10 Taking a fresh look at the CQ-personality mediation hypothesis: a network perspective

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INTRODUCTION

Cultural intelligence (CQ) has emerged as a major topic within international business and intercultural relation research. Following the original definitions of CQ by Early and Ang (2003) the construct focuses on inter-individual differences in the ability of individuals to adapt to novel cultural settings and the extent to which these inter-individual differences contribute to success in global work assignments. Our chapter contributes to cultural intelligence (CQ) research by (a) examining the associations of CQ with a broader range of work related attitudes and behaviors, (b) exploring the associations of CQ with personality traits as important individual difference characteristics and (c) through the use of psychological network models, providing new perspectives on the mediation hypotheses linking personality, CQ and work behavior. To provide some guidance on our chapter, we briefly recap some major findings on the structure and associations of CQ as an individual difference variable, discuss links with personality traits and show how a network perspective can provide new insights. We report data from a large NZ employee sample in which short measures of CQ, personality and work attitudes were measured and introduce the reader to basic steps of psychological network analyses. Readers can download the script to replicate these analyses (https://osf.io/39u7c/).

CQ as an individual difference variable consists of four major components: (1) cognitive components (CCQ), which include an individual's knowledge of specific norms, practices and conventions in new cultural settings; (2) meta-cognitive CQ (MCCQ), defined as the individual's cultural awareness during interactions with people from different cultural backgrounds; (3) motivational aspects (MCQ), which capture a person's drive or motivation to learn more about culture and to function effectively in culturally diverse situations; and (4) behavioral components (BCQ), which include a person's ability to demonstrate situationally and culturally appropriate actions when interacting with people from different cultural backgrounds. These four components were first operationalized by Ang and colleagues (2004), with data from Singapore and the United States. The structure has subsequently been supported in a number of studies, including with international student samples in NZ (Ward et al., 2009), and the United Arab Emirates (Kadam et al., 2019), Korean expatriates (Koo Moon et al., 2013) and Filipino domestic workers in Taiwan (Chen, 2015). In contrast, a German adaptation (Greischel et al., 2021) indicated the presence of an overall factor of cultural intelligence with three subcomponents differentiating cognitive, motivational and behavioral components, but the absence of a separate meta-cognitive component. A study with Chinese and Dutch students (Bücker et al., 2016) only found support for a two-dimensional structure separating cognitive and meta-cognitive components from motivational-behavioral components. Taken together, this indicates that while some sub-components of CQ might be sample specific two

major subcomponents differentiating cognitive from behavioral-motivational components can be routinely identified in a range of studies.

Expanding the Network of Work-Related Outcomes of CQ

A major goal of the work conceptualizing and developing CQ was to help identify individuals who will succeed in global work assignments, show general adjustment and higher work performance in diverse cultural settings. In support of the usefulness of CQ to foster development in these areas, a significant body of research over the last years has suggested that indeed higher levels of CQ are associated with increased performance levels of international managers and expatriates (Ang & Van Dyne, 2008) and increased adjustment in diverse populations (Ott & Michailova, 2018).

Beyond individuals immersed in a cultural context that is foreign to them, several studies have now demonstrated that cultural intelligence is an essential attribute for employees in organizations that are increasingly multicultural (Ott & Michailova, 2018; Rüth & Netzer, 2020). Employees with higher scores in CQ reported more satisfaction, better work performance, more transformational leadership, and extra effort beyond traditional role descriptions (for a general review, see Ott & Michailova, 2018). This tendency of CQ to foster positive work outcomes might be reflective of the underlying ability dynamics of CQ and we could expect that CQ components show meaningful relationships with specific work attitudes and behaviors. For example, the meta-cognitive component includes monitoring one's interactions with others, which may help individuals to be aware of interaction success with diverse individuals, not just individuals from different cultural contexts. The motivational component is related to general tendencies to perform well, and it has been linked to general efficacy (Wilson et al., 2013). Finally, the ability to demonstrate situationally and culturally appropriate behavior may help individuals to perform appropriate actions at the right moment, increasing work performance. In summary, the emerging evidence suggests that CQ may be beneficial for employees in general, especially when considering that many modern work environments are increasingly multicultural. Therefore, one of the contributions of our study is a broader examination of the associations between CQ components and a diverse set of core work attitudes and behaviors in a general employee sample.

One important question is how the different components of CQ may relate to a wider range of work variables. Are some work variables relatively distinct from CQ or could we expect that all components of CQ are equally relevant to work behaviors? Here, we consider a range of work-related behaviors that are of relevance to managers in modern organizations, including attitudinal, behavioral and emotional variables. First, we include a number of key attitudinal and motivational constructs. Organizational commitment is a multidimensional construct (Meyer et al., 2002), including affective, calculative and normative components which capture emotional attachment, perceived costs associated with leaving and sense of obligation, respectively. A second motivational variable is engagement (Salanova et al., 2005), which refers to a sense of thriving at work, feeling full of energy and connected to one's work, reflecting the affective-cognitive state of individuals and the persistence and pervasiveness of one's motivation at work (Schaufeli et al., 2006). A third variable is job satisfaction, which indicates the degree of the overall affective state of individuals in relation to their job and which together with organizational commitment is often taken as a direct antecedent and predictor of job performance (Harrison et al., 2006; Judge et al., 2001). We also included the General Health

Questionnaire (Goldberg, 1972), which measures psychosocial distress that disables normal daily functioning.

We also measured both positive and negatively valenced behaviors. First, Extra-role Behavior (ERB) is an important organizational behavior that ensures the survival of modern businesses (Organ et al., 2006). Specifically, we focused on voice and helping behaviors as two specific types of Organizational Citizenship Behavior (OCB, Van Dyne & LePine, 1998) that foster efficient and smooth functioning of the organization and lead to higher innovation and creativity. We also measured two negatively valenced constructs, namely workplace deviance, which includes lack of motivation to perform well or conform to social norms and expectations (Bennett & Robinson, 2000). Deviance behaviors fall into distinct clusters: (a) organization-focused deviance which includes organization-focused behaviors such as tardiness, taking excessive breaks, or stealing, and (b) individually-focused behaviors, which involve verbally or physically aggressive behavior, gossiping, favoritism and blaming behavior.

The CQ-Personality Mediation Hypothesis

CQ does not exist in a void but is rather embedded in a network of related individual differences. Factor analytical research has identified at least five major clusters of personality traits, which have been called the Five-Factor Model (FFM), Big5 or Big Five (McCrae & John, 1992). The five major dimensions are called Conscientiousness (C), Agreeableness (A), Neuroticism (N), Openness (O) and Extraversion (E). Openness refers to the extent to which an individual is curious and open to new experiences, is creative, and appreciates aesthetic and intellectual stimulation. Extraversion is characterized by assertiveness, talkativeness, drawing energy from external and social contexts, and enjoyment of social interaction. Agreeableness refers to the extent to which an individual is concerned with maintaining social harmony. People who score highly on agreeableness typically get on well with others, are helpful, kind, and co-operative. Conscientiousness is characterized by higher levels of self-discipline, a focus on achievement, and a preference for order and planning. Finally, emotional stability manifests as a calm and composed demeanor, and a decreased tendency to become easily upset or reactive.

These five dimensions can also be identified in relation to intercultural encounters. Research on intercultural sensitivity and cross-cultural effectiveness has identified a number of key traits that appear to be specific applications of these generic personality traits to intercultural interactions. For example, the need for people to be open to new ideas and situations, and curious about other cultures, is a factor that is consistently included in the literature. Across various studies and measures, this has been conceptualized as cultural openness (Arthur & Bennett, 1995), open-mindedness (Bhawuk & Brislin, 1992), interest in local culture (Kealey & Ruben, 1983), and curiosity (Kets de Vries & Mead, 1991). This trait is closely related to openness traits (Pascual-Leone et al., 2005; Van der Zee & Van Oudenhoven, 2001). Second, a general cultural sensitivity and ability to empathize with people that differ from oneself have also been identified as relevant in the literature. This has been conceptualized as relational skills (Arthur & Bennett, 1995) and empathy (Hannigan, 1990; Kealey & Ruben, 1983) and relates closely to both Agreeableness and Openness (Pascual-Leone et al., 2005). The third attribute that has emerged consistently across the intercultural effectiveness literature is the ability for individuals to adapt to uncertainty, commonly labelled as flexibility (Arthur & Bennett, 1995; Bhawuk

& Brislin, 1992; Hannigan, 1990; Kealey & Ruben, 1983), openness to ambiguity (Hannigan, 1990), or tolerance (Kealey & Ruben, 1983). This trait is typically correlated (negatively) with Conscientiousness (Pascual-Leone et al., 2005). Fourth, the ability to approach other people and situations with confidence is advantageous in intercultural encounters, and has been discussed in the literature as self-confidence (Kets de Vries & Mead, 1991). The culture-specific trait is highly correlated with Extraversion (Pascual-Leone et al., 2005). Finally, emotional stability is also important for intercultural interactions and the emotional resilience in intercultural contexts is highly related to general emotional stability (Pascual-Leone et al., 2005; Van der Zee & Van Oudenhoven, 2001).

The original discussion by Earley and Ang (2003) and the subsequent operationalization of the self-report construct (Ang et al., 2004) considered the relationship between CQ and personality-trait like variables. Ang et al. (2006) reported consistent relationships between the Big Five and CQ. They found that meta-cognitive CQ were predicted by Openness and Conscientiousness, cognitive and motivational CQ were both predicted by Extraversion and Openness and behavioral CQ was predicted by all personality traits except Conscientiousness. Openness seemed to be a consistent predictor of all CQ dimensions, with additional traits being relevant for specific components of CQ.

Using a more culturally oriented measure of personality dimensions, Ward et al. (2009) found positive correlations between all personality traits and CQ aspects. The only correlation that was not significant was between emotional stability and behavioral CQ. The strongest correlation for each CQ component was with Open-Mindedness. Similarly strong correlations between openness traits measured using diverse personality inventories and CQ have been reported in Argentinian samples (Depaula et al., 2016), students samples in the US (Shu et al., 2017) and Germany (Greischel et al., 2021).

Does this imply that CQ and personality are interchangeable? The early work by Earley and Ang (2003) proposed that personality traits as more stable inter-individual characteristics may function as antecedents or causal agents of CQ, but may also help to channel CQ effects in relation to cross-cultural adjustment, implying that personality traits may work as moderators. Ward et al. (2009) found that CQ did not predict variance over and above these personality dimensions in a number of outcome measures for international students in NZ, whereas in US student samples (Shu et al., 2017) CQ significantly predicted variance in general, interaction and academic adjustment variables. In the US sample, motivational and cognitive components were significant predictors after accounting for personality traits and all other CQ components for all outcome variables. In an analysis focusing exclusively on motivational CQ as a potential mediator of personality effects on general adjustment of international students in NZ, Ward and Fischer (Ward & Fischer, 2008) reported that motivational CQ may indeed mediate effects of cultural empathy, open-mindedness and flexibility on adjustment, but social initiative and emotional stability personality trait effects showed direct effects on general adjustment. Similarly, Huff et al. (2014) reported that motivational CQ is a significant predictor of various outcome measures over and above personality traits in an expatriate sample in Japan. This seems to suggest that motivational CQ may indeed act as a mediator of more stable personality characteristics on various important outcome measures. Given that motivational CQ is conceptually closely related to efficacy, which is an important determinant of behavior in general (Fischer & Karl, 2021), we could expect that motivational CQ may indeed be an important mediator within a wider network of work variables. Therefore, it is worth exploring how CQ components relate to a wider range of work-related outcome variables vis-à-vis personality

traits. In our study, we use network statistics to start unpacking these complex relationships (for an overview see Figure 10.1).
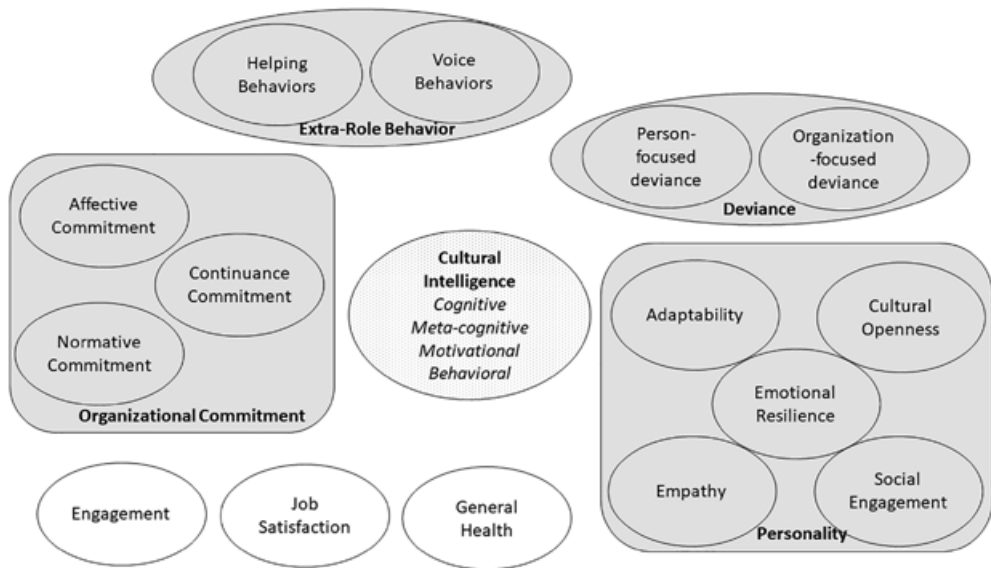

Figure 10.1   Overview of variables included in our analysis

Psychometric Network Analysis

Why network analytics? Over recent years network analysis has emerged as a novel approach in psychology to study complex interconnecting relationships between variables. Studies reviewed so far have typically used regression or structural equation modelling approaches to examine the relative relationships between CQ, personality and a range of outcome variables. These methods presuppose a causal ordering of the variables. Typically, the work-related variables are taken as the criterion or dependent variables and personality and CQ components are regressed on these criterion variables. Alternatively, mediation models within a regression or structural equation modelling perspective can be set up to test models with implied causality, for example personality acting as a more distal predictor, CQ as a mediating variable and the work variables as outcome measures. The problem with all these approaches is that (a) the data is typically cross-sectional, that is, no causal direction can be inferred, and (b) there is increasing evidence that relationships may be more complex. For example, personality traits may be more adaptive and flexible than previously assumed and respond to work conditions (Fischer, 2017; Roberts, 1997; Roberts et al., 2003; Wrzus & Roberts, 2017). This of course reverses the possible causal linkages, which means that work variables could operate as causal predictors of personality changes over time (Wrzus & Roberts, 2017). Given the nature of the data and these emerging insights of greater causal complexity, it is necessary to use more appropriate tools that provide an open-minded but rigorous exploration of possible relationships (Gelman & Vehtari, 2021).

Psychological network analytics do provide both the analytical rigor and the conceptual openness to explore potential mechanistic relationships between constructs. Modern network approaches provide both traditional graphical methods for displaying associations such as Multi-Dimensional Scaling as well as network specific statistical methods, such as centrality and bridge indicators. At their core network approaches model the relationship between individual variables (nodes) and their relationship (edges) (for a detailed introduction see: Barabási & Pósfai, 2016). Importantly, as in psychology, most absolute relationships between constructs can be expected to be above zero, even if trivially. Current network approaches use sophisticated regularization approaches to minimize the number of present close to zero edges while retaining the overall network structure. In practice this has been shown to be an effective way of recovering the underlying structure while reducing the number of spurious edges (Epskamp & Fried, 2018). In order to interpret these structures, it is necessary to display the structure via multidimensional scaling which preserves the relative distance between the nodes (variables).

Subsequently, statistical indicators for each of the nodes and edges can be extracted to describe their role in the overall network (Borgatti, 2005). We will focus mostly on centrality and bridge metrics. Importantly, because importance of a node can represent a number of different associations (direct connections, indirect connections via intermediate nodes), distinct centrality indices represent different lenses through which the importance of nodes can be examined and do not necessarily converge due to their distinct theoretical meaning (even though the average correlation among the indices is often moderate to high). Most centrality metrics are extensions of a node's degree centrality (the number of unique edges each node has) and broadly describe how a node is connected in the network. We focus on the three most commonly captured centrality indices within psychological network models: Strength, Closeness and Betweenness (but see Bringmann et al., 2019 for critical discussions).

The Strength of each node is defined as the number of edges (degree centrality) the node has, adjusted for the combined weight (regularized partial correlations) of these edges. A node high in Strength therefore has a central position in the network due to the number and weight of its direct connections with other nodes. Following from this, a high Strength node can be expected to have a strong unmediated relationships with several other nodes (Barrat et al., 2004). In contrast to Strength, Betweenness and Closeness describe a node's mediating role between other nodes from two perspectives. Betweenness represents how many shortest paths between two nodes pass through the node of interest. A high Betweenness for a node indicates that this node is an important broker in the network. In contrast, Closeness represents the inverted distance of a node to all other nodes (Freeman, 1978). Put more directly, a node high in Closeness is the node in the network which can be most easily reached from any other node and in turn the node which can reach other nodes the fastest (Borgatti, 2005; Freeman, 1978; Sabidussi, 1966). This can be thought of as flow speed through the network (Borgatti, 2005; Freeman, 1978; Sabidussi, 1966), how fast it is possible to reach any other node via the node of interest, that is, the extent to which a specific node acts like "superconductor" connecting other nodes either directly or indirectly.

Beyond these classic measures of a node's centrality, researchers have recently highlighted the usefulness of additional network measures such as Bridge Expected Influence. Bridge measures shift the lens away from a node's individual relationship in the network to their relative importance in connecting clusters of nodes. Typically, researchers first identify clusters or communities of nodes which are highly related to each other and show somewhat

weaker associations to other nodes in other clusters. These node clusters can either be theoretically specified, such as in analyses of psychopathology (Borsboom & Cramer, 2013) or can be empirically derived with community detection approaches such as Exploratory Graph Analysis (Christensen et al., 2019; Peralta et al., 2020). Once these clusters have been identified, it becomes possible to examine which of the nodes within each cluster or community is particularly well connected with other nodes outside the cluster, hence works as a bridge. Differently from the previously discussed centrality indices, Bridge Centrality can be both positive or negative indicating a nodes role in transmitting in- and outgoing positive or negative influences between clusters. Therefore, these bridge indicators provide some information on the overall positive or negative relationships between clusters and which nodes are particularly important for linking clusters or communities.

Our Study

Summarizing, we are presenting new data using a short measure of CQ in a general working sample. Broadening the associations of CQ, we measured a variety of attitudinal, motivational and behavioral variables that are of importance for modern organizations in multicultural societies. We also included a short measure of culture-oriented personality which allows us to examine the relative associations of personality traits with CQ and how these two sets of individual differences relate to work-related variables. Therefore, we provide new insights on the relationship between CQ and personality and their relationship with work motivation and behaviors. From a methodological perspective, we apply modern psychological network statistics which allow a more rigorous and statistically robust but open-minded exploration of associations, without presupposing causal relations on cross-sectional data.

METHODS

Participants

We used snow-ball sampling via student contacts to gather data from organizations in the larger Wellington region within NZ. Organizations were contacted by students in a third-year university course. Managers were asked to administer the survey to a random sample of 30 employees within their organization. No data on non-response was available. The final sample was made up of 760 individuals from 29 different organizations in New Zealand. The majority of respondents were female (52%). Respondents' ages ranged from 16 to 71, and the mean age was 36.42 (SD = 12.46). The majority (71.7%) classed themselves as being of European descent, and the remaining participants either classed themselves as part of a minority (19.6%) or did not indicate their ethnicity. Of the 29 organizations, the majority (44.1%) were private, followed by multinational (24.1%), public (21.6%), non-government organizations (7.8%) and other (2.5%). Most organizations (53.3%) had more than 100 employees.

Measures

The Cultural Intelligence Scale (CQS)

The CQS measures the four types of cultural intelligence: Motivational, Cognitive, Meta-Cognitive and Behavioral. Our survey contained 11 items, adapted from the nine item version from the CQ Handbook (Ang & Van Dyne, 2008), with three items each for Motivational CQ (e.g. "I enjoy interacting with people from different cultures"), Behavioral CQ (e.g. "I vary the rate of my speaking when a cross-cultural interaction requires it"), and Cognitive CQ (e.g. "I know the cultural values and religious beliefs of other cultures"), and two items for Metacognitive CQ (e.g. "I am conscious of the cultural knowledge I use when interacting with people from different cultural backgrounds"). Participants were asked to select the response that best described their capabilities, on a 7-point Likert scale, from 1 (strongly disagree) to 7 (strongly agree).

Cultural personality

We included 25 items designed to measure intercultural personality factors aligned with the Big Five (Fischer et al., 2017). Specifically, we measured Cultural Openness (e.g. "I like to learn more about other cultures"), Cultural Empathy (e.g. "I pay attention to others' emotions"), Social Engagement (e.g. "I am often the leader in groups"), Adaptability (e.g. "I like routine in my life", reversed) and Emotional Resilience (e.g. "I get upset easily", reversed). Participants are asked to indicate on a 7-point Likert scale how well the statement describes them, from 1 (does not describe me well) to 7 (describes me perfectly).

Organizational commitment

A shortened version of The Organizational Commitment Scale (Allen & Meyer, 1990) adapted for NZ samples (Veurink & Fischer, 2011) was used, assessing three types of commitment on a nine item questionnaire. Respondents were asked to answer how strongly they agreed or disagreed with the statements on a 7-point Likert scale. Three items measured Affective Commitment (e.g. "this organization has a great deal of personal meaning to me"), three items measured Normative Commitment (e.g. "I feel a sense of moral obligation to remain in this organization") and three items measured Continuance Commitment (e.g. "it would be too costly for me to leave my organization in the near future").

Engagement

We used a four item version of engagement measure (Salanova et al., 2005), which measures vigor (e.g. "at work I feel full of energy"), dedication (e.g. "I am enthusiastic about my job"), and absorption (e.g. "time flies when I am working"). Participants are asked to indicate how frequently they have felt a certain way, from 0 (never) to 6 (always).

Satisfaction

A six item measure of satisfaction was used, which asked participants to rate their satisfaction on a 7-point Likert scale, from 1 (not at all satisfied) to 7 (very much satisfied). The items covered a range of areas of job satisfaction (e.g. "how satisfied are you with your pay?" and "how satisfied are you with your colleagues?") as well as an overall satisfaction question ("overall, how satisfied are you with your present job?").

General health

We used the 12-item version of the General Health questionnaire to measure general health. Six items are positively worded (e.g. "been able to concentrate on whatever you are doing") and six are negatively worded (e.g. "been losing confidence in yourself"), answered on a 4-point Likert scale where the exact wording of each point differs based on the wording of the corresponding item, with low scores suggesting better general health.

Extra-role behavior

A shortened version of the Extra-Role Behavior (ERB) questionnaire (Van Dyne & LePine, 1998) was used, containing seven items, with four measuring Help (e.g. "how often have you helped orient new employees to your work?") and three measuring Voice (e.g. "how often have you spoken up in your group with ideas for projects or changes in procedures?). Participants are asked to answer on a 6-point Likert scale, from 0 (never) to 5 (extremely often).

Workplace deviance

A modified version of Bennett and Robinson's (2000) measure of Workplace Deviance was used, consisting of seven items, of which four measure Organizational Deviance (e.g. "how often have you daydreamed rather than did your work?") and three measure Personal Deviance (e.g. "how often have you played a practical joke on someone at work?"). Participants are asked to answer on a 6-point Likert scale, from 0 (never) to 5 (extremely often).

Reliability on all measures was above .70.

Analytical Approach

Networks modelled on psychological data tend to be fully saturated with many edges (estimated from correlations between observed indicators) that are close to but not exactly zero, because of the highly interconnected nature of psychological systems. To account for these properties the *Least Absolute Shrinkage and Selection Operator* (*LASSO*) has been proposed. LASSO uses regression to extract network edges that faithfully represent the underlying network while also reducing near zero edges to exact zero by iteratively introducing data-driven weights to counteract a potential bias towards large coefficients. (Costantini et al., 2015). LASSO is part of a larger family of overparameterization statistics that have distinct advantages over correlation and least square-based statistics in data science (Gelman & Vehtari, 2021). Specifically, we used the *Extended Bayesian Information Criterion Gaussian Least Absolute Shrinkage and Selection Operator* (*EBICglasso*; Foygel & Drton, 2010) that minimizes the Bayesian Information Criterion as an indicator of sufficient network parsimony.

We then transformed the layout of the network using Multi-Dimensional Scaling to make the relative position of the nodes to each other interpretable. To examine the stability of the observed edges in the network solution we bootstrapped this model with 1000 samples, gradually dropping cases up to a maximum of 75% of all cases (Epskamp et al., 2018). We examined how many participants we could drop from the data while still retaining a correlation of at least .70 between the edges in at least 95% of the samples in the reported graph and the new bootstrapped graph. A high value > .50 indicates that the estimated network is robust for this sample and shows little fluctuation (Epskamp et al., 2018).

Proceeding from this we extracted node characteristics such as Strength, Closeness and Betweeness and estimated their robustness in an identical approach. Strength is calculated as

a nodes number of edges adjusted for the combined weight (regularized partial correlations) of these edges. Betweenness is calculated as the shortest paths between two different nodes that pass through the focal node. Finally, Closeness is calculated as the inverted distance of the focal node to all other nodes, e.g. the average shortest weighted path from one node to all other nodes.
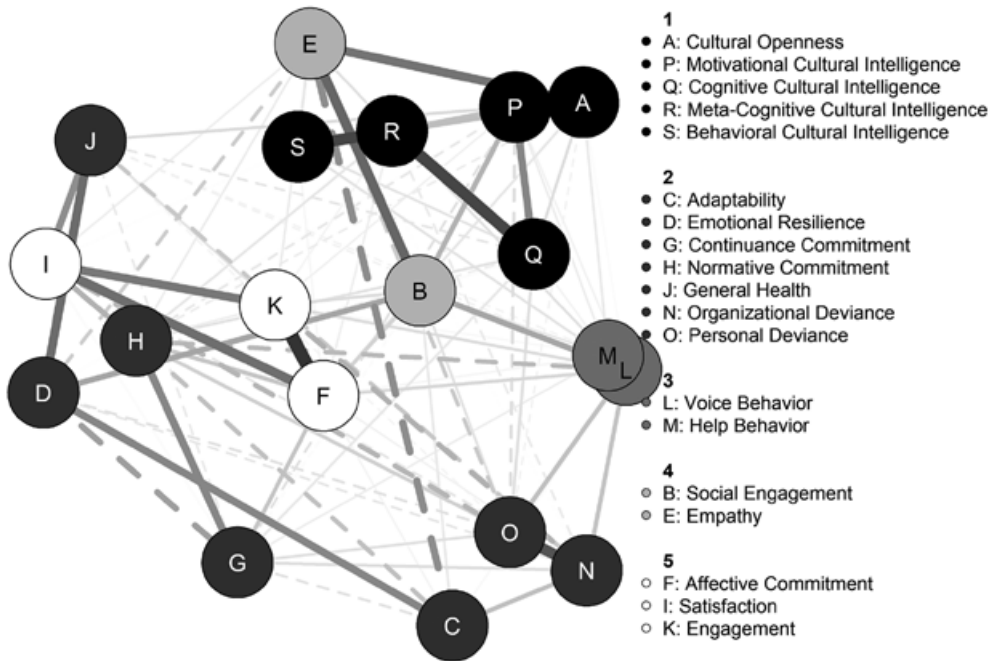
Beyond individual nodes, network approaches also allow for the investigation of larger node communities (which are mathematically equivalent to latent variables: Bork et al., 2021). In addition to revealing the underlying clustering of the data, this approach also allows for the identification of Bridge Nodes. Bridge Nodes are nodes that govern the relationship between clusters or communities and can be considered as conduits between construct internal relationships and other constructs. To derive the communities, we used Exploratory Graph Analysis (EGA) as an empirical approach to extract clusters of strongly connected nodes. EGA estimates community structure by extracting sparsest covariance matrix using the EBICglasso approach followed by a walktrap clustering algorithm to identify the optimal number of densely connected subgraphs (communities) (for the first description of the EGA approach see Golino & Demetriou, 2017; for a detailed mathematical description of the Walktrap approach see Pons & Latapy, 2005). To ensure the robustness of our approach and to identify the most common community solution, we ran a bootstrapped version of this approach across 1000 bootstrap samples.

The data and analysis scripts as well as additional figures and results are available on the OSF: https://osf.io/39u7c/

RESULTS

Our first step was to compute the overall network structure. We found 102 remaining edges (out of a possible 171), of which 74 were positive and 28 were negative. Examining the case drop stability of the network we found that the network was highly stable, even if the maximum specified (75%) of cases were dropped, indicating the interpretability of the overall network. The two major dimensions underlying our network (Figure 10.2) were labelled "Externalized Activity" (separating externally oriented behaviors from more internal affective-attitudinal nodes) and "Valence" (separating more negatively valenced nodes such as deviance and continuance costs assessing the cost of leaving an organization from more positively valenced constructs such as CQ and personality).

We then extracted Strength, Betweenness and Closeness centrality indices. We again tested the replicability of the node centralities using case-drop bootstraps. In contrast to the overall network structure, the replicability of the individual node centralities was lower ($CS_{Strength}$ = .28, $CS_{Closeness}$ .36, $CS_{Betweenness}$ = .13). While both Strength and Closeness are below the threshold for highly stable centrality parameters (CS =.50), they nevertheless surpassed suggested interpretation thresholds (CS = .25) (Epskamp et al., 2018). In other words, Betweenness showed substantial fluctuation if only sub-samples of our data were drawn. We found that Strength and Closeness measures were not significantly correlated ($r = .26, p = .29$; rank-order of nodes was equally dissimilar across measures: $r = .11, p = .66$) highlighting that they focus on different properties of nodes in our network, with Strength being more suitable for psychological network models (see Bringmann et al., 2019 for critical arguments on interpretation of centrality indices).

1
- A: Cultural Openness
- P: Motivational Cultural Intelligence
- Q: Cognitive Cultural Intelligence
- R: Meta-Cognitive Cultural Intelligence
- S: Behavioral Cultural Intelligence

2
- C: Adaptability
- D: Emotional Resilience
- G: Continuance Commitment
- H: Normative Commitment
- J: General Health
- N: Organizational Deviance
- O: Personal Deviance

3
- L: Voice Behavior
- M: Help Behavior

4
- B: Social Engagement
- E: Empathy

5
- F: Affective Commitment
- I: Satisfaction
- K: Engagement

Note: Nodes are grouped along the communities identified via Exploratory Graph Analysis with 1000 bootstrap samples.

Figure 10.2   Network structure displayed using multi-dimensional scaling

High Strength nodes were (see the OSF for full details): Voice Behavior, Motivational Cultural Intelligence, Affective Commitment, Cultural Empathy, and Meta-Cognitive Cultural Intelligence. These nodes showed strong direct connections to other nodes in the network, and hence their potential ability to directly nudge adjacent nodes if changed (e.g., through intercultural contact). What is interesting is that pro-active behavior focused on offering change (voice behavior) and motivational constructs (both motivational CQ and affective commitment) have the largest number of links in the network. In contrast, Social Engagement, Cultural Empathy, Adaptability, Emotional Resilience, and Voice Behavior showed stronger Closeness. This indicates that these nodes are important transfer points through the network, tying together disparate nodes. CQ nodes were not showing high "flow speed" within the network. The nodes with the highest rank difference between Closeness and Strength were: Adaptability, Meta-Cognitive Cultural Intelligence, Social Engagement, General Health, and Affective Commitment. The difference therefore captures the distinction between being connected to many nodes (strength) vs. having average short distance (average high correlation to all other constructs). It is interesting to observe that meta-cognitive CQ is connected to many other nodes, while being rather "distant" to other constructs.

Community Clustering

Following our examination of the individual node characteristics we investigated the clustering of nodes in an EGA solution. Using bootstrapping, the four-community (55.4%) and five-community (33.3%) solutions were the most frequent. We therefore decided to interpret the five community structure:

(1)   Cultural intelligence & cultural openness (consisting of Motivational Cultural Intelligence, Cultural Openness, Meta-Cognitive Cultural Intelligence, Cognitive Cultural Intelligence, Behavioral Cultural Intelligence)
(2)   Regulatory processes & deviance behaviors (adaptability and emotional resilience traits, continuance and normative commitment, personal and organizational deviance.)
(3)   Extra-Role Behavior (voice and helping behavior)
(4)   Socially focused traits (Social Engagement & Empathy personality traits)
(5)   Motivation (affective commitment, job satisfaction, engagement).
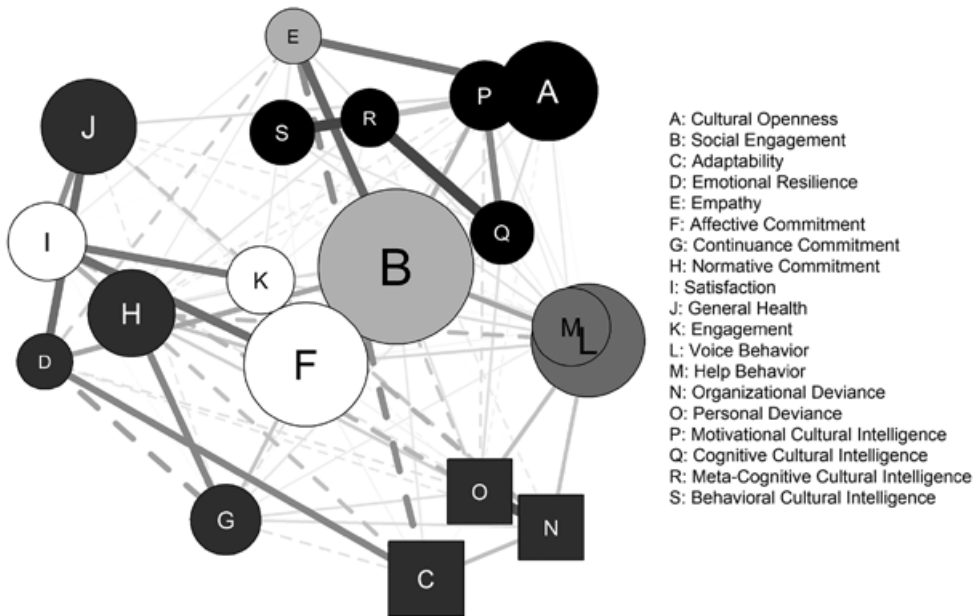
These dimensions showed reasonable stability across the bootstraps (with values close to 1 indicating higher stability): (1) .673; (2) .997; (3) .511; (4) .959; (5) .876.

Finally, we examined the individual nodes that bridged these community clusters. As we included both positive and negative edges in the model, we extracted one-step and two-step expected influence. These metrics examine the bridging property of a specific node, with one-step expected influence metrics showing the direct bridging function of a node (direct links of a node between two clusters or communities), and two-step expected influence metrics showing wider influence (e.g., indirect influence of a node within a community on a third community via an intermediate community). We calculated overall bridge capacity of a node rather than the bridge capacity to a specific cluster. This means that the bridge statistic for each node expresses its general tendency to link its own cluster to all other clusters, but cannot provide information on the specific clusters to which it governs the relationships. Given the relatively small size of individual clusters we found unsurprisingly a high correlation between the direct and indirect bridging capacity of a node ($r = .94$, $p < .001$; see Figure 10.3). Neither direct bridging capacity ($r_{strength} = .28$, $p = .25$; $r_{Closeness} = .15$, $p = .54$) nor indirect bridging capacity ($r_{strength} = .34$, $p = .16$; $r_{Closeness} = .12$, $p = .62$) were substantively related to the Strength or Closeness centrality parameters.

DISCUSSION

Our analysis sheds new light on the relationship between CQ, personality traits and work variables in a general working sample. In our sample, we found that openness traits formed a strong and internally coherent community with CQ components, which aligns with previous research that suggested that openness traits are closely related to CQ. This cluster was located towards the behavioral and positively valenced end of the overall network structure. Although we did not report item-level analyses, the results are of relevance for previous research investigating the structure of CQ. The community clustering showed a strong single cluster, suggesting that CQ forms a relatively internally coherent construct. This finding is relevant for continuing discussions about the possible multidimensional nature of the construct (for diverging perspec-

One-Step Expected Influence

A: Cultural Openness
B: Social Engagement
C: Adaptability
D: Emotional Resilience
E: Empathy
F: Affective Commitment
G: Continuance Commitment
H: Normative Commitment
I: Satisfaction
J: General Health
K: Engagement
L: Voice Behavior
M: Help Behavior
N: Organizational Deviance
O: Personal Deviance
P: Motivational Cultural Intelligence
Q: Cognitive Cultural Intelligence
R: Meta-Cognitive Cultural Intelligence
S: Behavioral Cultural Intelligence

Note: Size of nodes displays the scaled direct influence on other communities, circles display overall positive influence, squares display overall negative influence.

Figure 10.3   *Bridge strength parameters (one step expected influence = direct linkages)*

tives, see Bücker et al., 2015; Chen, 2015; Kadam et al., 2019). At the same time, the analysis also raises concerns about the conceptual distinction from openness personality traits.

In terms of centrality of CQ components, motivational and meta-cognitive CQ nodes were strongly connected to all other nodes, but the relatively low closeness centrality suggested relative distance to all other nodes, meaning relatively low "flow speed". This is an interesting observation in light of previous research suggesting motivational CQ as a potential mediator of personality on work outcomes. When focusing on the relative importance of Openness personality traits vs. CQ nodes for linking to other network communities, openness showed higher connectivity. We found that motivational CQ (and other motivational variables) are well connected in the network, but not close, therefore may not strongly influence other constructs. This is further demonstrated by the relatively low bridge strength, suggesting that motivational CQ does not strongly link CQ to work variables. Once the links to all other communities are taken into consideration, motivational CQ (vs. Openness) is less important than indicated by previous regression-based studies.

Bringing these different points of evidence together, network analyses can provide novel insights for the mediation hypothesis because these models allow a simultaneous assessment of the structure of constructs and their relationship. If there was a clear mediation relationship, we would expect openness traits to be clustered within a different community, and this community then would need to be linked to work behaviors primarily via links through a CQ community. This is clearly not the case. Instead, both openness and CQ formed a single com-

munity raising questions about the empirical distinctiveness and the bridge nodes suggest that openness within this joint community is more important for behavior linkages.

Focusing on other insights in relation to work behavior and personality, in the overall network, both the social engagement (Extraversion equivalent) trait and affective commitment were highly connected with the larger network. When examining bridge network centrality, social engagement was also an important bridging node, demonstrating the importance of extraversion-related traits both overall as well as for linking communities.

The location of regulatory constructs together with the deviance behaviors clearly suggested the importance of social and cognitive processes for behavioral misconduct at work. Motivationally disgruntled individuals with no alternatives (e.g., continuance commitment) or feeling obliged to stay (e.g., normative commitment) are more likely to behave unethically. It may not be surprising that this feeling of being "stuck" with an organization is located in the same cluster as deviance behaviors as having no alternatives may be associated with reduced work efforts and even damaging behaviors for the organization and other employees. The location of adaptability with deviance behaviors may appear curious at a first glance because adaptability is often discussed as a positive intercultural trait, but it may actually undermine business performance (Gino & Ariely, 2012). It is also relevant to point out that adaptability-like traits might be negatively correlated with Conscientiousness (Pascual-Leone et al., 2005), which is an important and positive contributor to work performance typically. The boundaries of adaptability for organizations may require further empirical scrutiny.

Our study was conducted with a convenience sample in NZ using brief self-report measures of work attitudes and behaviors. Future studies may want to include observer-reports and objective measures of work behaviors as well as full psychometric scales. Our instruments nevertheless showed sufficient reliability and the emergence of distinct community clusters suggests that self-report biases may be less of an issue.

In summary, CQ is strongly associated with openness traits and formed a coherent cluster. However, openness appears to more strongly connect with other work variables and therefore may be of greater interest for managers in modern organizations. This obviously does not mean that CQ is not important in overseas or expatriate contexts. Within culturally diverse work contexts, CQ may be of less importance for understanding work behavior compared to personality traits.

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