al., 2017) to identify edges which differed significantly between the countries. As the focus of

Table 2 Means, standard deviations, and zero-order correlations in each country

Norway

	M	SD	2	3	4	5	6	7	8	9	10	11	12	13	14
1: Negative Identifying	30.37	10.47													
2: Positive Identifying	20.57	10.25	0.61***												
3: Negative Describing	30.30	10.52	0.79***	0.55***											
4: Positive Describing	20.72	10.29	0.57***	0.87***	0.63***										
5: External Orientation	20.92	10.23	0.54***	0.57***	0.59***	0.55***									
6: Observing	30.39	0.6	-0.04	-0.05	-0.12*	-0.11*	-0.26***								
7: Describing	30.52	0.79	-0.67***	-0.48***	-0.82***	-0.57***	-0.54***	0.22***							
8: Awareness	30.00	0.6	-0.39***	-0.35***	-0.33***	-0.35***	-0.28***	-0.07	0.34***						
9: Non-Judgment	30.29	0.80	-0.40***	-0.31***	-0.32***	-0.31***	-0.19***	-0.03	0.36***	0.44***					
10: Non-Reacting	30.09	0.59	-0.22***	-0.08	-0.25***	-0.17**	0.06	0.14*	0.27***	0.33***	0.47***				
11: Endurance	20.99	10.00	0.27***	0.32***	0.34***	0.28***	0.46***	0.03	-0.29***	-0.22***	-0.28***	0.02			
12: Taciturnity	20.64	0.96	0.36***	0.43***	0.46***	0.41***	0.59***	-0.08	-0.43***	-0.31***	-0.36***	-0.02	0.69***		
13: Serenity	20.28	0.84	0.30***	0.32***	0.35***	0.29***	0.51***	-0.12*	-0.31***	-0.21***	-0.34***	-0.09	0.39***	0.52***	
14: Death-Acceptance	20.52	10.02	0.04	0.13*	0.08	0.11*	0.19***	0	-0.09	-0.01	-0.02	0.05	0.35***	0.33***	0.16***

New Zealand

	M	SD	2	3	4	5	6	7	8	9	10	11	12	13	14
1: Negative Identifying	30.59	10.40													
2: Positive Identifying	20.90	10.28	0.64***												
3: Negative Describing	30.83	10.44	0.76***	0.51***											
4: Positive Describing	30.22	10.36	0.57***	0.79***	0.61***										
5: External Orientation	30.22	10.20	0.56***	0.57***	0.60***	0.54***									
6: Observing	30.30	0.69	-0.07	0.02	-0.07	0.00	-0.13*								
7: Describing	30.09	0.74	-0.54***	-0.34***	-0.72***	-0.51***	-0.44***	0.16**							
8: Awareness	20.82	0.74	-0.42***	-0.30***	-0.36***	-0.29***	-0.34***	-0.10	0.26***						
9: Non-Judgment	30.03	0.85	-0.49***	-0.37***	-0.45***	-0.32***	-0.39***	-0.11	0.26***	0.47***					
10: Non-Reacting	20.92	0.72	-0.18**	0.01	-0.11	0.03	0.10	0.30***	0.17**	0.13*	0.14*				
11: Endurance	20.83	10.02	0.29***	0.27***	0.37***	0.30***	0.44***	0.10	-0.26***	-0.20***	-0.28***	0.10			
12: Taciturnity	20.89	10.02	0.34***	0.29***	0.45***	0.34***	0.49***	0.12*	-0.29***	-0.25***	-0.33***	0.15**	0.63***		
13: Serenity	20.45	0.89	0.31***	0.39***	0.35***	0.35***	0.58***	-0.08	-0.29***	-0.16**	-0.29***	0.09	0.40***	0.53***	
14: Death-Acceptance	20.87	10.04	0.02	0.07	0.03	0.08	0.21***	0.17**	0.02	-0.04	-0.08	0.28***	0.28***	0.27***	0.17***

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 3 Invariance of measures between countries

Level	CFI	TLI	RMSEA	LC	UC	SRMR	ΔCFI	ΔTLI	ΔRMSEA
Stoic ideology									
Configural	0.947	0.930	0.064	0.053	0.075	0.052	-	-	-
Metric	0.946	0.936	0.061	0.051	0.072	0.057	0.001	–0.006	0.003
Scalar	0.894	0.881	0.084	0.074	0.093	0.070	0.052	0.055	–0.022
Mindfulness									
Configural	0.935	0.927	0.040	0.036	0.044	0.057	-		
Metric	0.930	0.925	0.040	0.037	0.044	0.067	0.005	0.002	–0.001
Scalar	0.917	0.913	0.043	0.040	0.047	0.069	0.013	0.012	–0.003
Alexithymia									
Configural	0.916	0.906	0.077	0.071	0.082	0.073	-		
Metric	0.914	0.909	0.075	0.070	0.081	0.078	0.001	–0.003	0.001
Scalar	0.903	0.900	0.079	0.074	0.084	0.080	0.011	0.009	–0.003

All models were fitted with an MLR estimator to account for multi-variate non-normality. For stoic ideology, a model was fitted in which the facets of stoic ideology were subsumed under a higher order factor. An identical model was fitted for Alexithymia. For mindfulness, a model has been fitted in which the facets of mindfulness were allowed to correlate and the individual items were freely loaded onto positive and negative methods factors as this model has shown greater cross-cultural comparability in past studies (Aguado et al., 2015; Karl et al., 2020; Van Dam et al., 2012)

the study was the relationship of mindfulness with alexithymia and stoic ideology, these are presented in Table 4; the full graphs are available on the OSF.

The relationship between mindfulness and alexithymia showed an expected negative pattern which did not vary between countries. Importantly, the mindfulness facets showed a more pronounced negative relationship with alexithymia facets focusing on difficulties identifying and describing negative emotions rather than positive emotions. Surprisingly, Non-Reacting showed a positive relationship with Externally Oriented Thinking, which indicates that Non-Reacting might partially capture redirection of attention away from engagement with one's internal states.

In contrast, the relationship between mindfulness and stoic ideology was more complex. Non-Judgement showed negative relationships with Endurance, Taciturnity, and Serenity, as did Awareness with Taciturnity. In contrast, Observing showed a positive relationship with Endurance, and Non-Reacting showed a positive relationship to Death-Acceptance, albeit this relationship was significantly more pronounced in New Zealand compared to Norway ($p = 0.012$).

Finally, the mindfulness facets were overall positively related. The exception to this was Observing which showed negative relationships with Acting with Awareness and Non-Judgement in both samples. Non-Judgement and
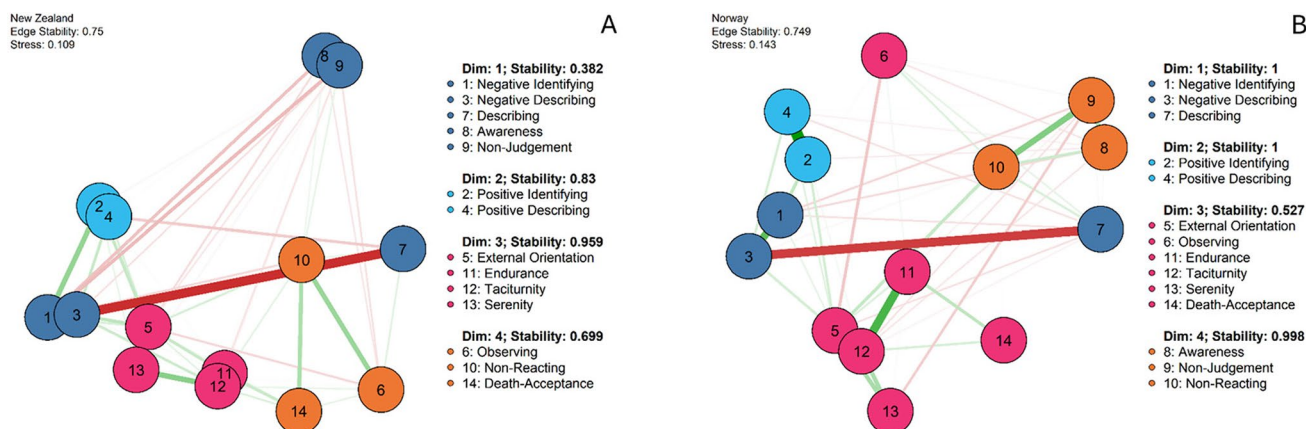

Fig. 1 Individual network in each country.. Node position is based on MDS of the graph; clustering is based on EGA with Louvain algorithm. Greater saturation of edges indicates a stronger relationship with red indicating a negative relationship and green a positive relationship

Fig. 2 **A** Comparison of the Procrustes rotated Norwegian graph against the NZ graph. **B** Distance between nodes in the MDS solution
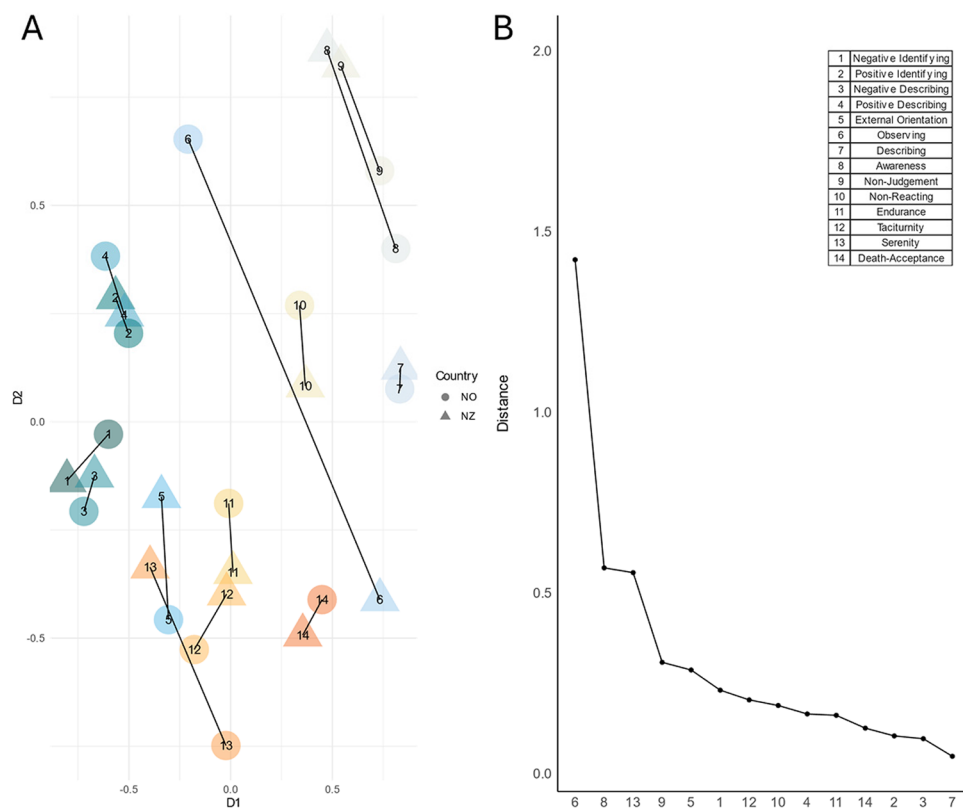
Non-Reacting showed a substantively more positive edge in Norway compared to New Zealand ($p = 0.001$) indicating that participants might see them as more closely aligned in this context.

Edge Positions Within the Networks and Differences Between Countries

Subsequently, to compare the networks between countries, the similarity and differences between the nodes between countries were examined. As the edges in the network represent standardized regularized correlations, a MDS approach was applied to examine the similarity of node structure between countries in a two-dimensional space. Overall, the MDS solutions between countries approached similarity on the first dimension (Tucker's $\Phi = 0.84$) but showed pronounced dissimilarity on the second dimension (Tucker's $\Phi = 0.64$). To visualize the results, Fig. 2A displays the MDS solution with Norway rotated towards New Zealand. Figure 2B is an overview of the distance between nodes in the rotated Norwegian solution to the solution in New Zealand. In New Zealand, the MDS revealed two axes with Axis 1 (Difficulties Identifying Emotions – Describing) capturing differences in the ability to identify one's emotions. In contrast, Axis 2 (Emotional Acceptance – Emotional Suppression) captured differences in either staying aware and non-judgmental of oneself versus engaging in emotional

suppression. Examining the difference in the relative position of the nodes between the countries helps to illuminate the low convergence between the two solutions, especially on the second axis. Overall, the mindfulness facets showed a pronounced shift between the countries with Non-Reacting, Non-Judgement, Acting with Awareness, and Describing clustering more tightly associated in Norway than in New Zealand. Especially marked was the different position of Observing which shifted from closely aligned to emotion identification and emotion suppression to the nearly diametrically opposite position in Norway. This highlights that the role of Observing in the respective networks is likely very different.

Community Structures and Differences Between Countries

Finally, to estimate the clustering of variables within each network more explicitly, separate exploratory graph analyses (EGA) were utilized in each sample using a Louvain algorithm to determine the optimal number of communities and empirical assignment of variables to each community. To compare the invariance of the EGA solutions, we used the New Zealand solution as baseline and examined the significance of community loading differences across the 1000 bootstraps. Overall, evidence for a four-community solution in each country emerged. Nevertheless, the content

Table 4 Non-zero edges in each country's graph

node1	node2	NZ	NO	*p*
Alexithymia				
5: External Orientation	6: Observing	–0.08	–0.14	0.507
5: External Orientation	10: Non-Reacting	0.08	0.15	0.387
3: Negative Describing	7: Describing	–0.46	–0.50	0.420
1: Negative Identifying	7: Describing	0.00	–0.07	**0.050**
1: Negative Identifying	9: Non-Judgment	–0.15	–0.10	0.417
1: Negative Identifying	8: Awareness	–0.13	–0.09	0.512
4: Positive Describing	7: Describing	–0.11	–0.07	0.530
4: Positive Describing	8: Awareness	–0.01	–0.04	0.608
2: Positive Identifying	9: Non-Judgment	–0.02	0.00	0.744
Stoic ideology				
14: Death-Acceptance	10: Non-Reacting	0.18	0.01	**0.017**
13: Serenity	9: Non-Judgment	–0.02	–0.12	0.157
11: Endurance	6: Observing	0.01	0.03	0.726
11: Endurance	9: Non-Judgment	–0.03	–0.04	0.894
12: Taciturnity	9: Non-Judgment	–0.06	–0.07	0.871
12: Taciturnity	8: Awareness	–0.01	–0.06	0.493
Mindfulness interrelations				
6: Observing	7: Describing	0.059	0.058	0.989
6: Observing	9: Non-Judgment	–0.062	–0.020	0.586
6: Observing	10: Non-Reacting	0.218	0.081	0.115
6: Observing	8: Awareness	–0.051	–0.063	0.864
7: Describing	10: Non-Reacting	0.051	0.091	0.594
9: Non-Judgment	10: Non-Reacting	0.052	0.324	**0.001**
8: Awareness	9: Non-Judgment	0.273	0.208	0.389
8: Awareness	10: Non-Reacting	0.036	0.128	0.253

Significance of edge differences is based on 1000 permutations of the NCT network-invariance test based on the regularized network within each country

of these communities differed between countries. While the first community in both countries contained Difficulties Identifying and Describing negative emotions and Describing, in New Zealand it additionally contained Acting with Awareness and Non-Judgement. Importantly, the community loading of Acting with Awareness and Non-Judgement on the first community did not differ significantly on the first community. This suggests that while these two nodes overlap with this community in Norway, they do not primarily load onto it.

The second community was identical across countries, capturing Difficulties in Identifying and Describing Positive Emotions. The third community in New Zealand captured all stoic ideology facets with the exception of Death-Acceptance. In contrast, in Norway this community also encompassed Death-Acceptance and Observing. Finally, the fourth community showed the greatest difference in node content between countries with Death-Acceptance, Non-Reacting, and Observing defining it in New Zealand versus Acting with Awareness, Non-Reacting, and Non-Judgement defining it in Norway. Overall, this shows that while the countries show relative qualitative convergence in their solutions, the role of Observing and the overall clustering of the mindfulness facets seem to differ between countries. See full loadings in Table 5 and the results of the EGA invariance analysis in Table 6.

Discussion

This study investigated how mindfulness is related to alexithymia and stoic ideology on a facet level. Overall, the results revealed negative relationships between mindfulness and dispositional difficulties (alexithymia) and cognitive strategies (stoic ideology) aimed at emotional suppression. These associations were stronger for individuals with high levels of alexithymia compared to those with high levels of stoic ideology. This indicates that while holding an ideology rooted in emotion suppression might negatively influence mindfulness, dispositional differences in the clarity of emotional experience might more strongly underpin individuals' low mindfulness.

Our finding supports previous research addressing the importance of the relationship between mindfulness and alexithymia (Norman et al., 2019). Broadly conceptually speaking, the facets of the FFMQ can be broken down into two major components: Monitoring (Observing) and Acceptance (Non-Judging and Non-Reacting) with Describing and Acting with Awareness representing complementary skills (Lindsay & Creswell, 2017). In this study, the Monitoring components showed only a small negative relationship with alexithymia, potentially representing the tendency of individuals high on monitoring to be more reactive to and pre-occupied with outside stimuli, both good and bad (Karl & Fischer, 2022c). The Acceptance components (Non-Reacting and Non-Judging) showed more substantial relationships, but these relationships were also more nuanced. Non-Judging was negatively related to difficulties in identifying emotions potentially because being non-judgmental requires greater differentiation of emotional states. In contrast, Non-Reacting showed a positive relationship with Externally Oriented thinking. One potential reason for this relationship might be that Non-Reacting is a form of emotion

Table 5 Loading of nodes on communities in each country

Variable	New Zealand				Norway			
	1	2	3	4	1	2	3	4
1: Negative Identifying	0.23	0.17	0.04	–0.22	0.29	0.11	0.03	–0.12
2: Positive Identifying	0.13	0.41	0.08	–0.01	0.09	0.47	0.07	–0.03
3: Negative Describing	0.49	0.09	0.13	–0.05	0.52	0.08	0.08	–0.01
4: Positive Describing	0.13	0.41	0.05	0.00	0.11	0.47	0.04	–0.03
5: External Orientation	0.13	0.15	0.26	0.15	0.14	0.13	0.25	0.15
6: Observing	–0.03	0.00	0.07	–0.19	–0.03	0.00	0.06	0.06
7: Describing	–0.27	–0.08	0.00	0.06	–0.33	–0.05	–0.05	0.11
8: Awareness	–0.08	0.00	–0.04	0.21	–0.06	–0.06	–0.03	0.24
9: Non-Judgment	–0.12	–0.02	–0.07	0.23	–0.07	0.00	–0.11	0.34
10: Non-Reacting	–0.07	0.00	0.14	0.17	–0.05	0.00	0.06	0.31
11: Endurance	0.01	0.01	0.34	–0.02	0.00	0.00	0.37	0.02
12: Taciturnity	0.06	0.00	0.40	–0.09	0.04	0.03	0.49	–0.08
13: Serenity	0.00	0.03	0.29	–0.01	0.00	0.00	0.23	–0.08
14: Death-Acceptance	0.00	0.00	0.11	0.14	0.00	0.00	0.13	0.00

suppression, which has been shown to be related to greater alexithymia (Preece et al., 2023). This finding contributes to the growing literature suggesting that Non-Reacting may capture not only general detachment but also, to some extent, emotional suppression or avoidance (Choi et al., 2021). Finally, the results revealed that the two components which have not been considered either Monitoring or Acceptance (Describing and Acting with Awareness) showed the most pronounced relationships with alexithymia. This highlights that these meta-cognitive aspects of mindfulness might be the most salient aspects and might represent important targets for mindfulness interventions aimed at impacting alexithymia. Importantly, this pattern of relationships did not differ across cultural and linguistic contexts in this study, supporting the robustness of these results.

Table 6 EGA invariance between New Zealand and Norway

Node	NZ	NO	Difference	p	
1: Negative Identifying	1	1	0.06	0.204	n.s
3: Negative Describing	1	1	0.04	0.319	n.s
7: Describing	1	1	–0.07	0.059	n.s
2: Positive Identifying	2	2	0.06	0.125	n.s
4: Positive Describing	2	2	0.06	0.125	n.s
5: External Orientation	3	3	–0.01	0.892	n.s
11: Endurance	3	3	0.03	0.508	n.s
12: Taciturnity	3	3	0.09	0.078	n.s
13: Serenity	3	3	–0.06	0.143	n.s
6: Observing	4	3	0.24	0.610	n.s
14: Death-Acceptance	4	3	0.02	0.632	n.s
8: Awareness	1	4	0.02	0.785	n.s
9: Non-Judgment	1	4	0.11	0.112	n.s
10: Non-Reacting	4	4	0.13	0.055	n.s

This is not to say that no cross-cultural differences were present in the data. Most importantly the placement of Observing, and to a lesser extent Acting with Awareness and Non-Judgement, differed substantially between the two countries. The finding on the different placement of the Observing facet between countries is reflective of the general instability of the Observing facet in the wider mindfulness network (de Bruin et al., 2012; Lilja et al., 2013; Reffi et al., 2021; Rudkin et al., 2018). Similarly, Acting with Awareness has been shown to be structurally less stable between cultures (Karl et al., 2020). Additionally, Non-Judgement and Acting with Awareness are the only facets in the FFMQ composed entirely of negatively worded items, which likely exacerbates minor differences in interpretation between cultures (Karl & Fischer, 2022b). This finding was supported by our EGA in which Non-Judgement, and Acting with Awareness together with Non-Reacting emerged as a separate community in Norway, compared to the solution in New Zealand, where they were strongly associated with the identification and description, especially of negative emotions. This difference in arrangement could reflect underlying cultural differences in indulgence and restraint. While in a more indulgence society like New Zealand these mindfulness facets seem to be more closely related with self-focused emotion regulation, in a more restrained country like Norway these variables might capture self-focused attention monitoring and emotional regulation.

Limitations and Future Research

The current study was mostly limited by the samples, based on student populations which took part in the studies for research participation credit. This limits the generalizability of the findings to the general population. However, it

should be noted that the original instruments were largely developed in student samples; hence, the results are compatible with previous research contexts. Furthermore, an individual-level scale for indulgence and restraint was developed only after this study's data collection. Thus, the study relies on previous country-level studies that have suggested these cross-cultural differences. Future studies should explore these relationships in a wider set of countries and directly collect individual-level data. Similarly, our results rely on the selection of two countries, which preclude the investigation of larger cross-cultural patterns of similarities and differences along major cultural axes. Future studies should aim to cover a greater, including non-WEIRD, cultural space to allow for a deeper understanding of the cultural variability of our observed effects. Additionally, our current study focused on providing initial exploratory insight into the wider network of mindfulness and stoic ideology relying on cross-sectional data. Future studies should build on the current results to expand the investigation using theoretical mechanisms, preferably with data which allows for stronger causal claims. Finally, our data was collected during the COVID pandemic; while we were unable to provide insight into specific effects of the pandemic on the observed network, future replication studies could utilize our open data to test for network differences in pandemic and post-pandemic contexts.

Declarations

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