Finding the Structure and Facet of Openness that Best Predict Prejudice and Social Tolerance: An Investigation of Predictive Utilities and Cross-cultural Stability

A Thesis Submitted to

the School of Social and Health Sciences of James Cook University

by

Ng Da Xuan (Mr)

MCOU, MSc, BA (Psychology)

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As once said by E. E. Cummings, “We do not believe in ourselves until someone reveals that something deep inside us is valuable, worth listening to, worthy of our trust, sacred to our touch.” Without the belief, trust, and support of my mentors, supervisors, friends, and families, I would not have the confidence and perseverance to complete this doctoral journey. First and foremost, I wish to thank my advisor, A/Prof Jonathan Ramsay. Jon agreed to supervise me even when I did not have a viable research proposal. His assurance kept me motivated and hopeful on multiple occasions. I am grateful for his guidance and his modelling of what it meant to be a leader. I would also like to thank the members of my supervisory panel, Prof Nigel Marsh and Dr Patrick Lin, for their advice and emotional support throughout my PhD journey. I am grateful for our bi-weekly meeting.

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Supervision

Advisory Panel

Title	**Name**
Primary Advisor	A/Prof Jonathan E. Ramsay
Secondary Advisor	Dr Patrick Lin
Advisor Mentor	Prof Nigel Marsh

Declaration

I, Da Xuan Ng, declare that I have authored the present thesis, and it has not been previously submitted in any form for another degree or diploma in any university or institution of tertiary education. All materials and ideas in the current thesis have been appropriately referenced and acknowledged. The extent of collaboration with others has been stated clearly and fully in the thesis, and the co-authors of any publications included in this thesis have provided written statements of the nature of their contributions. As the copyright owner of this thesis, I grant James Cook University a permanent nonexclusive license to store, display or copy any or all the thesis, in all forms of media, for use within the University after this date and to make the thesis freely available online to other persons or organisations. The James Cook University Human Research Ethics Committee approved the research methodology on the 9th of July, 2021 (Approval ID: H8484, Appendix).

Signed_____

Date_____

Statement of the Contribution of Others

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Nature of Assistance	**Contribution**	**Titles, Names, and Affiliations of Co-Contributors**
Intellectual Support	• Editorial Assistance	A/Prof Jonathan Ramsay (James Cook University) Dr Patrick Lin (James Cook University) Dr Chan Kaiqin (James Cook University) Prof Nigel Marsh (James Cook University) Mr Daniel O'Sullivan (James Cook University)
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Thesis Abstract

Background: Openness to experience ("openness") refers to the disposition towards exploring novelty, which includes new situations, feelings, ideas, people, traditions, cultures, and worldviews. The effects of openness on group attitudes are well-known, where studies consistently found openness to play a prominent role in predicting prejudice (negative evaluation of minorities) and social tolerance (positive evaluation of diversity). However, how openness relates to group attitudes at the facet level remains largely unknown.

Objective: This thesis aims to explain the relationship between openness and group attitudes by identifying the facet structure and facet of openness that best predicts prejudice and social tolerance. This thesis also addresses existing research gaps (i.e., limited exploration of the relationships at a facet level, little empirical evidence on the differentiation between prejudice and social tolerance, and lack of evidence in Southeast Asia).

Methods and Results: A scoping review (Chapter 3) maps out the extant literature on this topic. Following the systematic approach of the Joanna Briggs Institute, 17 primary studies met the inclusion criteria, and the scoping review highlighted the under-representation of non-NEO facet structure of openness and the under-representation of the Asian population in the current literature. That is, 15 of the 17 studies examined openness with the NEO facet-structure, and no study was situated in Southeast Asia. The effect sizes reported in the fifteen studies that examined the NEO facet structure of openness were then aggregated in a random-effects meta-analysis study (Chapter 4), where the facet of liberalism was found to be the strongest predictor of prejudice (ρ = -.44, 95% CI: -.56 - -.30) and the facet of artistic interests was found to be the strongest predictor of social tolerance (ρ = .53, 95% CI: .28 - .72).

In Chapter 5, an online survey study was conducted to examine three major facet structures of openness (i.e., IPIP-NEO, SFOS, and HEXACO) to identify the facet structure

and facet of openness that best predict prejudice, measured via a feeling thermometer scale, and social tolerance, measured via a social tolerance scale. Community samples were also recruited from two national cultures (Singapore and the United States) to determine whether conclusions were consistent across the two cultures. Through multiple regression modelling and dominance analyses, the results identified the SFOS facet structure of openness and the facet of tolerance as the best predictors of social tolerance and prejudice, and this finding was consistent across the two cultures examined. Interestingly, the facet structures of openness predicted social tolerance more so in Singapore and predicted prejudice more so in the United States.

To examine whether these findings can be replicated using different measures of group attitudes, a second online survey (Chapter 6) was conducted with the following measures of prejudice (i.e., the Attitudes Toward Lesbians and Gays Scale, the Modern Racism Scale, and the Modern Sexism Scale) and social tolerance (i.e., Miville-Guzman Universality-Diversity Scale Short Form). Community samples were recruited from both Singapore and the United States. Across cultures, multiple regression with dominance analyses again identified the SFOS facet structure and the facet of tolerance as the strongest predictors of social tolerance. Unlike the findings in Chapter 5, the IPIP-NEO facet structure and the facet of liberalism were identified as the strongest predictors of prejudice. Cultural differences were again observed, where the facet structures of openness predicted social tolerance more so in Singapore but predicted prejudice more so in the United States.

Conclusions: Across the two primary studies, the SFOS facet structure of openness accounted for the most variance in social tolerance, and this is consistent across national cultures (Singapore and the United States) and different social tolerance measures. On the other hand, the affective aspect of prejudice, when measured with feeling thermometer items in Chapter 5, was best accounted for by the SFOS facet structure of openness, while the

cognitive aspect of prejudice, as measured in Chapter 6, was best accounted for by the IPIP-NEO facet structure of openness. Of the three facet structures examined in this thesis, the HEXACO facet structure of openness accounted for the least variance of prejudice and social tolerance. This finding highlighted that the three facet structures of openness are not equivalent measures of openness and that facet structures vary in their ability to predict attitudes and behaviours.

The facet of tolerance was the strongest predictor of social tolerance out of all the 16 facets of openness examined in this thesis. Findings for the facet of openness that best predicts prejudice are inconclusive. However, results suggest that the facet of tolerance is the strongest predictor of affect-based prejudice, and the facet of liberalism is the strongest predictor of cognitive-based prejudice. Additionally, the three facet structures of openness significantly predicted prejudice and social tolerance in Singapore and the United States, and the facet structure and the facet of openness that demonstrated the highest explanatory power for prejudice and social tolerance were consistent across cultures, suggesting that there is a degree of cross-cultural consistency in these relationships.

Theoretical and Empirical Implications: According to the dual process model of prejudice, openness is more likely to influence prejudice that is affective-based (i.e., fear), while agreeableness is more likely to affect prejudice that is cognitive-based (i.e., to maintain dominance). However, the findings of this thesis indicated that openness influences both affect-based and cognitive-based prejudice, albeit via different facet structures, suggesting a need for further theoretical refinement. This thesis also provided empirical support for differentiating prejudice and social tolerance in group attitude research. The thesis highlighted the need for more cross-cultural studies to uncover the specific cultural factors responsible for the moderating effect of culture observed in this thesis.

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Preface

The present thesis is presented in seven chapters, which incorporate one peer-reviewed journal publication and one manuscript that is currently in preparation. This thesis was also prepared and formatted in accordance with the HDR Thesis Preparation Guidelines (https://www.jcu.edu.au/graduate-research-school/hdr-candidates/hdr-thesis-preparation) outlined in the James Cook University Policy and Procedures (https://www.jcu.edu.au/policy/research-education/higher-degree-by-research-requirements).

Structure of Thesis

Chapter 1 provides an overview of the four key theoretical underpinnings of this PhD thesis. The research objective, the research questions, and the original contributions of this PhD thesis are also summarised in Figure 1.1.

Chapter 2 provides a literature review of the major theoretical models covered in this thesis (Big Five personality model, hierarchical structure of personality, and the dual process model of prejudice). It then highlights the various research gaps and justifies why this PhD thesis was conceived.

Chapter 3 describes a scoping review that summarises the existing evidence for relationships between facet structures of openness, facets of openness, and group attitudes (i.e., prejudice and social tolerance), as well as the methodologies used to investigate them. This chapter also contains part of a published paper: Ng, D. X., Lin, P. K. F., Marsh, N. V., Chan, K. Q., & Ramsay, J. E. (2021). Associations between openness facets, prejudice, and tolerance: A scoping review with meta-analysis. *Frontiers in Psychology*, 12:707652.

Chapter 4 describes a meta-analysis that synthesises the effect sizes reported in the existing literature. Together with Chapter 3, this chapter is part of a published paper: Ng, D. X., Lin, P. K. F., Marsh, N. V., Chan, K. Q., & Ramsay, J. E. (2021). Associations between

openness facets, prejudice, and tolerance: A scoping review with meta-analysis. *Frontiers in Psychology*, 12:707652.

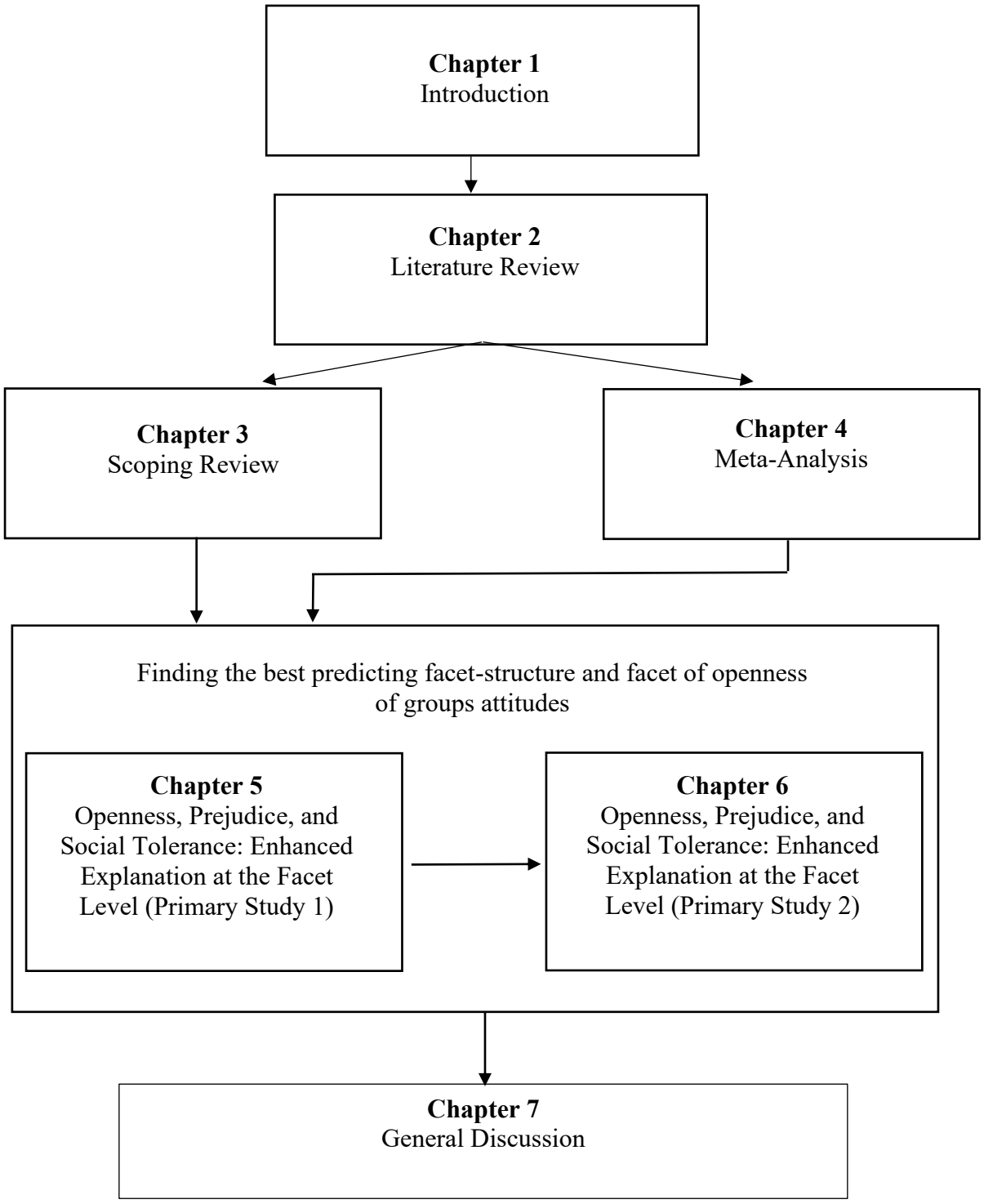
Chapter 5 describes a primary study that administered measures corresponding to the three major facet structures of openness (i.e., IPIP-NEO, SFOS, and HEXACO) in a cross-cultural sample (United States and Singapore) in order to determine the facet structure of openness, as well as the facet of openness, that best predict prejudice and social tolerance across cultures.

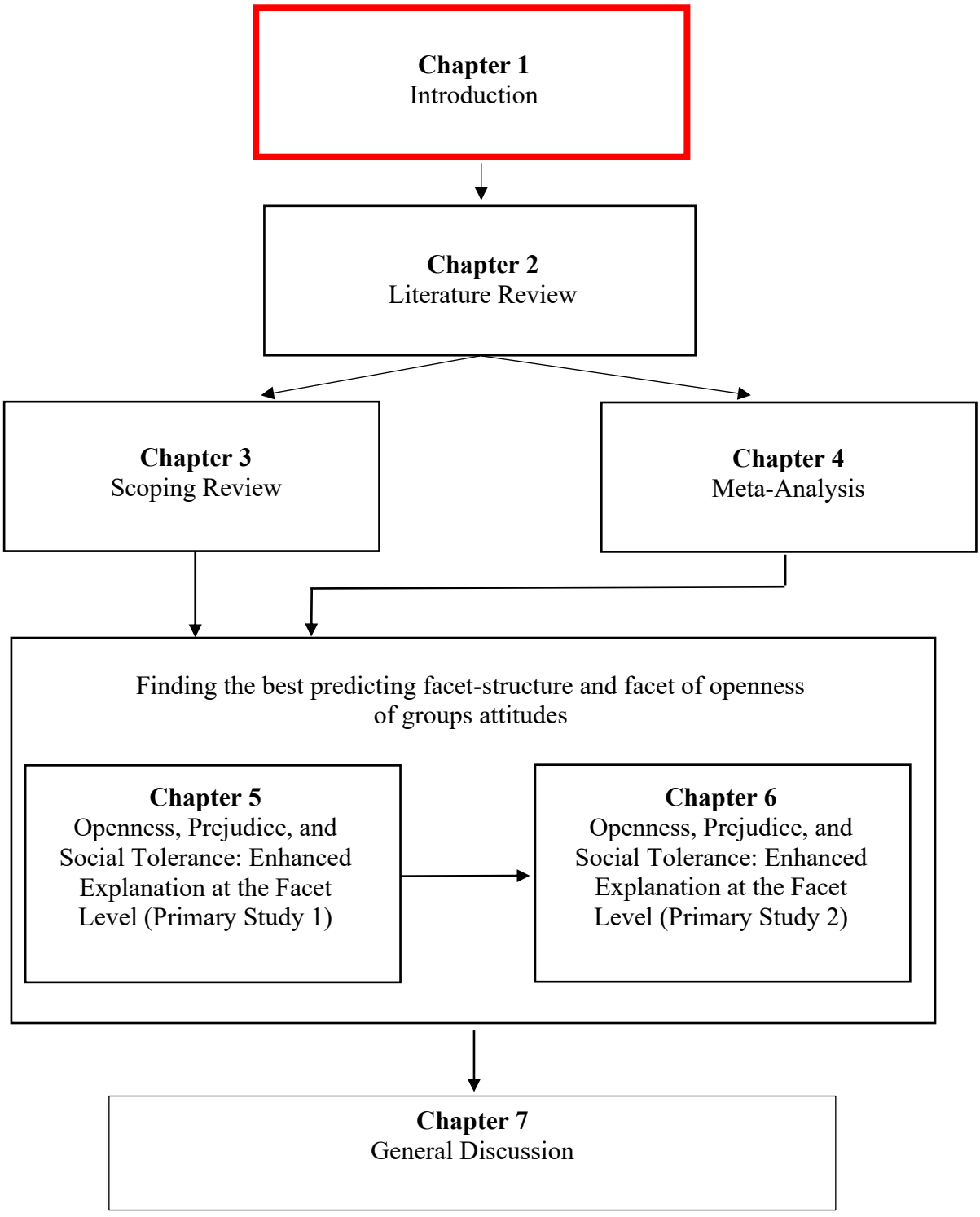
Chapter 6 describes a replication study of the primary study in Chapter 5, but with different measures of prejudice and social tolerance, that attempt to validate previous findings and assess if previous findings were generalisable across measures.

Chapter 7 presents a synthesis of the study findings, outlines the theoretical and practical implications of the study findings, highlights the limitations of the studies, and offers potential future research directions.

A diagram of the thesis structure is presented on the following page.

Structure of Thesis

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Chapter 1

Introduction

Openness, one of the major personality factors in the Five-Factor Model (FFM; Costa & McCrae, 2009), is one of many personality variables that predict group attitudes (e.g., prejudice and social tolerance; de Vries et al., 2022; Freitag & Rapp, 2015). Openness[1] refers to the disposition towards exploring novel situations (Woo et al., 2015), where openness is conceptualised in terms of cognitive exploration (DeYoung, 2014), associated with (a) a general attentiveness and invitational attitude ("openness to new impressions"), (b) a broad and unrestricted goal in information seeking ("openness to new content"), (c) an imaginative and creative way to seek information ("openness to new sources"), (d) a high exposure to varied situations and contexts ("openness to new encounters"), and (e) a creative way to interpret and make use of information ("openness to new implementation"; Heinström, 2010). Despite the features of openness being largely cognitive in nature (as mentioned above), openness is consistently associated with social consequences (e.g., political ideology; Xu et al., 2013), with some researchers describing openness as the "personality dimension that most centrally influences social phenomenon" (McCrae, 1996, p.323).

Individuals high in openness are often socially curious and socially sensitive (Ashton & Lee, 2007; Carter & Hall, 2008; Shaffer et al., 2006). Individuals with high openness perceive a personal benefit in approaching novel social situations (Weller & Tikir, 2011) and are more likely to engage in intergroup contact (DeYoung, 2014; Vezzali et al., 2018). Such individuals also take more social risks (e.g., moving away from friends and families to a new country of a different culture; Weller & Tikir, 2011), are more emotionally attuned to others during social interactions (Carter & Hall, 2008), and are more trusting towards dissimilar

[1] This thesis follows Ziegler and Backstrom's (2016) terminology, using "openness" as the overarching term for traits related to the inclinations to explore novel situations. The term "openness factor" refers specifically to the shared variability in the underlying facet structure of openness.

others (Saef et al., 2019). In addition, openness is predictive of adaptive social functioning (e.g., emotional intelligence, cultural intelligence, and empathy; Gierke et al., 2018; Tran et al., 2013). It is therefore not surprising that openness, being associated with social curiosity and adaptive social functioning, predicts high social tolerance (i.e., positive attitude towards diversity; Lall-Trail et al., 2021; Stürmer et al., 2013) and low prejudice (i.e., negative attitude towards minority social groups and their members; Bergh & Akrami; 2016; Duriez & Soenens, 2006).

In their meta-analysis, Sibley and Duckitt (2008) identified openness as the FFM factor that best predicts prejudice. The correlation coefficients (i.e., ρ) between the FFM factors and prejudice were -.30 (openness), .02 (conscientiousness), -.07 (extraversion), -.22 (agreeableness), and -.01 (neuroticism). The reported effect size confirmed the prominent role of openness in prejudice. As a comparison, the meta-analytic effect size estimate (i.e., ρ) of the relation between intergroup contact and prejudice was only -.21 (Pettigrew & Tropp, 2006).

Despite past evidence confirming the prominent role of openness in prejudice (e.g., Blais-Rochette et al., 2022; Hodson et al., 2009; Sibley & Duckitt, 2008), the nuances of how openness relates to group attitudes remain largely unexplored. Firstly, openness as a construct is both general and abstract (Woo et al., 2014). To illustrate, openness has been defined as "a permeable structure of consciousness" (McCrae & Costa, 1997, p. 839) that "affects not only internal experience but also interpersonal interactions and social behaviour" (McCrae, 1996, p. 323). Commonly termed as the bandwidth-fidelity trade-off (Soto & John, 2017), a broad construct, such as openness, summarises a variety of behavioural characteristics (i.e., high "bandwidth") but contains general and less precise descriptive information (i.e., low "fidelity"). For example, using the term "high openness" to describe an individual is akin to using the term "fish" to describe a "guppy"; the term provides a broad description of the

target individual but lacks descriptive precision. I argue that the relationship between openness and group attitudes at the broad trait level is too general and imprecise for the understanding of the role openness plays in social attitudes. Furthermore, the view of the broad trait as a latent common cause has been challenged (i.e., Mõttus, 2016), where observed associations between broad traits and outcomes often depend on which particular constituents have been included in trait operationalisations, such as the proposed psychometric structures of trait, the specific scales used to measure the trait, or the specific facets used to measure the broad trait (Ziegler & Bäckström, 2016). That is, the trait-outcome association may be attributed to the unique variance accounted for by the specific operationalisation of the trait. These call into question the importance of the broad trait, and more research is needed to display the predictive role of the constituents of trait operationalisations.

Most personality psychologists have adopted a hierarchical assessment approach in their operationalisation of openness (e.g., Costa & McCrae, 1992), where the broad openness construct is conceptualised as a composite of underlying traits known as facets (Ziegler & Bäckström, 2016). Compared to the broad and general description of openness, these facets of openness represented narrower and more specific behavioural connotations of openness (Judge et al., 2013). Some examples of the facets of openness include imagination (i.e., active fantasy), artistic interests (i.e., appreciation for art and beauty), emotionality (i.e., receptivity to one's feelings), adventurousness (i.e., eagerness to try new activities), intellect (i.e., intellectually curious and willing to consider new ideas), and liberalism (readiness to re-examine social, political, and religious values; Costa & McCrae, 1992). Despite facets of openness offering better descriptive and predictive utilities than the broad openness construct (e.g., Anglim et al., 2022), most studies have examined the relationship between openness and group attitudes only at the broad level. To my knowledge, no study has attempted to

summarise the relationship between openness and group attitudes at the facet level. Therefore, I argue that more investigations into the facet-level relationships between openness and group attitudes are needed to provide a more precise explanation of the role of openness in group attitudes such as prejudice and tolerance.

Secondly, there is a lack of consensus among personality psychologists on the structure of openness (Connelly et al., 2014a). Currently, there are more than ten personality measures of openness, each adopting a slightly different facet structure of openness (Schwaba et al., 2020). For instance, studies using the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992) treat openness as comprising six underlying facets, while studies using the Honesty-Humility, Emotionality, eXtraversion, Agreeableness, Conscientiousness, and Openness Personality Inventory (HEXACO-PI; Lee & Ashton, 2004) operationalise openness as having a four-facet structure. Further complicating matters, several researchers (e.g., Christensen, Cotter, & Silvia, 2019; Hough & Ones, 2001; Schwaba, 2020; Woo et al., 2014) have claimed that none of the current personality measures capture the entire domain of openness; that is, more than one facet structure of openness is needed to cover the full behavioural spectrum of the trait. To the best of my knowledge, no study has compared the predictive utilities of different facet structures of openness in group attitudes, meaning that the current evidence is inadequate in answering the following two questions: (a) does the magnitude of the relationship between openness and group attitudes change across different facet structures of openness, and (b) which facet structure of openness best explains the relationship between openness and group attitudes.

Thirdly, many studies have investigated the link between openness and prejudice, but few have investigated the link between openness and social tolerance (Blais-Rochette et al., 2022). Notably, low negative group attitudes (i.e., prejudice) are not synonymous with high positive group attitudes (i.e., social tolerance). As many researchers have asserted (e.g.,

Crawford, 2014; van Zalk & Kerr, 2014; Miklikowska, 2015), social tolerance (i.e., positive attitude towards diversity and intergroup differences) and prejudice (i.e., negative attitude towards minorities) represent related but distinct constructs. It is logically possible for an individual to hold a negative attitude towards minority groups (i.e., high in prejudice) but still accept the value and importance of diversity (i.e., high in social tolerance) and vice versa. For instance, an individual may hold negative stereotypes and feel emotionally distant towards immigrants but still strongly believe in the value of human rights and express willingness to immerse themselves in the diversity of worldviews and cultures of others. Therefore, with the intention to develop further knowledge of this positive aspect of group attitudes (i.e., social tolerance), this thesis adds to the existing literature by differentiating prejudice and social tolerance in the analyses and examining how the facets of openness relate to these two group attitudes.

Lastly, it is unclear whether the relationships between the facets of openness and group attitudes are cross-culturally stable. As past evidence suggests that the strength of the relationship between openness and prejudice may differ in different cultures (Bergh & Akrami, 2016), more studies, particularly one based in Southeast Asia, are needed to investigate the stability of the link between the facets of openness and group attitudes in order to ascertain whether past evidence findings can be generalised to other unexamined cultures (i.e., Singapore).

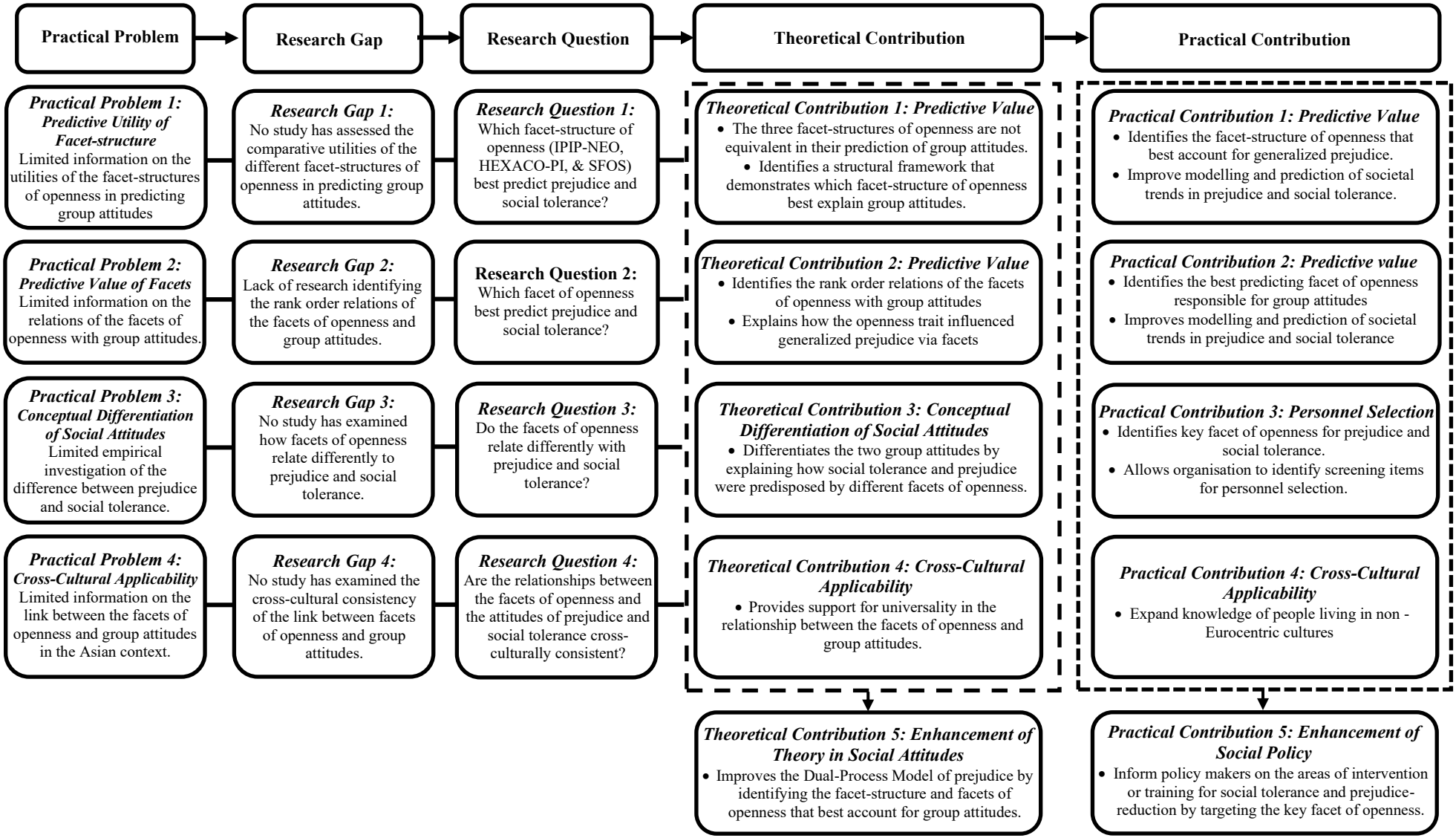
Original Contributions of the Thesis

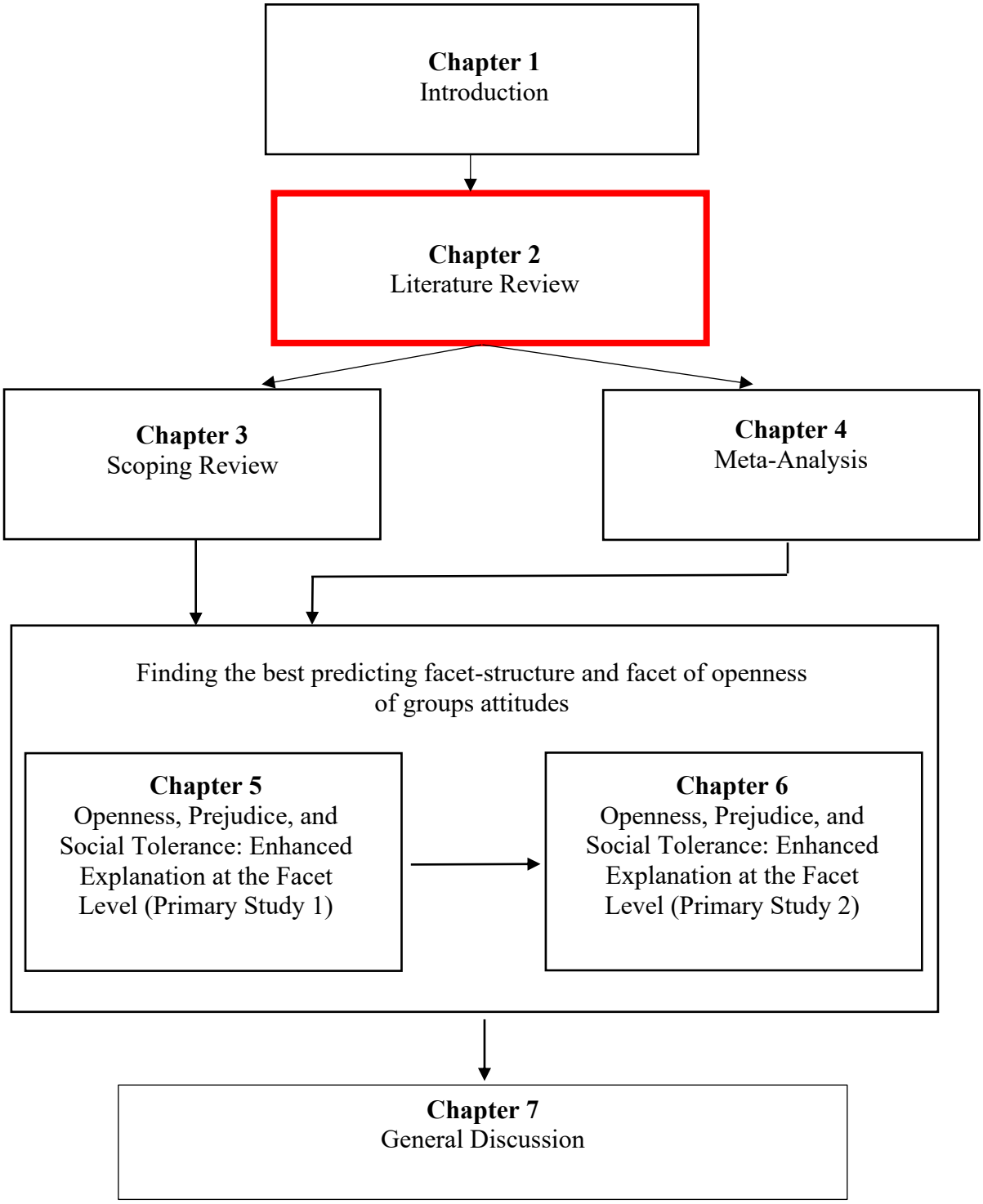
The research aim of this thesis is to provide a nuanced explanation of the relationship between openness and group attitudes. In this thesis, I first provide a literature review (Chapter 2) and a scoping review (Chapter 3) to summarise the existing literature on the relationship between facet structures of openness, facets of openness, and group attitudes. Second, I conduct a random-effect meta-analysis (Chapter 4) using the current evidence to

provide an aggregated effect size estimate for the relationships between facets of openness and group attitudes. Third, I conduct the first primary study (Chapter 5) that compares the predictive utilities of three major facet structures of openness in group attitudes. This study is also the first to investigate the link between openness and group attitudes in Southeast Asia (i.e., Singapore) and examine for cross-cultural consistency by comparing results from two national cultures (Singapore and the United States). Specifically, I aim to identify the facet structure of openness and the facet of openness that best predicts prejudice and social tolerance and assess the cross-cultural stability of these predictive relationships. Fourth, I collect more data via a replication study (Chapter 6) to validate the findings from Chapter 5 and examine if the findings can be generalised across different group attitude measures. An overview of the thesis contribution is summarised below in Figure 1.1.

Figure 1.1

Overview of Thesis Contribution

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Chapter 2

Literature Review

Recent high-profile examples of prejudice, discrimination, and violence against ethnic minorities in the United States have reignited a global discourse on the causes and possible solutions to reducing prejudice (Subbaraman, 2020). Prejudice, defined as generalised negative judgments, beliefs, and feelings towards minorities (Allport, 1954), is prevalent worldwide (Duckitt, 2019) and carries severe negative social implications. For instance, prejudice causes harm to the social fabric of society (e.g., incites intergroup hostility and reduces willingness to cooperate; Noh et al., 2007; Tropp, 2003; Williams, 2018). Prejudice also causes devastating physical and mental health outcomes to the individuals who experience prejudice, including increased risk of cardiovascular disease and mortality (Dover et al., 2020), substance abuse (Harris et al., 2012), depression (Ashburn-Nardo et al., 2007), and post-traumatic stress and suicidal attempts (Paradies et al., 2015). Given that prejudice is prevalent across the world and has extensive negative implications (for a review, see Duckitt, 2019), there is a need for more research into the nature of group attitudes and, more importantly, the identification of meaningful strategies to reduce prejudice, correct injustices, and improve social harmony. In this chapter, I provide the theoretical underpinning and rationale of my thesis by describing (a) the Big Five personality model, (b) the hierarchical structure of personality, (c) the facet structure and facets of openness, (d) the link between openness and prejudice, (e) the link between openness and social tolerance, and (f) the cultural bias in personality psychology.

The Big Five Personality Model

The Big Five[2] personality model is one of the most established descriptions of personality structure (Denissen et al., 2020; Twomey & Johnson, 2022). Personality psychologists arrived at the Big Five personality model when several independent researchers (e.g., Digman & Takemoto-Chock, 1981; Goldberg, 1990; Saucier & Goldberg, 1998; Wiggins, 1996) consistently found lexical terms, words used to describe human personality (e.g., adjectives), fall within a five-factor structure (Saucier et al., 2000). Traditionally, the Big Five are numbered and termed as follows: (I) surgency (or extraversion), (II) agreeableness, (III) conscientiousness (or dependability), (IV) emotional stability (as opposed to neuroticism), and (V) culture (Goldberg, 1993). However, not all lexical studies uncovered similar themes (Denissen & Penke, 2008), resulting in an ongoing debate on the characteristics of the Big Five (De Raad & Van Heck, 1994; Thalmayer & Saucier, 2014). Notably, the fifth factor had been associated with themes such as culture (e.g., polished, refined, imaginative, reflective, and artistically sensitive; Norman, 1963), intellect (e.g., wisdom, originality, objectivity, and knowledge; Goldberg, 1990), and openness[3] (e.g., imaginative, aesthetically inclined, seek variety, and liberal in values; McCrae & Costa, 2008). Although there are lexical studies with slightly different themes in their Big Five (e.g., Mastor et al., 2000; Othman et al., 2014; Rossier et al., 2007; Zuckerman, 1992), the five-factor structure of personality has been replicated across many different languages (i.e., German, Dutch, Czech, Polish, Mandarin, and Russian; Allik & McCrae, 2004; De Raad &

[2] Although using the terms Big-Five Model and Five-Factor Model interchangeably is common practice, readers are reminded that the conceptualisation of personality as the Five-Factor Model is separate from the lexical research program that led to the Big Five Model (Johnson, 2017). In this thesis, I will be using the expression "Big Five" generically to refer to both the FFM and Big-Five lexical model, even though these two models are not identical models.

[3] It is important to point out that the factor of openness was first identified by the questionnaire research leading to the FFM. Historically, FFM Openness and Big-Five Factor V refers to two separate research programs and utilised different conceptualisations of this factor. However, recent research has largely assimilated the FFM Openness with the Big-Five Factor V; particularly, Lee and Ashton's (2004) HEXACO-PI has adopted the FFM label of openness to experience for their Factor V.

Peabody, 2005; Heine & Buchtel; 2009; McCrae, Terracciano, & Carver, 2005; Schmitt et al., 2007).

The Big Five personality model is an evolving scientific construct requiring adaptation as the language for describing human behaviours becomes more sophisticated (John & Srivastava, 1999; McCrae, 2018). Several researchers have suggested expanding the scope of the Big Five model to include personality descriptors such as religiousness, cunningness (Saucier & Goldberg, 1998), morality, egotism (Paunonen & Jackson, 2000), and consideration (Tokar et al., 1999); all of which were left out in the Big Five model of personality. These developments led Lee and Ashton (2004) to propose a six-factor personality model known as the HEXACO (i.e., honest-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness to experience). In addition, there remain doubts about whether the Big-Five structure derived from the lexical analysis of the English language can be generalised to other languages (Cheung et al., 2011; De Raad et al., 1998; Saucier et al., 2005; Szirmák & De Raad, 1994). For instance, some studies have found that the factor analyses of the Mandarin language's personality descriptors returned only four major dimensions (i.e., expansiveness, dependability, accommodation, and interpersonal relatedness; Cheung et al., 2001; Cheung et al., 2006). Despite the ongoing debate on the factor structure of personality (Gorbaniuk et al., 2013; Lee & Ashton, 2008), openness[4] (i.e., the key variable of interest in my dissertation) was consistently uncovered as one of the significant personality dimensions (Ashton & Lee, 2007; De Raad et al., 2014).

The key contribution of the Big Five personality model is identifying the major dimensions of personality traits (McCrae & Sutin, 2018). Currently, most personality psychologists describe the five major dimensions as openness (characterised as imaginative,

[4] Using the Chinese Personality Assessment Inventory (CPAI), Cheung and colleagues (2008) found that the traditional characteristics of openness (i.e., aesthetics, divergent thinking, novelty-seeking) loaded significantly on the Chinese Personality factor of expansiveness, suggesting that the factor of openness is present in the Mandarin language, albeit with a different label.

curious, and with exploratory tendencies), conscientiousness (characterised as hardworking, purposeful, and disciplined), extraversion (characterised as warm, outgoing, and cheerful), agreeableness (characterised as generosity, honesty, and modesty), and neuroticism (characterised as irritable, and vulnerable to stress), or commonly known as the OCEAN (Soto & John, 2017). Identifying these major dimensions of personality traits allow personality psychologists to predict an individual's behaviour across contexts (within-individual consistency) while also predicting the distinctiveness of an individual from others (between-individual differences; Crawford & Brandt, 2019; Mõttus, 2016). A recent meta-analysis encompassing ten longitudinal panel studies involving 171,000 participants provided robust empirical support for the predictive significance of personality dimensions (i.e., extraversion, agreeableness, conscientiousness, neuroticism, and openness) concerning behavioural outcomes (Beck & Jackson, 2022). For instance, elevated levels of openness were associated with moving in with a partner, pursuing higher education, and engaging in volunteer activities over a 10-year period. Furthermore, these dimensions of personality also hold properties of universality (McCrae et al., 2005), stability (Terracciano et al., 2006), and heritability (Jang et al., 1998). Consequently, many researchers view personality dimensions as reflective of stable traits—enduring psychological features that vary quantitatively across individuals (McCrae, 2018).

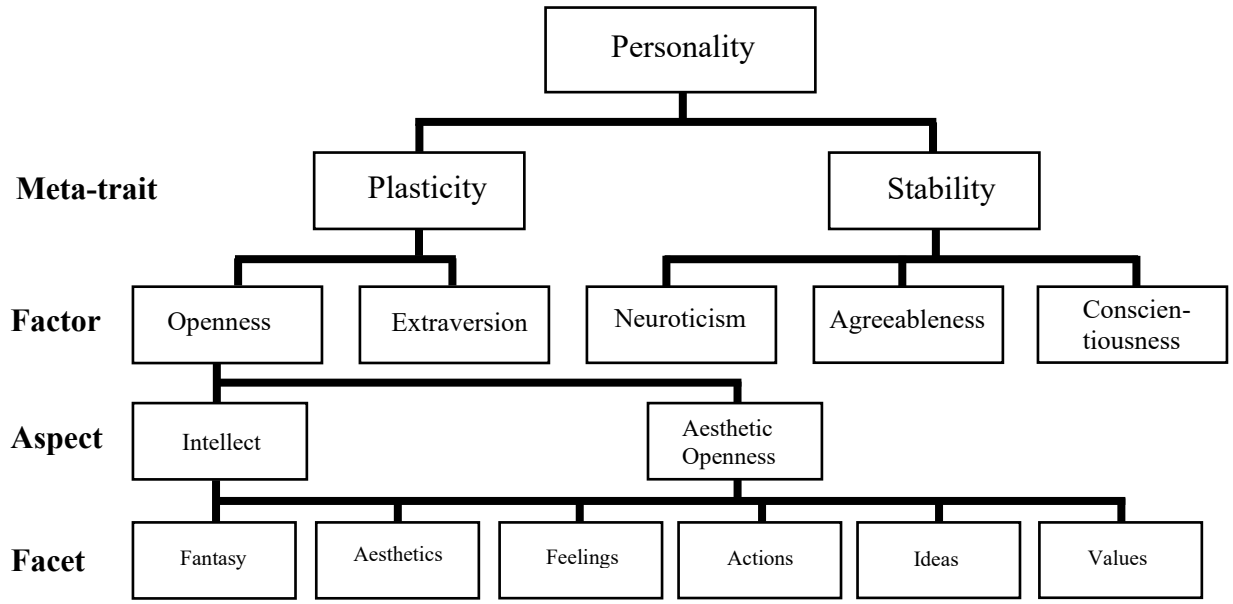
Hierarchical Structure of Personality

According to the Big Five personality model, personality traits are not thought to be entirely unidimensional. Instead, personality traits exhibit a hierarchical structure (see Figure 2.1), where higher-level traits subsume lower-level traits (Judge et al., 2013). For example, openness, one of the five major personality dimensions described in the Big Five model (Saucier & Ostendorf, 1999), is placed at a higher level in the hierarchy, while the facets of openness (i.e., fantasy, aesthetics, feelings, actions, ideas, and values) are placed at a lower

level (McCrae, Costa, & Martin, 2005). This hierarchical structure of personality has been well validated (DeYoung, 2006; Mount et al., 2005; Woo et al., 2014), postulating one general factor of personality at the broadest and highest level (Rushton & Irving, 2008; Veselka et al., 2012; for counterarguments, see Chang et al., 2012; Revelle & Wilt, 2013), two meta-traits (plasticity refers to the basic tendencies towards personal growth, and stability refers to the basic tendencies towards socialisation; DeYoung, 2006; Chang et al., 2012), followed by the Big Five factors (i.e., openness, conscientiousness, extraversion, agreeableness, and neuroticism), then aspects (DeYoung et al., 2007; Mussel et al., 2011), and lastly, the facets at the lowest level of the hierarchy (McCrae, Costa, & Martin, 2005). Figure 2.1 presents a hierarchical structure of openness, which is based on the work of Rushton and Irwing (2008), DeYoung et al. (2007), and McCrae, Costa, and Martin (2005).

Figure 2.1

Hierarchical Model of Personality Traits



Note. This model is adapted from the works of Rushton and Irwing (2008), DeYoung and colleagues (2007), and McCrae and colleagues (2005).

The hierarchical structure of personality assumes that higher-level factors account for broad behavioural tendencies while lower-level facets account for more specific behavioural inclinations (Hastings & O'Neill, 2009; Mõttus, 2016). In other words, the Big Five factors (defined as the "biologically based dispositions" of an individual's characteristic pattern of thoughts, emotions, and behaviours; McCrae, 2018, p. 15) represent distal predictors of behaviours, while facets (defined as the observable manifestations of personality factors; Ziegler & Bäckström, 2016) represent more proximal predictors of behaviours. As suggested by many researchers (e.g., Elleman et al., 2020; Mõttus, 2016; Paunonen & Ashton, 2013; Ziegler et al., 2014), lower-level facets may afford higher explanatory potential than the factors as the facets contain specific variance that accounts for individual differences beyond those of the common factors. This claim was supported by two recent meta-analyses where the results found that regression models with all facets combined outperformed models with all factors combined in predicting workplace behaviours and intelligence (Anglim et al., 2022; Pletzer et al., 2020). Furthermore, several studies have found that facets of openness hold stronger associations with behavioural outcomes than the broad openness factor (Danner et al., 2021; Griffin & Hesketh, 2004; Hastings & O'Neill, 2009; Woo et al., 2014). For instance, task performance was found to be significantly correlated with the openness facet of values ($r = .49$, $p < .01$; Griffin & Hesketh, 2004) and the facet of ideas ($r = .17$, $p < .05$; Griffin & Hesketh, 2004), but not with the broad openness factor ($r = .07$, *ns*; Griffin & Hesketh, 2004). All these findings support the claim that facets possess better predictive utility of behavioural outcomes than factors, although counterevidence has also been documented (e.g., Salgado et al., 2015).

The Facet-Structure and Facets of Openness

As highlighted in previous paragraphs, there is little dispute on the hierarchical representation of personality (Judge et al., 2013). However, personality psychologists are

much less certain about the facet structure (i.e., the number of facets) underlying each personality factor (Schwaba et al., 2020). For instance, there are eighty-five measures of openness (Connelly et al., 2014b), which exhibit significant variability in the number of facets underlying the openness factor (Christensen, Cotter, Silvia, 2019). The openness factor has been variously proposed to comprise three facets (e.g., intellect, imaginative-creative, and perceptive; Saucier & Ostendorf, 1999), four facets (e.g., creative, unconventional, inquisitive, aesthetic appreciation; Lee & Ashton, 2004), five facets (e.g., intellect, ingenuity-creativity, critical enquiry, unconventionality, inquisitiveness; Woods & Anderson, 2016), six facets (e.g., fantasy, aesthetics, feelings, actions, ideas, and values; McCrae, Costa, & Martin, 2005), nine facets (e.g., intellect, ingenuity, reflection, competence, quickness, introspection, creativity, imagination, and depth; Hofstee, De Raad, & Goldberg, 1992), ten facets (e.g., intellectual interests, self-assessed intelligence, intellectual curiosity, nontraditionalism, variety-seeking, diversity, aesthetic appreciation, openness to emotions, imaginative, and fantasy; Christensen, Cotter, & Silvia, 2019), and eleven facets (e.g., aestheticism, openness to emotions, openness to sensations, innovation, variety-seeking, introspection, fantasy, tolerance, autonomy, nontraditional, and thrill-seeking; Connelly et al., 2014b).

The lack of consensus on the facet-structure of openness is because personality theorists used different approaches to identify the underlying facet-structure of the Big Five factors (Woo et al., 2014). In the attempt to identify the facet structure of openness, personality theorists used two main approaches. The first approach is the questionnaire approach, where the factor analyses of similar measures of openness were used to derive the facet structure of openness. Examples of measures include the NEO-PI-R (Costa & McCrae, 1992), and the open-access equivalent, the International Personality Item Pool (IPIP) measures (e.g., IPIP-NEO; Goldberg, 1999). Notably, the facets of openness in the IPIP-NEO were treated as proxy measures of the facets of openness in the NEO-PI-R (Goldberg, 1999).

The second approach is the lexical approach, where the empirical reduction of the adjectives describing openness was used to derive the facet structure. Examples of measures that followed the lexical approach include the HEXACO-PI (Lee & Ashton, 2004). Table 2.1 defines the facets of openness within the NEO-PI-R, the HEXACO-PI, and the IPIP-NEO.

To better understand openness and its constituent facets, several researchers have argued for more research studies into the criterion-related validity of the openness facets (e.g., Hastings & O'Neill, 2009; Judge et al., 2013; Schwaba et al., 2020; Woo et al., 2014). Accumulating evidence on the criterion validity of narrow facets facilitates understanding the facet-specific variance often masked by aggregating facet scores into factor scores (Pletzer et al., 2020). For instance, pro-social workplace behaviours (e.g., helping a new worker to get used to the work environment, caring for a shared workplace, or expressing appreciation to co-workers) were found to be weakly correlated with the openness factor (r = .06, 95% CI = -.16 to .26) but was moderately correlated with the openness facet of actions (r = .24, 95% CI = .04 to .43; Helle et al., 2018), suggesting that the facet-specific variance of actions is more important in the prediction of workplace pro-social behaviours.

Table 2.1

Definition of Openness Facets in NEO-PI-R, HEXACO-PI, and IPIP-NEO

Openness facets	Description	Example item
NEO-PI-R/ IPIP-NEO		
1. Fantasy/ Imagination	Uses imagination to create an interesting inner world	"I have a vivid imagination"
2. Aesthetics/ Artistic Interests	Appreciation of natural and artificial beauty	"I see beauty in things that others might not notice"
3. Feelings/ Emotionality	Awareness of one's inner feelings	"I feel others' emotions"
4. Actions/ Adventurousness	Eager to try new activities and experience new things	"I prefer variety to routine"
5. Ideas/ Intellect	Willingness to consider new and unusual ideas	"I am interested in abstract ideas"
6. Values/ Liberalism	Readiness to challenge authority and re-examine values	"I believe that there is no absolute right or wrong"
HEXACO-PI		
1. Aesthetic appreciation	Appreciation of beauty in arts and in nature	"I can spend a long time studying a painting that I like"
2. Inquisitiveness	Eager to experience all aspects of nature and human world	"I enjoy looking at maps of different places."
3. Creativity	Preference for originality and innovative	"I would enjoy creating a work of art."
4. Unconventionality	Willingness to accept the unusual	"I like hearing about opinions that are very different from those of most people."

Note. Adapted from Costa and McCrae (1992), Lee and Ashton (2004), and Maples et al. (2014).

In addition, identifying the differential criterion-relations of openness facets unveiled the facet-level relationship between openness and the outcome variable. As highlighted by Gatzka and Hell (2018), academic performance was positively correlated with the facets of ideas (r = .07, 95% CI = .04 to .09) and values (r = .04, 95% CI = .02 to .07), negatively correlated with the facet of actions (r = -.04, 95% CI = -.06 to -.01), and not significantly correlated with the facets of fantasy, aesthetics, and feelings. These findings indicate that using only broad factors in analyses provides insufficient granularity when predicting specific behavioural outcomes. Mainly, factor-level analyses provide weaker predictive utility than facet-level analyses and likely mask the complex relationship between facets and outcome criterion. Instead, including facets in analyses may yield better predictive utility and provide insight into the facet that best accounts for the criterion of interest. The remaining sections of this chapter briefly review the current evidence on the predictive utility of the facet structure and facets of openness in the domain of group attitudes: prejudice and social tolerance.

Openness and Prejudice

The Dual Process Model (DPM; Duckitt, 2001) offers the most influential theory for the relationship between openness and prejudice (Blais-Rochette et al., 2022). According to the DPM, low openness individuals are more likely to perceive minority social groups and their group members as dangerous and threatening. The perception of minorities as a social threat motivates the support of punitive social policies (e.g., reduced welfare benefits for immigrants and restricted citizens' right to protest) in the hope of minimising social threats and maximising ingroup cohesiveness (Manson, 2020). This motivation towards maximising ingroup cohesiveness (also known as right-wing authoritarianism) causes low openness individuals to be prejudiced against minorities (Duckitt & Sibley, 2017).

Low-openness individuals, characterised by a black-or-white thinking style, intolerance of ambiguity, authoritarianism, dislike of change, and rejection of deviance from

social norms, have consistently been found to be more prejudiced than their more open-minded counterparts (Hodson & Dhont, 2015). Conversely, high openness has been consistently linked with lower prejudice (Duriez & Soenens, 2006; Ekehammar & Akrami, 2007; Flynn, 2005; Stürmer et al., 2013). Sibley and Duckitt (2008) conducted a meta-analysis of 71 studies and found that the openness factor had the strongest association with prejudice out of the Big Five factors. In their results, openness negatively correlated with prejudice towards low-status and disadvantaged groups like illegal immigrants, African Americans, females, and Asian immigrants. Similar findings were reported by Crawford and Brandt (2019). Their meta-analysis found openness negatively correlated with prejudice towards mixed-status groups (e.g., Mormons, rich people, atheists, antigay activists, bankers, Evangelical Christians, and conservatives). That is, prejudice towards groups (regardless of status) is strongly associated with openness.

Although openness has a consistent negative relationship with prejudice, the strength of this association does not appear to be consistent across measures. For instance, in their meta-analytic study, Sibley and Duckitt (2008) found a significant difference in the correlation between the openness factor and prejudice among personality measures. In their study, the openness factor was strongly correlated with prejudice when measured with the NEO-PI-R (Costa & McCrae, 1992) but weakly associated with prejudice when measured with the Big Five Inventory (BFI; John & Srivastava, 1999). According to Sibley and Duckitt (2008), one possible explanation is that the openness scale of NEO-PI-R contains a wider variety of items (i.e., 48 items) and may have captured both the factor-level and facet-level variance of openness associated with prejudice, while the 10-item openness scale of BFI may have captured only the factor-level variance of openness associated with prejudice. Another possible explanation is that the facets of openness measured by NEO-PI-R are more strongly related to prejudice than those measured by BFI (Sibley & Duckitt, 2008). The openness

scale of BFI contains items related to the facets of fantasy, intellect, and artistic interests. However, the openness scale of BFI does not include any items conceptually related to Costa and McCrae's (1992) facets of values and actions (John, Naumann, & Soto, 2008). That is, the strength of the association between openness and prejudice may be influenced by the ability to capture facet-level variance that best encapsulates the nuances of the disposition of openness towards group attitudes.

The strength of the association between openness and prejudice also depends on the operationalisation of openness (Sibley & Duckitt, 2008). For instance, openness, when defined as a six-facet structure in the NEO-PI-R (Costa & McCrae, 1992), is moderately or strongly correlated with prejudice (i.e., $-.52 < r < -.41$; Álvarez -Castillo et al., 2018; Huxley et al., 2015; Szeto et al., 2015). In contrast, openness, when operationalised as a four-facet structure in the HEXACO-PI (Lee & Ashton, 2004), is only weakly or moderately correlated with prejudice (i.e., $-.33 < r < -.10$; Anglim et al., 2019; Bergh & Akrami, 2016; Hodson & D, 2015; Sibley et al., 2010). Overall, the inconsistent relationship between openness and prejudice suggests the need for a systematic review of the specific contributions of the wide range of openness facets, as operationalised by various leading personality measures, for a more nuanced understanding of the role of openness in prejudice. To the best of my knowledge, no study has systematically reviewed the association between facets of openness and prejudice.

Openness and Social Tolerance

Social tolerance, a positive orientation towards diversity (Hjerm et al., 2020), offers social psychologists an avenue to examine positive group attitudes (Butrus & Witenberg, 2013). Given that social tolerance is linked with the capacity to recognise multiple perspectives and accept differing values (e.g., Menadue et al., 2021; Verkuyten et al., 2020), it is no surprise that social tolerance has been associated with the disposition trait towards

open-mindedness (i.e., openness; Ackermann & Ackermann, 2015; Saef et al., 2019; Weatherford & Spokane, 2013). Besides associating with social tolerance, openness is also associated with political tolerance (willingness to grant political rights to outgroups; Freitag & Rapp, 2015; Oskarsson & Widmalm, 2016), religious tolerance (willingness to recognise alternative religious faith; Proctor & McCord, 2009), cross-cultural exploration (willingness to engage in activities aimed to understand foreign cultures further; Stürmer et al., 2013), and multiculturalism (ideological belief in recognising and appreciating ethnic differences in society; Sparkman et al., 2019).

As highlighted earlier, the underlying facet-level variance of openness affords a higher predictive utility than the factor-level variance of openness. Specifically, the regression model with all facets combined accounts for more social tolerance variance than the one with all factors combined (Anglim et al., 2019). Openness also showed a stronger correlation with social tolerance when measured using scales examining facets of openness (i.e., NEO-PI-R) than when measured using scales examining only the factor of openness (i.e., BFI). For instance, openness was strongly correlated[5] (i.e., $r > .35$) with social tolerance when measured using NEO-PI-R (i.e., Han & Pistole, 2017; Unruh & McCord, 2010) but only weakly correlated (i.e., $r < .15$) with social tolerance when measured using BFI (i.e., Butrus & Witenberg, 2013). This evidence highlighted that a facet-level examination of openness is necessary for a nuanced explanation of the relationship between openness and social tolerance. To the best of my knowledge, no study has systematically reviewed the association between facets of openness and social tolerance.

Differentiating Social Tolerance and Prejudice

[5] Interpretations of the effect sizes were based on recent empirical benchmarks where $r < .15$ is small, $.15 < r < .35$ is medium, and $r > .35$ is large (Gignac & Szodorai, 2016).

Many researchers have suggested treating prejudice and social tolerance as two separate forms of group attitudes, with prejudice conceptualised as a negative evaluation of minority groups and their group members (with historical, cultural, and developmental roots; Dovidio et al., 2010), while social tolerance is conceptualised as a developmentally advanced moral reasoning ability coupled with prosocial beliefs and an understanding of equalitarian principles (e.g., social equality, and equal rights; Miklikowska, 2015). However, research on these two group attitudes has been complicated by the fact that many researchers have treated prejudice and tolerance as if they were opposite ends of a spectrum (e.g., Bambulyaka, 2011; Brandt et al., 2015; Verkuyten & Slooter, 2007; Witenberg, 2007), despite evidence that they are related yet distinct constructs (e.g., Crawford, 2014; Miklikowska, 2015; Pittinsky et al., 2011; Van der Noll et al., 2010). As van Zalk and Kerr (2014) reported, the Pearson *r* correlation between social tolerance and prejudice is -.45, meaning that only 20.25%[6] of the individual difference is shared between social tolerance and prejudice. In other words, there is a large amount of unique variance in these two group attitudes that are not explained by the other.

Prejudice and social tolerance are also associated with different neural mechanisms. For instance, prejudice has been related to the activation of emotional centres of the brain (e.g., amygdala, orbital frontal cortex, and insula; Amodio, 2014; Beer et al., 2008; Chekroud et al., 2014), whereas social tolerance has been linked with the activation of goal-directed and behavioural regulation centres of the brain (e.g., lateral prefrontal cortex and anterior cingulate cortex; Amodio, 2014; Bartholow et al., 2006). This evidence further suggests that the two constructs are distinct and not simply two sides of the same coin.

Consistent with this differentiation, a recent meta-analysis (Blais-Rochette et al., 2022) found that although openness predicts prejudice and social tolerance, the causal

[6] For a detailed discussion on the use of r^2 as a percent of determination, refer to Ozer (1985).

pathway by which openness influences each differed. Specifically, right-wing authoritarianism mediated the effect of openness on prejudice but not the effect of openness on social tolerance (Blais-Rochette et al., 2022). In other words, given that openness has been found to relate differently to prejudice and social tolerance, different aspects of openness may be more relevant in predicting each of these two attitudinal constructs.

All the evidence presented suggests that the pathways to reducing prejudice and fostering social tolerance are not the same, a conclusion shared by many researchers (e.g., Barbarino & Stürmer, 2016; Verkuyten et al., 2020). Specifically, the facet structure and facet of openness that best predict prejudice may not be the same as those that best predict social tolerance. However, personality and social psychology research has primarily focused on prejudice (Brandt et al., 2015). Particularly, prominent theories (e.g., dual process model) in the link between openness and group attitudes had neglected the pathway towards social tolerance. Most research also treated prejudice and social tolerance as merely opposites in the same spectrum. Therefore, more research is needed to elucidate the pathways from the openness trait to the attitudes of prejudice and social tolerance. To my knowledge, no study has examined the differential relationship between the facets of openness with prejudice and social tolerance.

Cultural Bias in Personality Psychology

Research has found significant variability in personality and group attitudes across cultures (Fetvadjiev et al., 2018; Kirkland et al., 2022). However, the evidence base of psychological science remains largely dominated by the Western perspective (Cheon et al., 2020). A problem first highlighted by Arnett in 2008, flagship journals of the American Psychological Association continue to publish predominantly studies from the United States and countries in Europe (Thalmayer et al., 2021), reigniting concerns that psychological science has overemphasised cultures that are Western, Educated, Industrialised, Rich, and

Democratic (WEIRD; Henrich et al., 2010). Close to 95% of published studies in psychology had samples from the WEIRD nations (i.e., United States, United Kingdom, Canada, Australia, New Zealand, and European countries), and this percentage has remained relatively unchanged since 1988 (Arnett, 2008; Thalmayer et al., 2021). Specifically, 62% of the samples were from the United States, 14% were from "English-speaking countries[7]" (i.e., United Kingdom, Canada, Australia, and New Zealand), 17% from Europe, 4% from Asia, and 1% from the remaining global population (i.e., Africa, the Middle East, Latin America; Thalmayer et al., 2021). In other words, people from the WEIRD nations, representing only 12% of the world's population, represented 93% of the evidence base in psychological science (Thalmayer et al., 2021). Other reviews in psychology have also reported similar findings (e.g., Hendriks et al., 2019; Williamson et al., 2021).

It is also important to emphasise that people from the United States, representing less than 5% of the world's total population, represent 62% of the evidence base in psychology (Thalmayer et al., 2021). The problem with using USA-centric psychological evidence is that the conclusions from this evidence may not be generalisable to cultures different from the United States (e.g., Singapore; Henrich et al., 2010a). Furthermore, it is likely that any meta-analysis or theoretical advancements based on this evidence, which primarily centres on the USA, would emphasise psychosocial patterns prevalent in Western cultures (Wong & Cowden, 2022). Clearly, most people are not WEIRD (Henrich, 2010b). To the best of my knowledge, no study has examined whether the relationships between openness and group attitude reported in the United States culture are replicable in Southeast Asia (i.e., Singapore). Most importantly, no study has examined the relationship between the facets of openness with prejudice and social tolerance in Southeast Asia (i.e., Singapore), prompting more

[7] The label, "English-speaking countries", was assigned to the following four national locations of samples (i.e., United Kingdom, Canada, Australia, and New Zealand) in Arnett (2008) and Thalmayer et al. (2021). The author acknowledges many English-speaking countries other than those outlined here.

research in this region. In this thesis, I contributed to the literature by examining the culture of Singapore, a Southeast Asian state that espoused Asian values and held political views different from the United States (Ng et al., 2022). While there may be minimal cultural differences in some aspects of social attitudes between the United States and Singapore cultures (Levine et al., 2011; Muthukrishna et al., 2020), several studies have found significant differences between the two cultures (Enke, 2019; Gelfand et al., 2011; Grijalva & Newman, 2015; Oyserman et al., 2002).

Conclusion

In this chapter, I provided a narrative review of the topic of interest and my thesis's theoretical underpinning and rationale. Several research gaps were also highlighted. Firstly, most studies have examined the relationship between group attitudes (prejudice and social tolerance) and openness, but only at the factor level. To the best of my knowledge, no study has attempted to identify the rank-order relations of the facets of openness with group attitudes; this thesis addressed the research gap by providing the rank-order relations of the facets of openness and group attitudes and identifying the facet of openness that best predicts group attitudes.

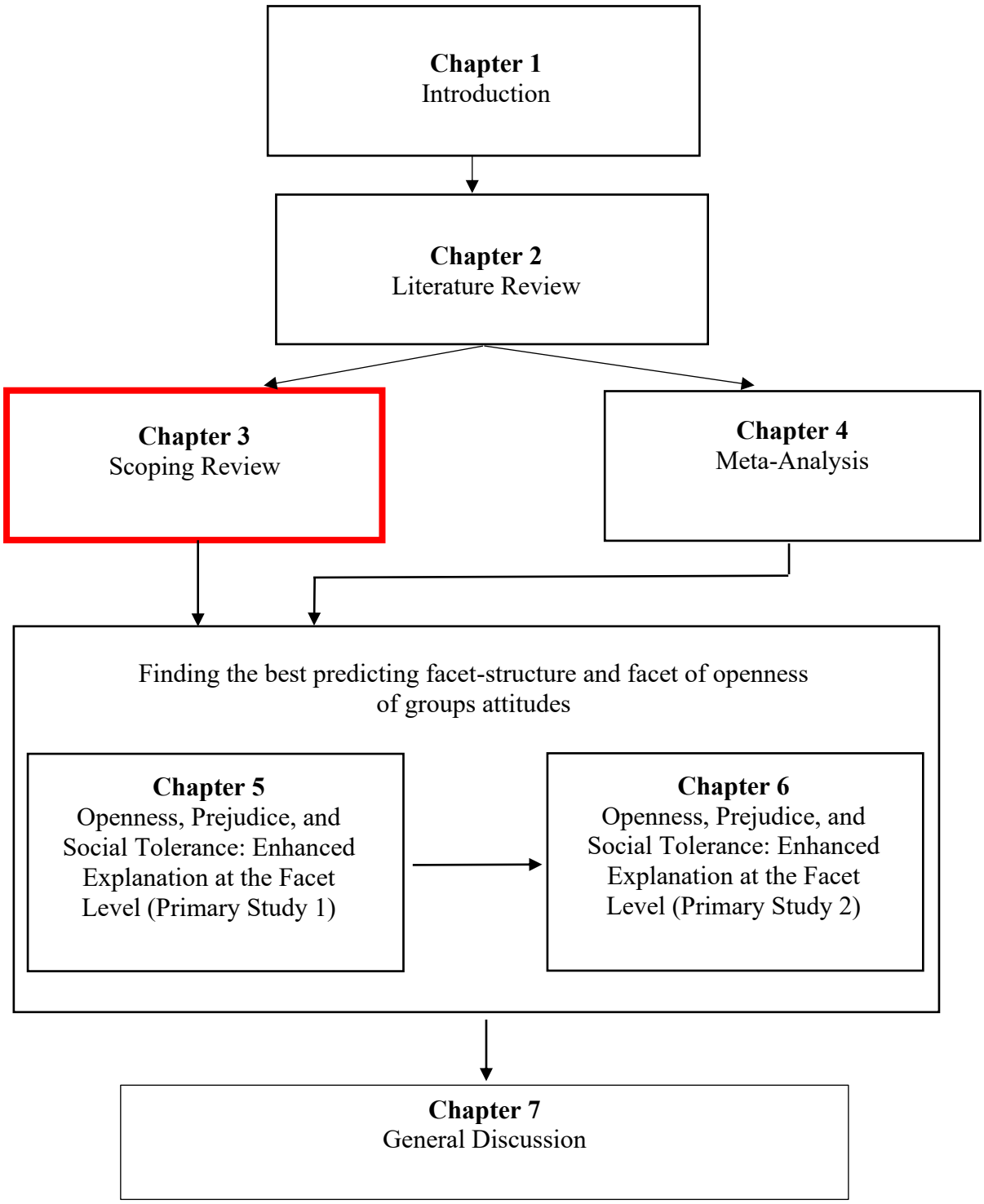
Secondly, most studies used only one type of facet structure to examine openness when investigating the relationship between openness and group attitudes. To my knowledge, no study has compared the utilities of different facet structures of openness in predicting group attitudes. This thesis addressed the research gap by assessing the predictive utilities of three different facet-structures of openness in group attitudes and identifying the facet-structure of openness that best predicts group attitudes.

Thirdly, more research is needed to provide a systematic conceptual and empirical differentiation between prejudice and social tolerance (Butrus & Witenberg, 2013). To my knowledge, no study has examined how prejudice and social tolerance relate to the facets of

openness differently. This thesis addressed the research gap by examining how facets of openness relate differently to prejudice and social tolerance.

Lastly, the current evidence base of psychological science is still largely USA-centric (Cheon et al., 2020; Wong & Cowden, 2022), meaning that the current understanding of the relationship between facets of openness and group attitudes may be limited to the people in the United States and not generalise to people from other Asian cultures like Singapore. This thesis addressed the research gap by examining the relationship between the facets of openness with prejudice and social tolerance using samples from Singapore and the United States and assessing the results for cross-cultural stability.

In the next chapter, I present a scoping review, the first of four studies, and provide a preliminary guide of the extant literature on the link between the facets of openness and attitudes of prejudice and social tolerance.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Chapter 3

Association Between Facets of Openness, Prejudice, and Social Tolerance: A Scoping Review

D. X. Ng*, Patrick K. F. Lin, Nigel V. Marsh, K. Q. Chan, and Jonathan E. Ramsay

School of Social and Health Sciences, James Cook University, Singapore

*Corresponding author:

Mr Da Xuan Ng

Email: da.ng@my.jcu.edu.au

Address: James Cook University, 149 Sims Drive, Singapore 387380

Statement of the Contribution of Others

This chapter contributed to a peer-reviewed publication in *Frontiers Psychology* (i.e., Ng et al., 2021). The publication was written with four co-authors, with the candidate as the primary author. As per the Contributor Roles Taxonomy (CRediT; Allen et al., 2019), the candidate's contribution to the work included the following:

- Research conception
- Methodology (Development and design of methodology)
- Software (Rayyan, Abstrackr, Word Frequency Analyser)
- Validation (Verification of results)
- Formal analysis (Analysed and synthesised study data)
- Investigation (Data collection)
- Resources (Developed screening tools)
- Data curation
- Writing – Original draft
- Writing - Review & editing
- Visualisation
- Project administration.

The nature of the co-author contribution is listed below in order of authorship:

Co-author	Affiliation	Contribution
Dr Patrick Lin	James Cook University Singapore	Data screening; Editorial support
Prof Nigel Marsh	James Cook University Singapore	Data screening; Editorial support
Dr Chan Kai Qin	James Cook University Singapore	Statistical Support; Editorial support
A/Prof Jonathan Ramsay	James Cook University Singapore	Data screening; Editorial support; Supervision; Funding acquisition (Internal Research Grant 2021; IRG20210001)

Declaration by co-authors

The undersigned hereby certify that:

- The above declaration correctly reflects the nature of the candidate's contribution to this work and the nature of the contribution of each of the co-authors.
- All authors have been included in the manuscript.

Signatures:

_____ _____

Dr Patrick Lin/ Date **Prof Nigel Marsh/ Date**

_____ _____

Dr Chan Kai Qin/ Date **A/Prof Jonathan Ramsay/ Date**

Abstract

The relationships between openness and group attitudes have been reviewed at the broad level but not at the lower facet level. This scoping review chapter provides a descriptive overview of the available evidence of the relationship between the facets of openness and group attitudes. The scoping review methodology used in this chapter has been preregistered (https://osf.io/yw9g8/) and followed established guidelines (Peters et al., 2020). Across three major databases (Scopus, Web of Science, and ProQuest) and two online repositories (Google Scholar and PsyArXiv), 2349 articles were reviewed, with 17 primary studies meeting the inclusion criteria. Most studies used the Dual Process Model (k = 6, 35%) to explain the link between facets of openness and group attitudes, used samples from Western countries (k = 16, 94%), and used the NEO-facet structure (k = 15; 88%) espoused by Costa and McCrae (1992). Findings revealed the under-representation of non-NEO facet structures of openness and the under-representation of the Asian population in the existing literature.

Association Between Facets of Openness, Prejudice, and Social Tolerance: A Scoping Review

Introduction

As described in the previous chapter, the personality factor of openness has been consistently linked with prejudice and social tolerance (Blais-Rochette et al., 2022; Sibley & Duckitt, 2008). However, at the underlying facet level, the relationship of openness with prejudice and social tolerance remains poorly understood, with no review of the existing literature being attempted to the best of my knowledge. Several researchers have also argued for more systematic conceptual and empirical differentiation of prejudice and social tolerance to understand better how these constructs interrelate (Butrus & Witenberg, 2013; van Doorn, 2014). In line with the call for more research into the similarities and differences between prejudice and social tolerance, this chapter examines how they relate to the various facets of openness to experience. Specifically, I will present a scoping review of existing literature and consolidate these findings into a coherent picture of the facet-level relationships between openness, prejudice, and social tolerance.

This scoping review enhances existing knowledge in three major ways: by (a) providing the first review of the relationships between facets of openness with prejudice and tolerance, (b) identifying the dominant measures of openness utilised in the existing literature, and (c) highlighting the current gaps in the literature to aid in the planning of future research.

Rationale and Objectives

A scoping review is important for knowledge synthesis (Pham et al., 2014), especially when there is a lack of understanding of key concepts within a topic (e.g., the lack of conceptual and empirical differentiation between prejudice and social tolerance) and when a concept of interest is of a complex or heterogenous nature (e.g., lack of consensus on the

facet-structure of openness with more than eighty-five different measures of the facets of openness). The strength of the scoping review methodology lies in the ability to summarise the evidence base of the research topic, provide a descriptive presentation of what is known about the key concepts, highlight the dominant methodologies used within the current literature, and identify existing knowledge gaps (Peterson et al., 2017). It also provides a preliminary classification and systematisation of the extant literature (Grant & Booth, 2009). Given that the evidence base of psychological science has been observed to be USA-centric (Thalmayer et al., 2021), the scoping review also allows researchers to highlight the extent of this problem and possibly offer a more granulated interpretation of psychological phenomena that is situated within particular cultures. Consequently, a scoping review was conducted on existing literature on openness facets and their association with prejudice and tolerance constructs.

In this scoping review, the primary research question was, “What current evidence exists regarding the connection between facets of openness and group attitudes (particularly prejudice and social tolerance)?” Research sub-questions included (a) what types of evidence are available, and how many studies have been conducted? (b) what are the typical demographic characteristics of participants, and how have they been sampled in the existing body of literature? (c) with what cultural groups has this research been conducted, and to what extent have understudied non-Western populations been explored? (d) what forms of prejudice and social tolerance were examined in the current literature? (e) which measures of facets of openness were used, and how frequently were they employed in the existing literature? (f) What trends in frequency can be discerned in the data regarding the connections between facets of openness, prejudice, and social tolerance? (g) which theories and structural models were utilised in prior studies? and (h) what variables were discovered to mediate or moderate the relationships between facets of openness, prejudice, and social tolerance?

Methods

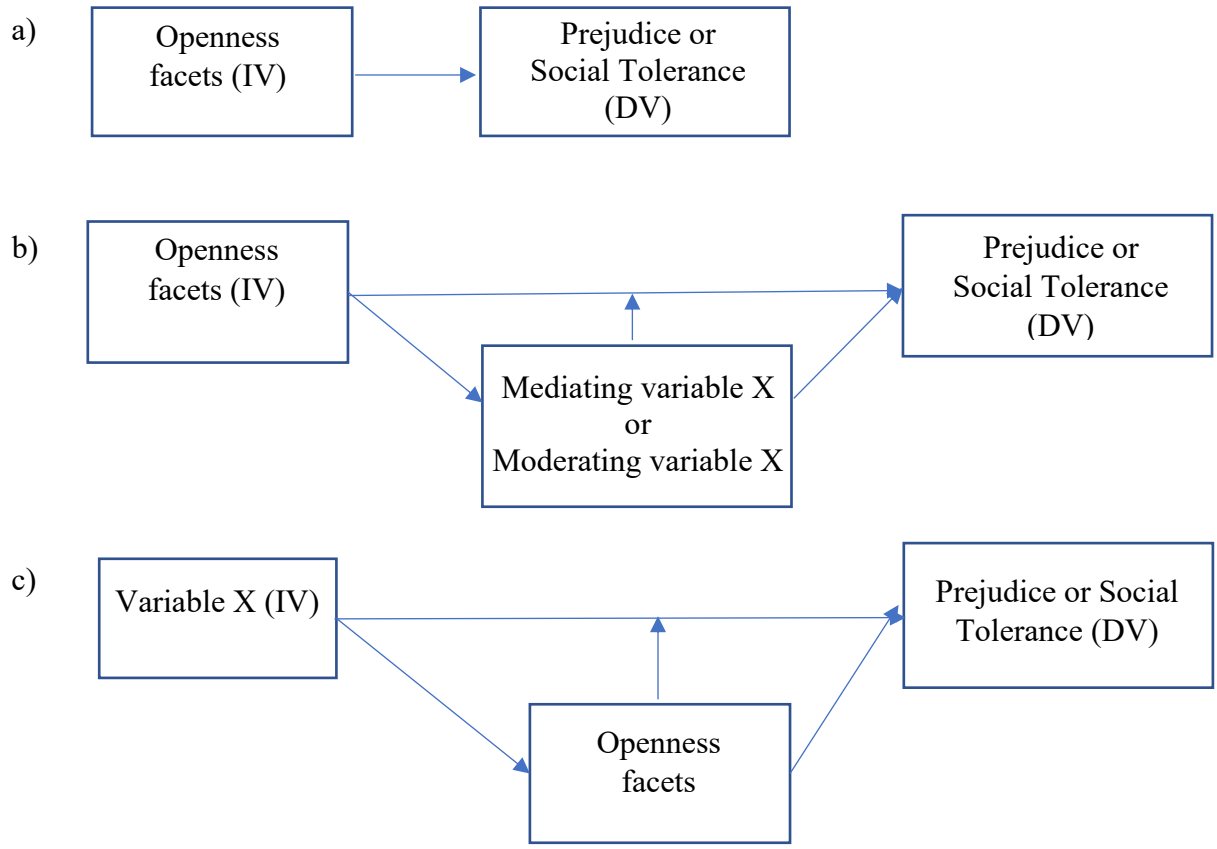
Planning Stage

The scoping review methodology adopted in this chapter was based on the recommendation of the Joanna Briggs Institute (JBI; Peter et al., 2020). Per the guidelines of PRISMA-ScR (Tricco et al., 2018), the review approach (objectives, selection criteria, and extraction methods) was planned, specified, and documented in a protocol. The protocol was preregistered and published (https://osf.io/yw9g8/) before data collection to provide transparency and minimise the risk of reporting bias.

The protocol specified that only studies examining the relationships between one or more facets of openness and either prejudice or social tolerance were included. Subject to this requirement, research studies examining all models (Figure 3.1) and measures of openness, prejudice, and social tolerance were eligible for inclusion. There were no inclusionary or exclusionary criteria for participants or settings. All studies that examined the relationships between the facets of openness and either prejudice or social tolerance were included, regardless of the type of participants (e.g., university students, members of the public) or the research context (e.g., geographic location and cultural setting). Only academic literature (i.e., journal articles, conference papers, dissertations, books, and book chapters) describing primary research was considered for inclusion in this review. This scoping review considered experimental, quasi-experimental, and correlational study designs. Theoretical papers, reviews, and opinion papers were excluded. Finally, only articles published in English were included in the review.

Figure 3.1

Three Possible Relational Models Between Openness Facets and Group Attitudes (Prejudice and Social Tolerance)



Search Strategy

The scoping review utilised a three-step search strategy recommended by JBI (Peter et al., 2020). I conducted an initial search on Scopus and Web of Science between July and August 2020 using the following search terms: Openness AND facets AND Prejudice OR discrimination OR tolerance. From this initial search, key articles were identified, and the title, abstract, and keywords of these articles were screened for additional relevant search terms. An automation tool was also used to identify relevant search terms (Word Frequency Analyser; Clark et al., 2020). Following an iterative process, I finalised the following search terms: (prejudice OR discrimination OR toleran* OR intoleran* OR diversity OR attitude*

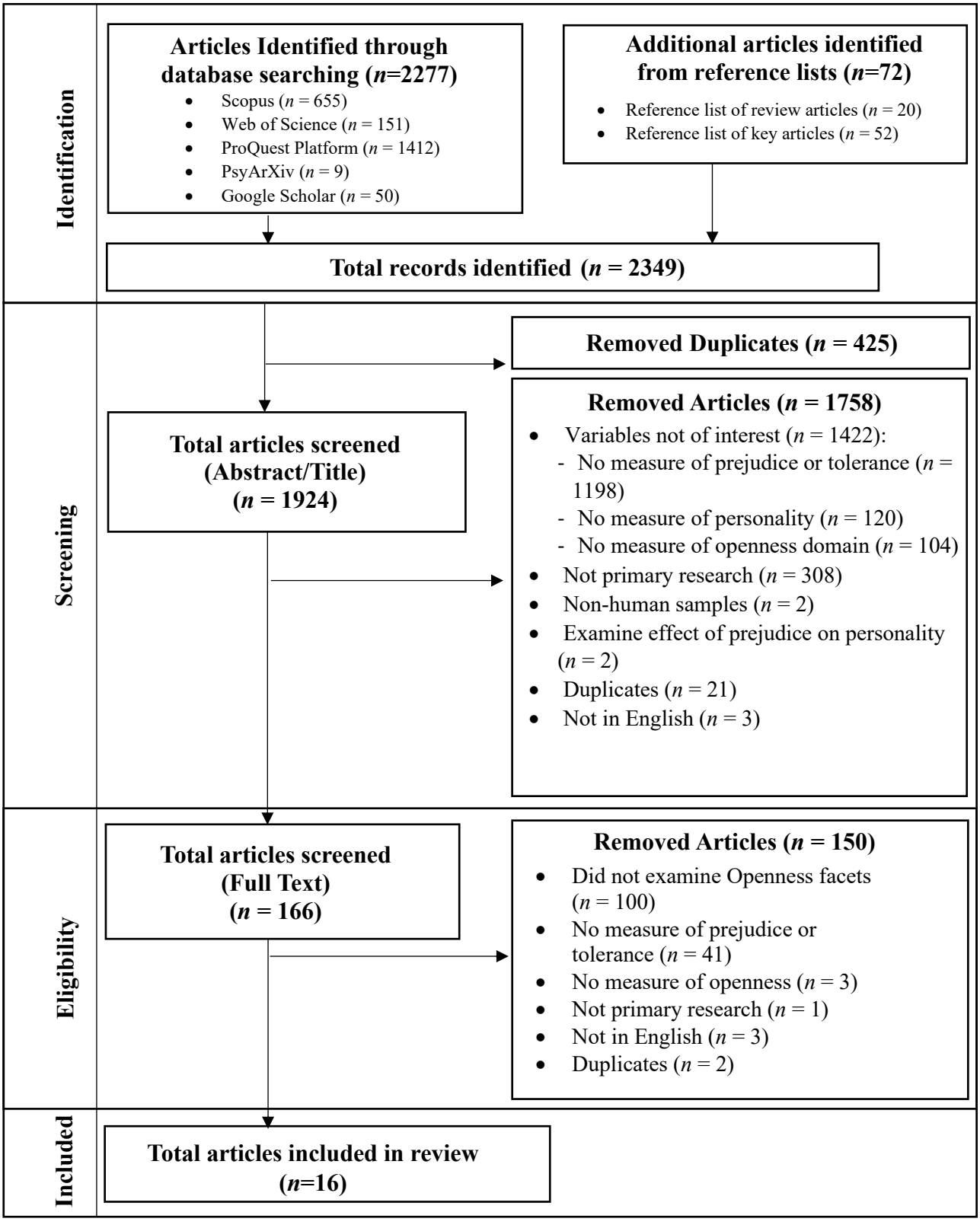
OR religio* OR ideology) for prejudice or tolerance, and [(openness OR intellect OR "big five" OR "five factor") AND facet*] for openness facet(s).

A second search using the finalised search terms was then conducted across three major databases (i.e., Scopus, Web of Science, and ProQuest[8]), with the search string adapted to each database (Appendix B). A supplementary search of Google Scholar and PsyArXiv further searched the relevant grey literature. A librarian liaison officer specialising in psychology was consulted and reviewed the search strategy at this stage. The last search examined the reference list of selected articles and relevant meta-analytic studies (e.g., Sibley & Duckitt, 2008; Crawford & Brandt, 2019) for articles pertinent to the review questions. The reference list search identified an additional 72 articles. In total, 2349 records were identified from the search strategy (Figure 3.2).

[8] The list of databases in ProQuest are available in Appendix A.

Figure 3.2

Screening and Inclusion Decision Flowchart of Scoping Review



Screening and Data Extraction Stage

Study selection involved screening all articles across two stages: (a) title and abstract screening, followed by (b) full-text screening (for a flowchart on the screening and selection process, see Figure 3.2). Citation files of all articles were first imported into a web-based systematic review software (Rayyan; Ouzzani et al., 2016) to aid the screening process. Screening tools were developed in advance (Appendices C & D), per established guidelines (Polanin et al., 2019), to help reviewers evaluate the articles consistently and reliably. To assess for inter-reviewer reliability, all reviewers (i.e., A/Prof. Jonathan Ramsay, Prof. Nigel Marsh, Dr Patrick Lin, and myself) pilot-tested the screening tools on a sub-sample of 20 abstracts and attained a 90% inter-reviewer agreement, which satisfies the 75% minimum requirement (Polanin et al., 2019). At least two reviewers screened all articles at the two screening stages. Articles that failed to meet the inclusionary criteria were excluded. Any disagreements between the reviewers were resolved through discussion and the achievement of consensus. The screening stage identified 16 articles that satisfied the review objectives and met all inclusion criteria (see Figure 3.2 for the complete PRISMA-ScR diagram; Tricco et al., 2018).

Using a preregistered data extraction tool (https://osf.io/yw9g8/; Appendix E), information pertinent to the review aims was extracted from the final set of 16 articles. The 16 articles contributed 17 separate studies (Table 3.1). The data extracted were as follows: author(s), year of publication, sample characteristics (sample size, age, gender, and sampling methods), country of research, personality measure used, type(s) of prejudice or social tolerance examined, variables examined (i.e., name of independent variables and dependent variables), measures of prejudice and social tolerance, theories and structural model used, and key findings. The data extraction tool was pilot tested on two studies by two reviewers (i.e., A/Prof. Jonathan Ramsay and I). A high inter-reviewer agreement was achieved; there was

no discrepancy in the information extracted from the two reviewers. I extracted data from the remaining 15 studies. All extracted data were collated and stored using Microsoft Excel. The author(s), year of publication, participant demographics, country of research, personality measure used, outcome measure(s) used, the theoretical framework and structural model of the included studies are presented in Table 3.1. All extracted findings were categorised based on their relevance to the review aims and are summarised in Tables 3.2 – 3.6.

Results

Study Demographics and Characteristics

Following the Joanna Briggs Institute framework for a scoping review (Peter et al., 2020) and the inclusion criteria outlined above, 15 peer-reviewed studies, one book chapter (Huxley, Bizumic, & Kenny, 2015), and one PhD dissertation (Averhart, 2012) were identified to be relevant to the review objective (Table 3.1). All studies were published between 2002 and 2019, with most (k = 11, 64.7%) published in the last ten years (Table 3.1). Regarding geographic and cultural representation among these articles, most of the studies were from Western settings, predominantly the United States (k = 8, 47%). The only piece of research from a non-Western setting was conducted in Israel (k = 1, 5.9%). No studies from Africa, South America, and other major parts of Asia (i.e., central, south, east, or south-east Asia) were identified in this scoping review (Table 3.2)

Most samples (k = 11, 64.7%) were college students (Table 3.2). The most frequently used measure of facets of openness was the NEO-PI-R and NEO-PI-3, collectively labelled as NEO-PI-R/3 (k = 10, 58.8%; Table 3.2). Other measures of facets of openness were IPIP-based measures (k = 5, 29.4%) and the HEXACO-PI (k = 2, 11.8%).

Table 3.1

Details of the 17 Studies

Author(s)/ Year	Study Characteristics					Theoretical Framework and Structural Model	
	n, M_{age}, range	Country, Sampling population	Personality measure used	Outcome measure(s) used	Dependent variable	Theoretical Framework	Structural Model examined
1. Anglim, Knowles, Dunlop, and Marty, 2017	*n* = 1244 (47% female), M_{age} = 44.3, range = 18-70)	Australia, Community sample	HEXACO-PI (Lee and Ashton, 2004)	57-item Portrait Values Questionnaire (PVQ; Schwartz et al., 2012)	Universalism value	Not specified	No mediators or moderators
2. Anglim, Sojo, Ashford, Newman, and Marty, 2019	*n* = 731 (66% female), M_{age} = 43.0, *SD* = 12.0	Australia, Community sample	HEXACO-PI (Lee and Ashton, 2004)	A 16-item measure was developed to assess four types of prejudice. Attitudes Toward Diversity Scale (Montei et al., 1996)	Sexism/Racism/ Ageism/ Disability prejudice Diversity Attitude	Dual Process Theory (Duckitt, 2001)	No mediators or moderators
3. Averhart, 2012	*n* = 551 (55% female), M_{age} = 40.58, range = 23-71	United States, Community sample	IPIP-NEO (Goldberg, 1999)	29-item Fraboni Scale of Ageism (Fraboni, Saltstone, and Hughes, 1990)	Ageism	Dual Process Theory (Duckitt, 2001)	No mediators or moderators
4. Christopher, Zabel, and Miller, 2013	*n* = 296 (48% female), M_{age} = 39.81, range = 22-74	United States, Community sample	NEO-PI-R (Costa and McCrae, 1992)	22-item Ambivalent Sexism Inventory (Glick and Fiske, 1996)	Sexism	Dual Process Theory (Duckitt, 2001)	RWA and SDO as mediators
5. Ekehammar and Akrami, 2007 (Study 1)	*n* = 158 (50% female), M_{age} = 24.7, range = 19-50	Sweden, College students and community sample	NEO-PI-R (Costa and McCrae, 1992)	8-item Swedish Modern Sexism Scale (Ekehammar, Akrami, and Araya, 2000)	Sexism	Authoritarian-personality (Adorno et al., 1950) and Social Dominance Theory (Sidanius & Pratto, 1999)	No mediators or moderators

Table 3.1 cont.

Details of the 17 Studies

Author(s)/ Year	Study Characteristics					Theoretical Framework and Structural Model	
	n, M_{age}, range	Country, Sampling population	Personality measure used	Outcome measure(s) used	Dependent variable	Theoretical Framework	Structural Model examined
6. Ekehammar and Akrami, 2007 (Study 2)	*n* = 170 (63% female), M_{age} = 19.9, range = 16-50	Sweden, College and high school students	NEO-PI-R (Costa and McCrae, 1992)	9-item Modern Racial Prejudice Scale (Akrami, Ekehammar, and Araya, 2000) 8-item Swedish Modern Sexism Scale (Ekehammar, Akrami, and Araya, 2000) 11-item Modern Attitude Toward People with Mental Disabilities Scale (Akrami, Ekehamar, Claesson, and Sonnander, 2006) 10-item Attitude to Homosexuality Scale (Ekehammar and Akrami, 2006)	Generalised Prejudice	Authoritarian-personality (Adorno et al., 1950) and Social Dominance Theory (Sidanius & Pratto, 1999)	No mediators or moderators
7. Han and Pistole, 2017	*n* = 176 (72% female), M_{age} = 21.01, range = 18-51	United States, College students	NEO-PI-3 (McCrae, Costa, and Martin, 2005)	15-item Miville-Guzman Universal-Diverse Scale-Short Form (Fuertes et al., 2000)	Universal-Diverse Orientation	Not specified	No mediators or moderators
8. Huxley, Bizumic, and Kenny, 2015	*n* = 223 (59% female), M_{age} = 29.83, *SD* = 13.59	Australia, College students and community sample	IPIP-NEO (Goldberg, 1999)	6-item feeling thermometer scale on attitudes towards asylum seeker ethnic groups (i.e., Sri Lankans, Afghanis, Iraqis, Sudanese, Burmese, and asylum seekers in general)	Racism	Not specified	Ethnocentrism as mediators

Table 3.1 cont.

Details of the 17 Studies

Author(s)/ Year	Study Characteristics					Theoretical Framework and Structural Model	
	n, M_{age}, range	Country, Sampling population	Personality measure used	Outcome measure(s) used	Dependent variable	Theoretical Framework	Structural Model examined
9. Kandler, Bleidorn, and Rieman, 2012	*n* = 872 (74% female), M_{age} = 34.3, range = 17-82	Germany, Community sample	NEO-PI-R (Costa and McCrae, 1992)	Eight bipolar items were developed and used to examine orientation towards equality	Social equality orientation	Five factor theory (McCrae & Costa, 2008)	No mediators or moderators
10. Miller, 2019	*n* = 79 (54% female), M_{age} = 22.08, range = 18-39	United States, College students	NEO-PI-R (Costa and McCrae, 1992)	Two items from the Right-Wing Authoritarianism (RWA) scale were used to examine homosexuality and "different" sexual preference	Sexual prejudice	Dual Process theory (Duckitt, 2001)	RWA as mediators
11. Miller, Wagner, and Hunt, 2012	*n* = 117 (89% female), M_{age} = 20.69, *SD* = 4.41	United States, College students	NEO-PI-R (Costa and McCrae, 1992)	20-item Attitudes Toward Lesbians and Gay Men scale (Herek, 1988) 10-item Attitudes Toward Homosexuals scale (Agnew et al., 1993)	Sexual prejudice	Dual Process theory (Duckitt, 2001)	No mediators or moderators
12. Onraet, Van Hiel, Roets, and Cornelis, 2011	*n* = 220 (50% female), M_{age} = 46, range = 17-86	Belgium, Community sample	NEO-PI-R (Costa and McCrae, 1992)	9-item blatant racism scale (Duriez and Van Hiel, 2002) 12-item subtle racism scale (Van Hiel and Mervielde, 2005)	Racism	Dual Process theory (Duckitt, 2001)	RWA as mediators
13. Proctor and McCord, 2009	*n* = 59, M_{age} = not available, range = not available	United States, College students	IPIP-M5 (McCord, 2002)	Four-item measure was developed and used to examine prejudice towards Muslim	Racism	Not specified	No mediators or moderators

Table 3.1 cont.

Details of the 17 Studies

Author(s)/ Year	Study Characteristics					Theoretical Framework and Structural Model	
	n, M_{age}, range	Country, Sampling population	Personality measure used	Outcome measure(s) used	Dependent variable	Theoretical Framework	Structural Model examined
14. Roccas, Sagiv, Schwartz, and Knafo, 2002	*n* = 246 (65% female), M_{age} = 22, range = 16-35	Israel, College students	NEO-PI-R (Costa and McCrae, 1992)	62-item Schwartz (1992) value inventory	Universalism value	Not specified	No mediators or moderators
15. Szeto, O'Neill, and Dobson, 2015	*n* = 201 (71% female), M_{age} = 20.52, *SD* =3.57	Canada, College students	IPIP-120 (not disclosed in the study)	A 27-item was developed and used to assess prejudice towards people with mental disorders 12-item social distance questionnaire (Norman et al, 2008)	Mental disorder prejudice	Not specified	No mediators or moderators
16. Thompson, Brossart, Carlozzi, and Miville, 2002	*n* = 106 (86% female), M_{age} = 34.7, range = 22-57	United States, College students	NEO-PI-R (Costa and McCrae, 1992)	45-item Miville-Guzman Universality-Diversity Scale (Miville et al., 1999)	Universal-Diverse Orientation	Not specified	No mediators or moderators
17. Unruh and McCord, 2010	*n* = 53 (72% female), M_{age} = 20.94, range = 18-37	United States, College students	IPIP-M5 (McCord, 2002)	25-item Professional Beliefs About Diversity Scale (Pohlan and Aguilar, 1999)	Diversity Attitude	Not specified	No mediators or moderators

Table 3.2

General Characteristics of Included Studies

Characteristic	Number (k = 17)	Percentage (%)
Publication type		
Journal article	15	88.2
Book Chapter	1	5.9
Thesis dissertation	1	5.9
Countries examined		
U.S.A	8	47.0
Australia	3	17.6
Sweden	2	11.8
Germany	1	5.9
Belgium	1	5.9
Canada	1	5.9
Israel	1	5.9
Sample Type		
College students	11	64.7
Community sample	6	35.3
Group Attitudes[a]		
Prejudice	11	64.7
Social Tolerance	7	41.2
Facet-structure		
NEO-PI-R/3	10	58.8
IPIP measures	5	29.4
HEXACO-PI	2	11.8

[a] The number does not tally with the total number of included studies because one study examined both prejudice and social tolerance.

Facets of Openness and Prejudice

Eleven studies examined prejudice as the dependent variable (Table 3.2). All eleven studies used self-report methods to measure prejudice; none included implicit or behavioural measures of prejudice (Table 3.1). All studies used different measures to assess prejudice; no two studies used the same measure (Table 3.1). Together, these eleven studies examined a total of seven different types of prejudice, namely: racism (k = 4), sexism (k = 3), sexual prejudice (k = 2), ageism (k = 2), generalised prejudice (k = 1), mental disorder prejudice (k = 1), and disability prejudice (k = 1; Table 3.3). Among studies that examined prejudice and used the NEO-PI-R or IPIP measures (k = 10), the facet of values/liberalism was consistently linked with prejudice (Table 3.4).

Facets of Openness and Social Tolerance

Seven studies examined social tolerance as the dependent variable. All seven studies used self-report methods to measure social tolerance, and none included implicit or behavioural measures (Table 3.1). The seven studies examined four different types of social tolerance, namely: universal-diverse orientation (UDO; k = 2), social equality orientation (k = 1), universalism value (n = 2), and diversity attitude (k = 2; Table 3.5). As highlighted in Table 3.6, the facet of values/liberalism was consistently linked with social tolerance in the studies that used the NEO-PI-R/3 or IPIP measures (k = 5).

Table 3.3

Types of Prejudice Examined

Types	Number (k = 11)	Percentage (%)
Prejudice[a]		
Racism	4	36.4
Sexism	3	27.3
Sexual prejudice	2	18.2
Ageism	2	18.2
Generalised prejudice	1	9.1
Mental disorder prejudice	1	9.1
Disability prejudice	1	9.1

[a] Adding the number of studies for each prejudice types does not tally with the total number of studies (i.e., k = 11) as one study examined four prejudice types (i.e., Anglim et al., 2019).

Table 3.4

Frequency of Significant Correlations in Studies that Examined Prejudice and used NEO-PI-R or IPIP Measures

Facets of Openness	Number (k = 10)	Frequency (%)
NEO-PI-R/ IPIP measures		
Fantasy/ Imagination	6	60
Aesthetics/ Artistic Interests	8	80
Feelings/ Emotionality	6	60
Actions/ Adventurousness	5	50
Ideas/ Intellect	5	50
Values/ Liberalism	9	90

Table 3.5

Types of Social Tolerance Examined

Types	Number (k = 7)	Percentage (%)
Social Tolerance		
Universal-Diverse Orientation	2	28.6
Social Equality Orientation	1	14.2
Universalism value	2	28.6
Diversity attitude	2	28.6

Table 3.6

Frequency of Significant Correlations Among Studies that Examined Social Tolerance and used NEO-PI-R or IPIP Measures (k = 10)

Facets of Openness	Number (k = 5)	Frequency (%)
NEO-PI-R/ IPIP measures		
Fantasy/ Imagination	2	40
Aesthetics/ Artistic Interests	4	80
Feelings/ Emotionality	4	80
Actions/ Adventurousness	3	60
Ideas/ Intellect	3	60
Values/ Liberalism	5	100

Theories and Structural Models Examined in Existing Literature

Out of the seventeen included studies, only nine (52.9%) invoked a specific theoretical framework to explain the relationship between facets of openness and group attitudes (Table 3.1). The most cited theory was the Dual Process Theory by Duckitt (2001), with six studies (35.3%), followed by Adorno and colleagues' (1950) Authoritarian Personality theory and Sidanius and Pratto's (1999) Social Dominance theory with two studies each (11.8%), and McCrae & Costa's (2008) Five-Factor Theory with one study (5.8%). Out of the four theories, the Dual Process Theory is the only theory that explains the link between openness and group attitudes.

Information pertaining to mediation or moderation models was extracted from the included studies to review the structural models examined in the existing literature (Table 3.1). None of the studies had moderation analyses. Only four studies included mediation analyses involving facets of openness as independent variables and group attitudes as dependent variables. That is, two studies (Miller, 2019; Onraet et al., 2011) examined the mediating role of RWA, one study (Huxley, Bizumic, & Kenny, 2015) examined the mediating role of ethnocentrism, and one study (Christopher, Zabel, & Miller, 2013) examined the mediating role of both RWA and social dominance orientation (SDO). Overall, these four studies found that the openness facet of values (or liberalism) predisposed individuals towards prejudice via RWA, SDO, and ethnocentrism. None of the studies examined a mediated or indirect pathway between the facets of openness and social tolerance (Table 3.1).

Discussion

The objectives of this scoping review were to comprehensively map the extant research on the relationships between facets of openness and group attitudes (i.e., prejudice and social tolerance) and to further characterise the literature in terms of the specific measures used and

the samples and populations involved. The primary review question was "what are the factors that influenced the relationship between facets of openness and group attitudes (prejudice and social tolerance)?" with the following sub-questions: (a) what types of evidence are available, and how many studies have been conducted? (b) what are the typical demographic characteristics of participants, and how have they been sampled within the existing literature? (c) with what cultural groups has this research been conducted, and to what extent have understudied non-western populations been examined? (d) which types of prejudice and social tolerance were examined within existing literature? (e) which measures of facets of openness were used, and what is the frequency of use within existing literature? (f) what frequency trends were present within the data related to the associations between facets of openness, prejudice and social tolerance? (g) which theories and structural models were employed within existing literature? and (h) what variables were found to mediate or moderate the relationships between facets of openness, prejudice and social tolerance? In this section, I first provide an overall summary of the scoping review findings, followed by a discussion of the theoretical implications of specific findings. Lastly, I offer directions for future research and note the limitations of this scoping review.

Types of Evidence Available and Number of Studies Conducted (Sub-question a)

One of the objectives of this scoping review was to examine whether the relationships between facets of openness and group attitudes differ depending on how the openness facets were measured. Logically, this has to be the case, since disagreement and uncertainty over the nature and structure of openness (Christensen, Cotter, & Silvia, 2019; de Raad & van Heck, 1994; Hough & Ones, 2001; Woo et al., 2014) have yielded different measures aligned with different theoretical perspectives. Although most of the available research were peer-reviewed empirical research, the few studies (i.e., 17) limited the ability to systematically

compare personality measures. Specifically, only one study examined prejudice using HEXACO-PI.

Demographic, Sampling Strategies, and Cultural Emphasis of Existing Literature (Sub-Question b and c)

Most studies used college samples (64.7%; Table 3.2), meaning that non-student populations may have been under-represented in the extant literature. In addition, almost all included studies were conducted using samples from Western cultures (94.1%; Table 3.2). Culture is a strong contextual factor that influences the inner experience (e.g., how an individual experiences and interprets the social environment) as well as outward behaviours of an individual (e.g., how an individual behaves and interacts with others; Matsumoto, Yoo, & Fontaine, 2008; Kende et al., 2018; McDonald, Navarrette, & Sidanius, 2011). Several studies have found that contextual factors, such as culture, influence both the development of personality (Allik & McCrae, 2004; Schmitt et al., 2007; Schmitt et al., 2008) and group attitudes (Gerber et al., 2010; Grijalva & Newman, 2015; Lee et al., 2018; Kandler, Bleidorn, & Riemann, 2012). Culture was also found to moderate the association of the openness factor with group attitudes (e.g., Alper & Yilmaz, 2019; Gerber et al., 2010). For instance, the link between openness and diversity attitude was stronger among participants from Western, Educated, Industrialised, Rich, and Democratic (WEIRD) cultures (Alper & Yilmaz, 2019).

It is very likely that contextual factors like culture also moderate the relationship of the facets of openness with prejudice and social tolerance. Notably, the facets of openness may influence prejudice and social tolerance more strongly in the WEIRD cultures but weaker in the non-WEIRD cultures. Furthermore, the facet-level relationship of openness with group attitudes may also differ across cultures. For instance, the facet of openness strongly linked with prejudice and social tolerance in the WEIRD cultures may not be the facet of openness strongly linked with prejudice and social tolerance in non-WEIRD cultures. In sum, the lack

of non-college samples and the lack of cultural representation of non-Western settings represents a gap in the current literature and limits the generalisability of the findings of this review. More research is needed to unravel the relationship between facets of openness and group attitudes among the general public and in non-Western settings, although the current search strategy of including only English-language articles possibly inflated the number of WEIRD-biased samples.

Lack of Implicit Measures and Lack of Consensus on the Measure for Group Attitudes (Sub-Question d)

The studies included in this review examined seven different forms of prejudice: racism, sexism, sexual prejudice, ageism, generalised prejudice, mental disorder prejudice, and disability prejudice (Table 3.3). While these seven forms represent a reasonably broad cross-section of the prejudice and discrimination literature (Duckitt, 1992; Sibley & Duckitt, 2008; Son Hing & Zanna, 2010), several prominent forms of prejudice (e.g., gender identity prejudice, anti-immigrant prejudice), have not yet been examined in terms of their relationships with openness facets. In addition, not all measures of prejudice were reviewed in the included studies. For example, none of the studies included an implicit measure of prejudice (e.g., the Implicit Association Test; IAT; Greenwald, McGhee, & Schwartz, 1998). Although the validity of using IAT as a measure of implicit social attitude has been seriously questioned (Schimmack, 2021), existing studies using implicit means to examine prejudice has produced more robust indices of prejudice than those using self-report measures (e.g., Legault et al., 2007; Nosek et al., 2007). Some researchers regarded implicit measures of prejudice as a more reflective measure of prejudice as participants are less able to control their responses to the measure and, hence, are less likely to respond in a socially desirable manner (e.g., Cvencek et al., 2010; Geoffrey, 2013). Several studies have found that participants motivated to suppress their prejudice (to avoid negative reactions from others)

were more likely to report a lower prejudice score on self-report measures than implicit measures of prejudice (e.g., Devine et al., 2002; Legault et al., 2007). Therefore, it is likely that the included studies, which used only self-report measures of prejudice, might have reported a lower prejudice score, especially among participants motivated to suppress their prejudice for social desirability.

This review identified four different operationalisations of the social tolerance construct (i.e., universal-diverse orientation, social equality orientation, universalism value, and diversity attitudes; Table 3.5). In other words, the current literature has operationalised the social tolerance construct as either a: (a) positive orientation towards differences (i.e., universal-diverse orientation and diversity attitudes), (b) egalitarian ideology (i.e., social equality orientation), or (c) universalism value (i.e., the pursuit of welfare and protection for all individuals). Several researchers have argued that egalitarianism cannot promote a genuinely tolerant society (Son Hing et al., 2008). Instead, researchers have advocated for social tolerance to be operationalised as a positive orientation toward diversity, which is characterised by the awareness of intergroup differences, appreciation of diversity, and having a sense of relatedness towards group members (Hjerm et al., 2020; Miville et al., 1999; Son Hing et al., 2008). As only seven studies on tolerance were retrieved, and only four studies operationalised social tolerance as a positive orientation towards diversity (Table 3.5), it is recommended for future research to explore the operationalisation of social tolerance as an orientation toward diversity. More primary research studies on the association between the facets of openness and social tolerance are also needed to broaden the understanding of the personality underpinning this important aspect of social tolerance.

Reliance on the NEO-PI-R/3 measure (Sub-Question e)

Within the identified studies, the NEO-PI-R and its variants were identified as the most frequently used measures of openness facets (Table 3.2). Several studies have found that the

NEO-PI-R/3 facets of openness mainly characterise the individual differences in openness towards non-intellectual experiences, such as aesthetic experiences, variety-seeking, daydreaming, and emotions (e.g., Christensen, Cotter, & Silvia, 2019; Woo et al., 2014). While the NEO-PI-R/3 provides some coverage of individual differences in openness towards intellectual pursuits, such as intellectual curiosity towards ideas (i.e., the facet of ideas), several facets associated with intellectual pursuit are not captured (e.g., ingenuity, scientific curiosity, depth, and self-assessed intelligence; Christensen, Cotter, and Silvia, 2019; Woo et al., 2014). Therefore, reliance on the NEO-PI-R/3 represents a weakness of the extant literature, since investigations of facet-level relationships between openness and group attitudes need to examine the full breadth of the openness construct in order to identify the facet of openness that best predicts prejudice and social tolerance.

Recently, Woo and colleagues (2014) developed a new measure, the Six-Facet Openness Scale (SFOS), which covered most of the facets of openness unexamined by the NEO-PI-R. This new measure may complement the NEO-PI-R in examining the full spectrum of openness facets. Other measures of the facets of openness beyond those discussed in this review may also be considered in future investigations to explore the broad range of openness facets and their relationship with prejudice and social tolerance. For instance, the nine intellect scales in the Abridged Big Five Circumplex (AB5C; Hofstee, de Raad, & Goldberg, 1992), the homogenous item clusters of intellectance and school success in the Hogan Personality Inventory (Hogan, Brinkmeyer, & Hogan, 1996), and the analytical item cluster in the Jackson Personality Inventory (Jackson, 1994) contain openness to intellectual pursuits not otherwise covered by the NEO-PI-R. In order to attain more definitive conclusions regarding the various components of openness as assessed by different inventories and their relationship with prejudice and social tolerance, it may be imperative to conduct a comprehensive, large-scale study or a series of studies. Such research endeavours

should encompass all inventories evaluating openness facets and employ diverse methods for assessing multiple forms of prejudice and social tolerance, including behavioural and implicit measures of prejudice.

Facet of Value and Liberalism Consistently Linked with Prejudice and Social Tolerance (Sub-Question f)

Among the facets of openness examined in the NEO-PI-R/3 and IPIP-based measures, the facet of values (or liberalism) was most consistently linked with prejudice and social tolerance within the included studies (Table 3.4 and 3.6). This finding is unsurprising, given that the facets of value (or liberalism) have been positively linked with dispositional perspective-taking (Miller, 2019) and negatively correlated with RWA (Sibley & Duckitt, 2010). It may be argued that the facet of values (or liberalism) promotes social tolerance and protects an individual against endorsing prejudiced attitudes by enhancing the ability to adopt others' perspectives and restricting authoritarian attitudes. While this review aimed to empirically and conceptually differentiate prejudice and social tolerance based on their differential relationships with the facets of openness, the findings showed that prejudice and social tolerance were consistently linked with the same facet of openness (i.e., facet of value or liberalism).

The Dual Process Model and RWA (Sub-Question g and h)

Most of the included studies relied on dual process theory to explain the link between facets of openness and prejudice (Table 3.1). According to dual-process theory (Duckitt, 2001), the openness factor prospectively predicts RWA, which in turn predicts prejudice. Therefore, it is no surprise that the mediating role of RWA on the relationship between facets of openness and prejudice was examined among the articles in this scoping review. Although several studies (e.g., Lin & Alvarez, 2020) found RWA to fully mediate the effect of the broad trait of openness on prejudice, it does not necessarily mean that RWA equally mediates

all the lower-level facets of openness in their effect on prejudice. As shown by the included studies in this scoping review, RWA only mediated the effect of some facets of openness (i.e., values) and not others (i.e., aesthetics). However, only four mediation studies were retrieved in this review and all four examined prejudice. More research is needed to uncover the mediators responsible for the relationships between the facets of openness with prejudice and social tolerance.

Limitations of the Present Research

As only articles that were written in English were selected, the search strategy may have failed to capture relevant articles written in languages other than English. Using only publications authored in English also likely inflates the number of WEIRD-based studies uncovered from the search strategy. Despite using a broad search strategy, only 17 studies were identified as relevant from the existing literature. It is emphasised that the limited number of studies identified in this scoping review represents a weakness of the current literature in providing a proper systematisation of the evidence on the relationship between the predictor (facets of openness) and the criteria (prejudice and social tolerance), and not necessarily represents a weakness of the search strategy used in this review. Nevertheless, the limited number of studies summarised in this review restricted the generalisability of the conclusions. More studies are needed to validate (or invalidate) the associations of facets of openness with indices of prejudice and social tolerance summarised in this paper before any firm conclusions can be made.

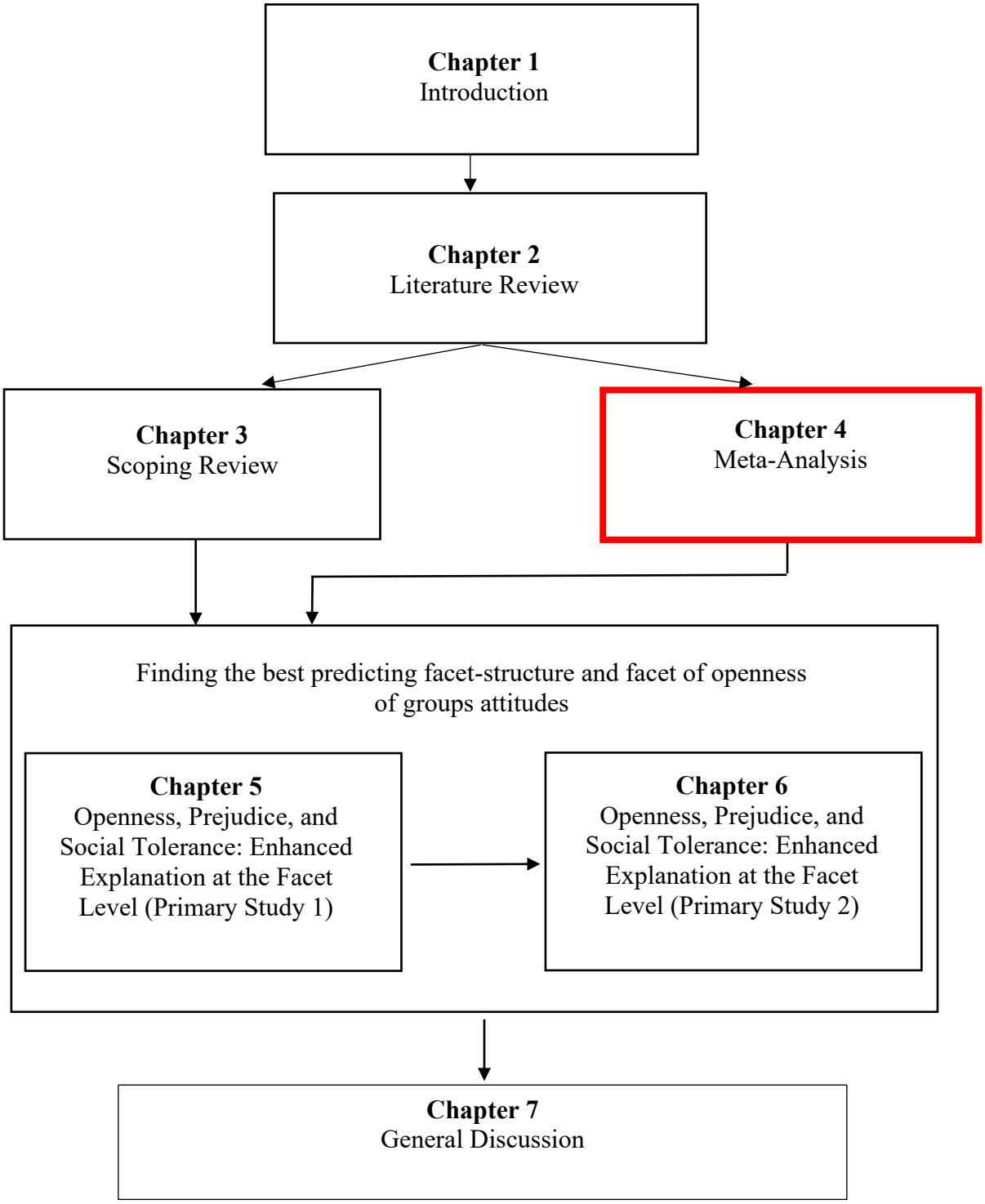
Future Directions

Many psychologists have argued that factor scores might obscure facet-criterion relationships (e.g., Hastings & O'Neill, 2009; Woo et al., 2014). This review provides a more nuanced understanding of the facet-level associations between the openness factor and both prejudice and social tolerance. However, this review did not include a statistical synthesis of

the findings. In Chapter 4, I will present the meta-analysis of the effect sizes in the included studies of this review. In my primary studies (Chapters 5 and 6), I also contribute to the extant literature by using three major inventories of the facets of openness (i.e., IPIP-NEO, SFOS, and HEXACO-PI) and examining the relationships between these facets of openness with prejudice and social tolerance, which were assessed using different measures. In addition, the primary studies in Chapters 5 and 6 examine the relationships between the facets of openness and prejudice or social tolerance in Singapore and assess the cross-cultural stability of these relationships.

Conclusion

This scoping review provides a preliminary guide on the link between the facets of openness and the group attitudes of prejudice and social tolerance. The findings from this scoping review offer insight into the extent of current research in this topic area and identify gaps among the existing literature. Particularly, only a few studies have been conducted in this topic area with an over-reliance on Western samples and using NEO-PI-R measures for the facets of openness. The research gaps identified in this review will be addressed in the upcoming chapters.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Chapter 4

Associations Between Facets of Openness, Prejudice, and Social Tolerance: A Meta-analysis

D. X. Ng*, Patrick K. F. Lin, Nigel V. Marsh, K. Q. Chan, and Jonathan E. Ramsay

School of Social and Health Sciences, James Cook University, Singapore

*Corresponding author:

Mr Da Xuan Ng

Email: da.ng@my.jcu.edu.au

Address: James Cook University, 149 Sims Drive, Singapore 387380

Statement of the Contribution of Others

This meta-analysis chapter contributed to a peer-reviewed publication in *Frontiers Psychology* (i.e., Ng et al., 2021). The publication was written with four co-authors, with the candidate as the primary author. As per the Contributor Roles Taxonomy (CRediT; Allen et al., 2019), the candidate's contribution to the work included the following:

- Research conception
- Methodology (Development and design of methodology)
- Software (Developed R code for analysis)
- Validation (Verification of results)
- Formal analysis (Analysed and synthesised study data)
- Investigation (Data collection)
- Resources (Developed screening tools)
- Data curation
- Writing – Original draft
- Writing - Review & editing
- Visualisation
- Project administration.

The nature of the co-author contribution is listed below in order of authorship:

Co-author	Affiliation	Contribution
Dr Patrick Lin	James Cook University Singapore	Editorial support
Prof Nigel Marsh	James Cook University Singapore	Editorial support
Dr Chan Kai Qin	James Cook University Singapore	Statistical Support; Editorial support
A/Prof Jonathan Ramsay	James Cook University Singapore	Editorial support; Supervision; Funding acquisition (Internal Research Grant 2021; IRG20210001)

Declaration by co-authors

The undersigned hereby certify that:

- The above declaration correctly reflects the nature of the candidate's contribution to this work and the nature of the contribution of each of the co-authors.
- All authors have been included in the manuscript.

Signatures:

_____ _____

Dr Patrick Lin/ Date **Prof Nigel Marsh/ Date**

_____ _____

Dr Chan Kai Qin/ Date **A/Prof Jonathan Ramsay/ Date**

Abstract

A random-effects meta-analysis was conducted to aggregate the effect sizes reported by the studies included in the scoping review. The aggregated correlation coefficients between the six NEO facets of openness (i.e., imagination, artistic interests, feelings, adventurousness, intellect, and liberalism) and group attitudes (i.e., prejudice and social tolerance) were all statistically significant. Overall, the facet of liberalism was the strongest predictor of prejudice (ρ = -.44, 95% CI: -.56 - -.30). Aggregated correlation coefficients also suggest that the facet of artistic interests may be the strongest predictor of social tolerance (ρ = .53, 95% CI: .28 - .72), although the confidence interval around the coefficient was broad. Notwithstanding, three other facets showed appreciable effect sizes with social tolerance; Adventurousness = .45, Intellect = .42, and Liberalism = .41. The meta-analysis found large extent of study heterogeneity, suggesting that the effect sizes are likely to vary across study settings (e.g., sample demographics and measures used). In light of the small number of meta-analysed studies (k = 15), the findings of this meta-analysis should be treated as preliminary. More primary research studies are needed to confirm the trends found in this meta-analysis.

Associations Between Facets of Openness, Prejudice, and Social Tolerance: A Meta-analysis

Introduction

In the scoping review (Chapter 3), effect sizes (i.e., correlation coefficients) were aggregated by counting the number of studies demonstrating statistical significance with group attitudes. Subsequently, the facet of openness with the highest number of studies was determined as the most important predictor of group attitudes. Using this approach (also known as vote-counting; Quintana & Minami, 2006), the scoping review concluded that the openness facet of values (or liberalism) was the most important predictor of group attitudes as the facet was consistently linked with prejudice and social tolerance (see Table 3.4 and 3.6 in the previous chapter). However, using vote-counting to aggregate effect sizes overemphasises the importance of significance testing (specifically, null hypothesis significance testing), which has met with increasing criticism (Cumming, 2014; Krueger & Heck, 2018; Schmidt, 2010). In addition, the vote-counting approach[9] did not account for the quality of the included studies (Arya et al., 2020) and left unanswered the critical question, "what is the 'true' effect size between the facets of openness and group attitudes?" As such, a meta-analysis on the same set of included studies was conducted to supplement the scoping review findings.

Meta-analysis refers to statistical techniques that combine effect sizes across multiple studies into one meaningful estimate, an estimate of the true effect size of the relationship between variables (Arya et al., 2020; Braver et al., 2014). A meta-analysis also assesses whether this effect size estimate is reliable and valid by examining for study heterogeneity (i.e., identifying sources of between-study differences and analysing the magnitude of unexamined systematic differences among included studies; Higgins et al., 2003) and publication bias (i.e., determine the likelihood that the meta-analytic effect size had

[9] For a detailed discussion on vote-counting, see Bushman and Wang (2009).

underrepresented non-published "null" findings; Borenstein et al., 2010). Other advantages of meta-analyses include better precision in effect size estimates (i.e., narrow confidence interval) and enhanced generalisability of results (Deeks et al., 2022; Polanin et al., 2017).

Review Objective

I conducted a scoping review in the previous chapter and identified seventeen relevant studies via a systematic search strategy. In this chapter, a meta-analysis was conducted to aggregate the effect sizes of the included studies to generate an estimate and the corresponding confidence interval of the true correlational effect between each facet of openness and group attitudes (prejudice and social tolerance). Given that the facets of openness in the IPIP-based measures (i.e., imagination, artistic interests, emotionality, adventurousness, intellect, and liberalism; Goldberg, 1999) were developed as proxy measures of the facets of openness in NEO-PI-R (i.e., fantasy, aesthetics, feelings, actions, ideas, and values), the facets of openness with similar themes[10] were treated as the same in this meta-analysis. For a detailed description of the theme and definition of the facets of openness included in this meta-analysis, refer to Table 2.1. The HEXACO facets of openness were not examined due to the limited number of studies.

The primary objective was to obtain 12 meta-analytical estimates on the bivariate relationships between the six facets of openness (imagination, artistic interests, emotionality, adventurousness, intellect, and liberalism) and the two forms of group attitudes (i.e., prejudice and social tolerance). This meta-analysis addressed the following research question, "what are the effect size estimates for the relationships between the six facets of openness in NEO-PI-R (or the open-access equivalent, IPIP-based measures) and group attitudes?"

Method

[10] From here onwards, these facets would be labelled as imagination, artistic interests, emotionality, adventurousness, intellect, and liberalism for clarity.

Literature Search and Inclusion Criteria

The search strategy used in this meta-analysis replicated those of the previous scoping review. The search for published studies and unpublished theses was conducted in the following databases: Scopus, Web of Science, ProQuest, Google Scholar, and PsyArXiv. All relevant studies that were published before September 14, 2020, were identified for screening. The only inclusion criterion was that the study must be primary research that examined the relationships between one or more facets of openness and prejudice or social tolerance; there were no inclusionary or exclusionary criteria on the types of participants or settings. For details on the search string, selection, and screening process, please refer to pages 34-38 of Chapter 3. Seventeen studies met the inclusion criteria (see Table 4.1), of which fifteen studies that examined facets of openness using NEO-PI-R/3 or IPIP-based measures were included for meta-analysis. The PRISMA (Preferred Reporting Items for Systematic reviews and Meta-analyses; Page et al., 2021) breakdown of the search is detailed in Table 3.1 in Chapter 3.

Table 4.1

Study Characteristics and the Effect Sizes Reported in the 17 Included Articles

Author(s)/ Year	Study Characteristics			Results	
	Country, Sampling population	Personality measure used	Outcome measure(s) used	Effect Sizes Reported (with indices of prejudice)	Effect Sizes Reported (with indices of social tolerance)
1. Averhart, 2012	United States, Community sample, *n* = 551	IPIP-NEO (Goldberg, 1999)	29-item Fraboni Scale of Ageism (Fraboni, Saltstone, and Hughes, 1990)	• Ageism - Liberalism (r = -.011, *ns*)	Not investigated
2. Christopher et al., 2013	United States, Community sample, *n* = 296	NEO-PI-R (Costa and McCrae, 1992)	22-item Ambivalent Sexism Inventory (Glick and Fiske, 1996)	• Hostile Sexism - Imagination (r = -.32**) - Artistic interests (r = -.16**) - Emotionality (r = -.30**) - Adventurousness (r = -.28**) - Intellect (r = -.19**) - Liberalism (r = -.49**) • Benevolent Sexism - Imagination (r = -.27**) - Artistic interests (r = .00, *ns*) - Emotionality (r = -.12, *ns*) - Adventurousness (r = -.24**) - Intellect (r = -.08, ns) - Liberalism (r = -.41**)	Not investigated
3. Ekehammar and Akrami, 2007 (Study 1)	Sweden, College students and community sample, *n* = 158	NEO-PI-R (Costa and McCrae, 1992)	8-item Swedish Modern Sexism Scale (Ekehammar, Akrami, and Araya, 2000)	• Subtle Sexism - Imagination (r = not disclosed) - Artistic interests (r = -.18*) - Emotionality (r = -.18*) - Adventurousness (r = -.18*) - Intellect (r = not disclosed) - Liberalism (r = -.43*)	Not investigated

*** $p < .001$. ** $p < .01$. * $p < .05$. *ns* refers to non-significance findings.

Note. The effect sizes in Christopher et al. (2013) were corrected for dependency in the meta-analyses.

Table 4.1 cont.

Study Characteristics and the Effect Sizes Reported in the 17 Included Articles

Author(s)/ Year	Study Characteristics			Results	
	Country, Sampling population	Personality measure used	Outcome measure(s) used	Effect Sizes Reported (with indices of prejudice)	Effect Sizes Reported (with indices of social tolerance)
4. Ekehammar and Akrami, 2007 (Study 2)	Sweden, College and high school students, *n* = 170	NEO-PI-R (Costa and McCrae, 1992)	- 9-item Modern Racial Prejudice Scale (Akrami et al., 2000) - 8-item Swedish Modern Sexism Scale (Ekehammar et al., 2000) - 11-item Modern Attitude Toward People with Mental Disabilities Scale (Akrami et al., 2006) - 10-item Attitude to Homosexuality Scale (Ekehammar and Akrami, 2006)	• Generalised Prejudice - Imagination (r = -.25*) - Artistic interests (r = -.34*) - Emotionality (r = -.49*) - Adventurousness (r = -.30*) - Intellect (r = -.12, *ns*) - Liberalism (r = -.55*)	Not investigated
5. Han and Pistole, 2017	United States, College students, *n* = 176	NEO-PI-3 (McCrae, Costa, and Martin, 2005)	15-item Miville-Guzman Universal-Diverse Scale-Short Form (Fuertes et al., 2000)	Not investigated	• UDO - Imagination (r = -.47*) - Artistic interests (r = -.77*) - Emotionality (r = -.49*) - Adventurousness (r = -.77*) - Intellect (r = -.72*) - Liberalism (r = -.66*)
6. Huxley et al., 2015	Australia, College students and community sample, *n* = 223	IPIP-NEO (Goldberg, 1999)	6-item feeling thermometer scale on attitudes towards asylum seeker ethnic groups	• Ethnic Prejudice - Imagination (r = -.46**) - Artistic interests (r = -.27**) - Emotionality (r = -.31**) - Adventurousness (r = -.27**) - Intellect (r = -.34**) - Liberalism (r = -.51**)	Not investigated

*** $p < .001$. ** $p < .01$. * $p < .05$. *ns* refers to non-significance findings.

Note. The effect sizes of the two studies in Ekehammar and Akrami (2007) were corrected for dependency in the meta-analyses.

Table 4.1 cont.

Study Characteristics and the Effect Sizes Reported in the 17 Included Articles

Author(s)/Year	Study Characteristics			Results	
	Country, Sampling population	Personality measure used	Outcome measure(s) used	Effect Sizes Reported (with indices of prejudice)	Effect Sizes Reported (with indices of social tolerance)
7. Kandler et al., 2012	Germany, Community sample, *n* = 872	NEO-PI-R (Costa and McCrae, 1992)	Eight bipolar items were developed and used to examine orientation towards equality	Not investigated	• Social Equality Orientation -Liberalism (r = -.08*)
8. Miller, 2019	United States, College students, *n* = 79	NEO-PI-R (Costa and McCrae, 1992)	Two items from the Right-Wing Authoritarianism (RWA) scale	• Sexual Prejudice - Imagination (r = -.37**) - Artistic interests (r = -.33**) - Emotionality (r = -.28*) - Adventurousness (r = -.21, *ns*) - Intellect (r = -.41***) - Liberalism (r = -.59***)	Not investigated
9. Miller et al., 2012	United States, College students, *n* = 117	NEO-PI-R (Costa and McCrae, 1992)	- 20-item Attitudes Toward Lesbians and Gay Men scale (Herek, 1988) - 10-item Attitudes Toward Homosexuals scale (Agnew et al., 1993)	• Sexual Prejudice - Imagination (r = not disclosed) - Artistic interests (r = -.22*) - Emotionality (r = not disclosed) - Adventurousness (r = not disclosed) - Intellect (r = -.22*) - Liberalism (r = -.68***)	Not investigated

*** $p < .001$. ** $p < .01$. * $p < .05$. *ns* refers to non-significance findings.

Table 4.1 cont.

Study Characteristics and the Effect Sizes Reported in the 17 Included Articles

Author(s)/Year	Study Characteristics			Results	
	Country, Sampling population	Personality measure used	Outcome measure(s) used	Effect Sizes Reported (with indices of prejudice)	Effect Sizes Reported (with indices of social tolerance)
10. Onraet et al., 2011	Belgium, Community sample, *n* = 220	NEO-PI-R (Costa and McCrae, 1992)	- 9-item blatant racism scale (Duriez and Van Hiel, 2002) - 12-item subtle racism scale (Van Hiel and Mervielde, 2005)	• Blatant Racism - Imagination (r = -.54***) - Artistic interests (r = -.44***) - Emotionality (r = -.44***) - Adventurousness (r = -.54***) - Intellect (r = -.44***) - Liberalism (r = -.54***) • Subtle Racism - Imagination (r = -.43***) - Artistic interests (r = -.37***) - Emotionality (r = -.37***) - Adventurousness (r = -.43***) - Intellect (r = -.37***) - Liberalism (r = -.43***)	Not investigated
11. Proctor and McCord, 2009	United States, College students, *n* = 59	IPIP-M5 (McCord, 2002)	Four-item measure was developed and used to examine prejudice towards Muslim	• Religious Prejudice - Imagination (r = -.24, *ns*) - Artistic interests (r = -.34**) - Emotionality (r = -.10, *ns*) - Adventurousness (r = -.11, *ns*) - Intellect (r = -.21, *ns*) - Liberalism (r = -.31*)	Not investigated

*** $p < .001$. ** $p < .01$. * $p < .05$. *ns* refers to non-significance findings.

Note. The effect sizes in Onraet et al. (2011) article were corrected for dependency in the meta-analyses.

Table 4.1 cont.

Study Characteristics and the Effect Sizes Reported in the 17 Included Articles

Author(s)/ Year	Study Characteristics			Results	
	Country, Sampling population	Personality measure used	Outcome measure(s) used	Effect Sizes Reported (with indices of prejudice)	Effect Sizes Reported (with indices of social tolerance)
12. Roccas et al., 2002	Israel, College students, *n* = 246	NEO-PI-R (Costa and McCrae, 1992)	62-item Schwartz (1992) value inventory	Not investigated	• Universalism Value - Imagination ($r = .25^{**}$) - Artistic interests ($r = .43^{**}$) - Emotionality ($r = .11^{**}$) - Adventurousness ($r = .33^{**}$) - Intellect ($r = .30^{**}$) - Liberalism ($r = .30^{**}$)
13. Szeto et al., 2015	Canada, College students, *n* = 201	IPIP-120 (not disclosed in the study)	- A 27-item was developed and used to assess prejudice towards people with mental disorders - 12-item social distance questionnaire (Norman et al, 2008)	• Mental Disorder Prejudice - Imagination ($r = -.19^{**}$) - Artistic interests ($r = -.28^{**}$) - Emotionality ($r = -.33^{**}$) - Adventurousness ($r = -.14$, *ns*) - Intellect ($r = -.34^{**}$) - Liberalism ($r = -.30^{**}$)	Not investigated
14. Thompson et al., 2002	United States, College students, *n* = 106	NEO-PI-R (Costa and McCrae, 1992)	45-item Miville-Guzman Universality-Diversity Scale (Miville et al., 1999)	Not investigated	• UDO - Imagination ($r = .13$, *ns*) - Artistic interests ($r = .51^{**}$) - Emotionality ($r = .34^{**}$) - Adventurousness ($r = .38^{**}$) - Intellect ($r = .39^{**}$) - Liberalism ($r = .46^{**}$)
15. Unruh and McCord, 2010	United States121554., College students, *n* = 53	IPIP-M5 (McCord, 2002)	25-item Professional Beliefs About Diversity Scale (Pohlan and Aguilar, 1999)	Not investigated	• Diversity Belief - Imagination ($r = .22$, *ns*) - Artistic interests ($r = .29^{*}$) - Emotionality ($r = .35^{*}$) - Adventurousness ($r = .16$, ns) - Intellect ($r = .15$, ns) - Liberalism ($r = .47^{**}$)

*** $p < .001$. ** $p < .01$. * p v< .05. *ns* refers to non-significance findings.

Analyses

The methods used in this meta-analysis were based on established Cochrane guidelines (Deeks et al., 2022). A meta-analysis of correlations consists of the following steps: (a) determine the effect size statistic, (b) calculate the weighted average of the effect size reported by the included studies, (c) choose a modelling approach (i.e., fixed-effects or random-effects), (d) calculate the between-study variance, and (e) examine for study heterogeneity and publication bias to assess the robustness of findings (Deeks et al., 2022). In the sections, I detailed the steps used in the meta-analysis.

Effect Size. The effect sizes (i.e., Pearson *r*) of each study were first converted to *z* values using the Fisher's variance-stabilising *z* transformation of *r* (or Fisher's *r*-to-*z* transformation) as the *z* values of correlation were more likely to meet the normality assumption of meta-analytic models (Fisher, 1921; Rosnow & Rosenthal, 2009; Welz et al., 2022). For each of the $i = 1. \ldots, k$ included studies, the formula for transforming Pearson *r* to *z* values can be expressed as:

$$Z_{r_i} = \frac{1}{2} log_e \left(\frac{1+r_i}{1-r_i}\right) \quad (1)$$

where r_i is the Pearson *r* reported in the i^{th} study, and Z_{r_i} is the *z*-transformed effect size statistic for the i^{th} study (Field, 2005). Once the population effect size estimate and the confidence intervals had been obtained, the Fisher's *z* scores were converted to Pearson *r* for easier interpretation. The transformation back to r_i is expressed as:

$$r_i = \frac{e^{(2z_i)}-1}{e^{(2z_i)}+1} \quad (2)$$

where Z_i is the *z*-transformed effect size statistic for the i^{th} study (Field, 2005).

Calculate the Weighted Average of the Effect Sizes. The weighted average of the effect sizes and the corresponding confidence interval were then calculated using the Hedges-

Olkin-Vevea Fisher-*z* technique (Hafdahl & Williams, 2009). The weighted average, which estimates the true correlational effect between variables ($\hat{\rho}$), is defined as

$$weighted\ average\ (\bar{z}_\rho) = \frac{sum\ of\ (effect\ size\ statistic\ X\ weight)}{sum\ of\ weights} = \frac{\Sigma z_i W_i}{\Sigma W_i} \quad (3)$$

where z_i is the effect size statistic reported in the i^{th} study, W_i is the weight given to the i^{th} study, and the summation is across all included studies in the meta-analysis (Welz et al., 2022).

Choose Modelling approaches. The weights assigned to each effect size in Equation (3) depend on the modelling approach (Viechtbauer, 2010). Meta-analysis consists of two primary modelling approaches: the fixed-effect model (where all included studies were assumed to share the same population effect size) and the random-effects model (where included studies were assumed to hold different study-specific population effect sizes; Borenstein et al., 2010; Veroniki et al., 2016). This meta-analysis assumes that the included studies do not share the same population effect size as the included studies held very different methodologies (i.e., sample characteristics and measures used; Table 4.1). Instead, the effect sizes of included studies were treated as random samples from a distribution of population effect sizes (Riley et al., 2011). In this meta-analysis, random-effects meta-analytic models were used to calculate the mean of this distribution of population effect sizes (Borenstein et al., 2010). Accordingly, the weight of each effect size was determined by the inverse of the effect size's variance and the estimate of between-study variance (i.e., the variance of the distribution of population effect sizes; Veroniki et al., 2016). That is,

$$W_{i,RE} = {}^{1}/_{(v_i + \tau^2)} \quad (4)$$

where $W_{i,RE}$ is the weight given to the i^{th} study in the random-effects model, v_i is the within-study variance of the effect size in the i^{th} study, and τ^2 refers to the between-study variance.

Calculate Between-Study Variance. Throughout this meta-analysis, the between-study variance (τ^2) in Equation (4) was estimated using the restricted maximum likelihood

(REML)[11] technique, as per the recommendations of many researchers (e.g., Langan et al., 2019; Novianti et al., 2014; Veroniki et al., 2016; Viechtbauer, 2005). Because multiple effect sizes were sometimes taken from the same article (Table 4.1), the dependency of observations was corrected for these effect sizes, per the guidelines provided by Viechtbauer (2010). Specifically, effect sizes taken from the same article were assigned to the same random effect value in the meta-analytic models (Konstantopoulos, 2011).

Study Heterogeneity, Publication Bias, and Sensitivity Analyses. Two methods were used to examine for study heterogeneity: the Cochrane *Q* statistic and the I^2 statistic. The *Q* statistic tests the null hypothesis that all included studies shared the same population effect size (Quintana & Minami, 2006). The I^2 statistic examines the percentage of variability in the effect size estimate that is due to between-study differences, where a value of 25%, 50%, and 75% suggest low, moderate and high heterogeneity between studies, respectively (Higgins et al., 2003; Riley et al., 2011). Other analyses include (a) Egger's weighted regression method, which examines for publication bias among small sample meta-analyses (Egger et al., 1997), (b) the failsafe *N* test, which identifies the number of 'nonsignificant' studies that would be required to nullify the obtained effect size estimates (Rosenthal, 1979), and (c) Cook's distance and hat values which examine for outliers and provide influential case diagnostic (Viechtbauer & Cheung, 2010). Methods that identify sources of heterogeneity in a meta-analysis (e.g., subgroup analysis and meta-regression; Song et al., 2001) were not conducted due to the limited number of studies.

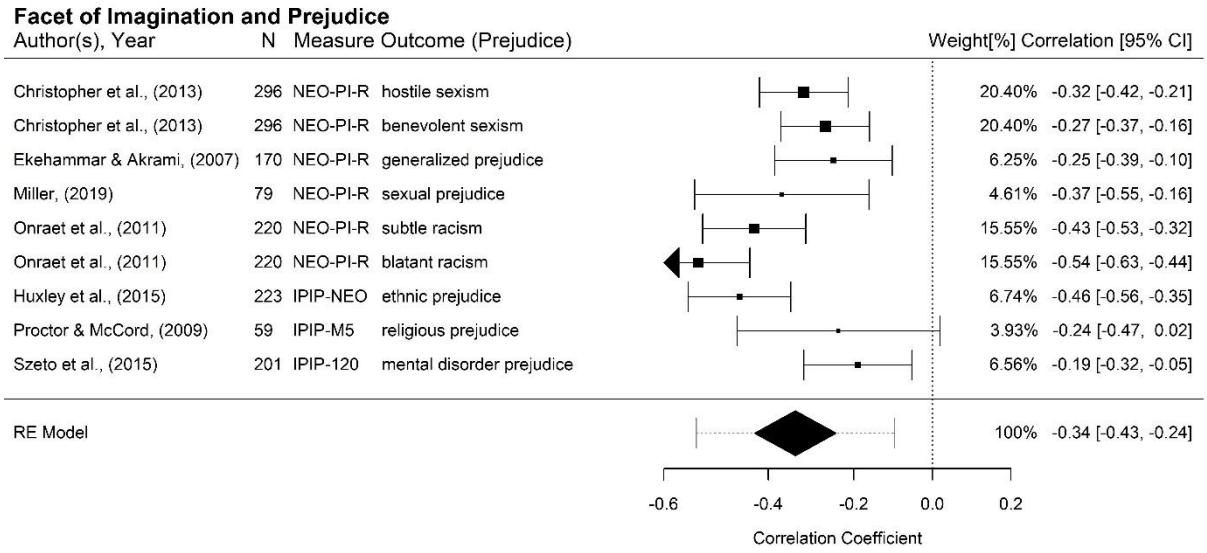
Presentation of Results. Taking reference from a non-technical primer (Quintana, 2015), all analyses were conducted using the *metafor* (Viechtbauer, 2010) and *robumeta* (Fisher & Tipton, 2015) packages for *R* (R Development Core Team, 2015). Forest plots

[11] For further details on REML, please refer to the work of Veroniki and colleagues (2016).

were created to present the effect size estimate of the six facets of openness with prejudice and social tolerance (Figures 4.1 and 4.2). Interpretations of the effect sizes were based on recent empirical benchmarks where $r < .15$ is small, $.15 < r < .35$ is medium, and $r > .35$ is large (Gignac & Szodorai, 2016). The variability of the aggregated effect sizes was presented via the 95% confidence intervals and the 95% prediction intervals. The confidence interval of the aggregated effect size, displayed as a polygon in Figures 4.1 and 4.2, suggests that the average population effect size has a 95% likelihood of falling within the reported range of values (Welz et al., 2022). On the other hand, the prediction interval, displayed as a dotted line extending from the polygon, provides the range of effect sizes across the population of studies (Riley et al., 2011).

Figure 4.1

Forest Plots for the Associations of Facets of Openness with Prejudice



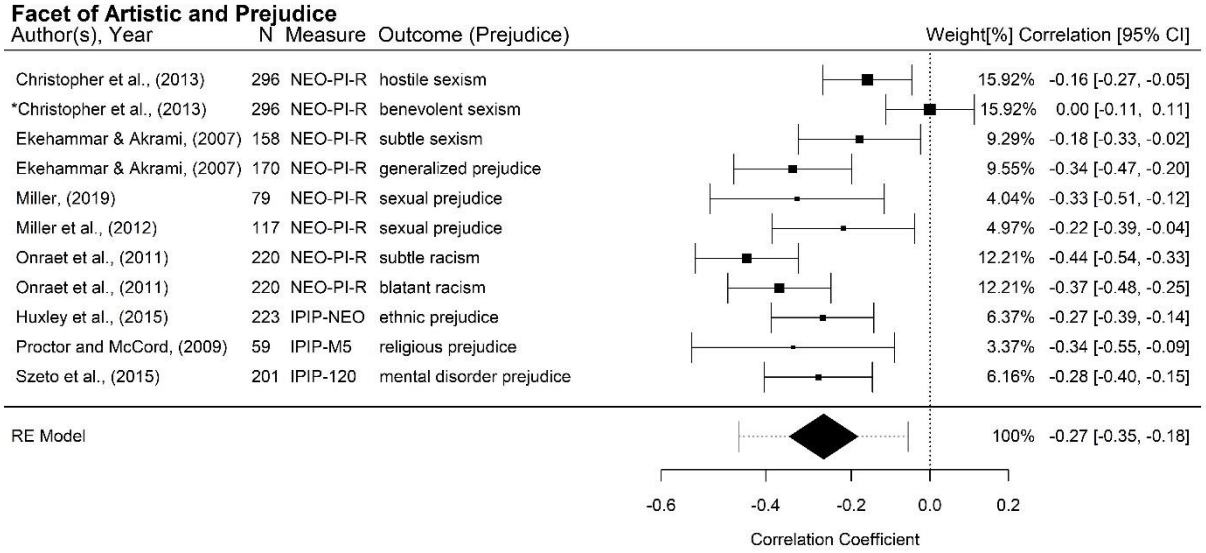


Figure 4.1 cont.

Forest Plots for the Associations of Facets of Openness with Prejudice

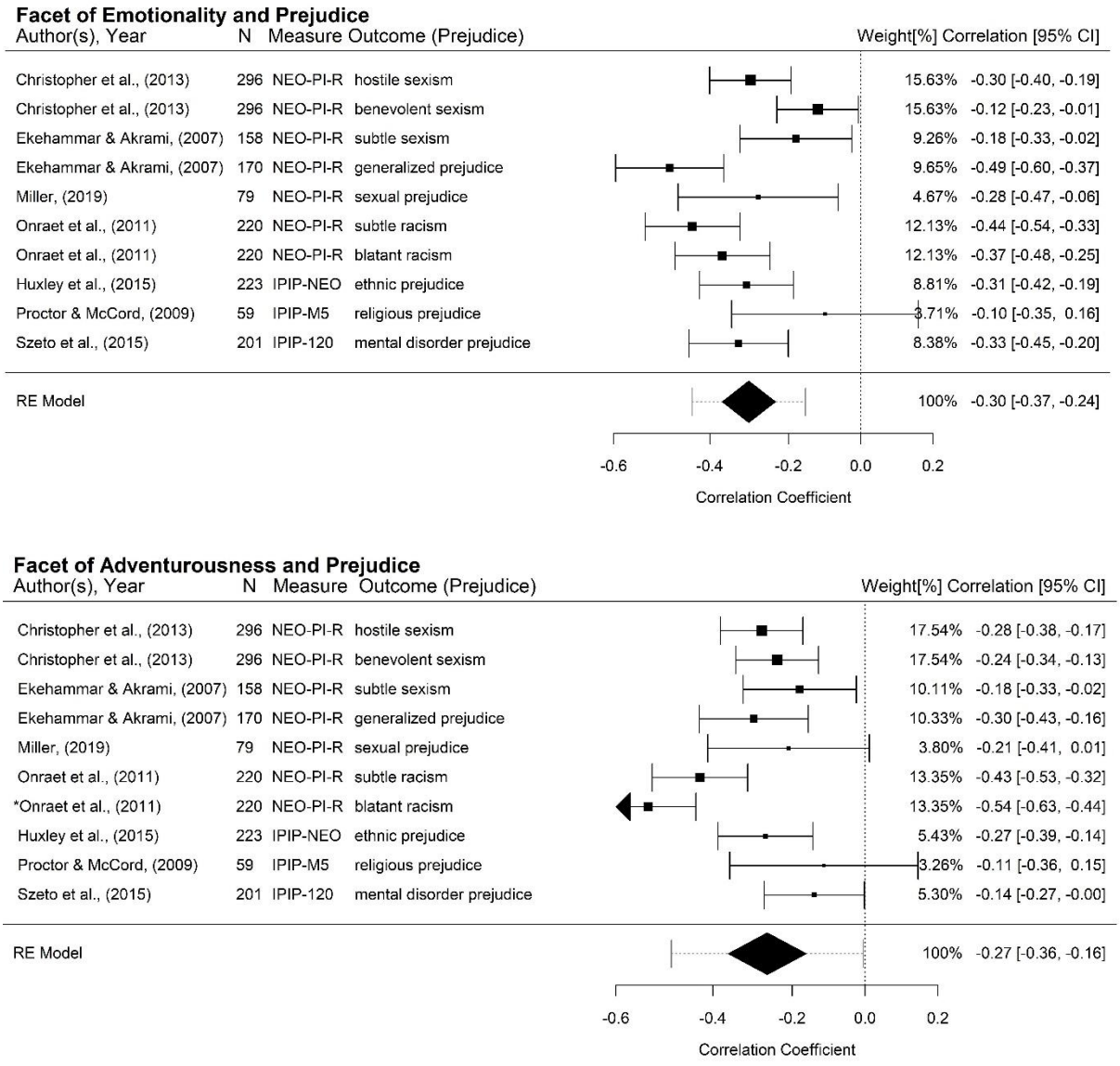
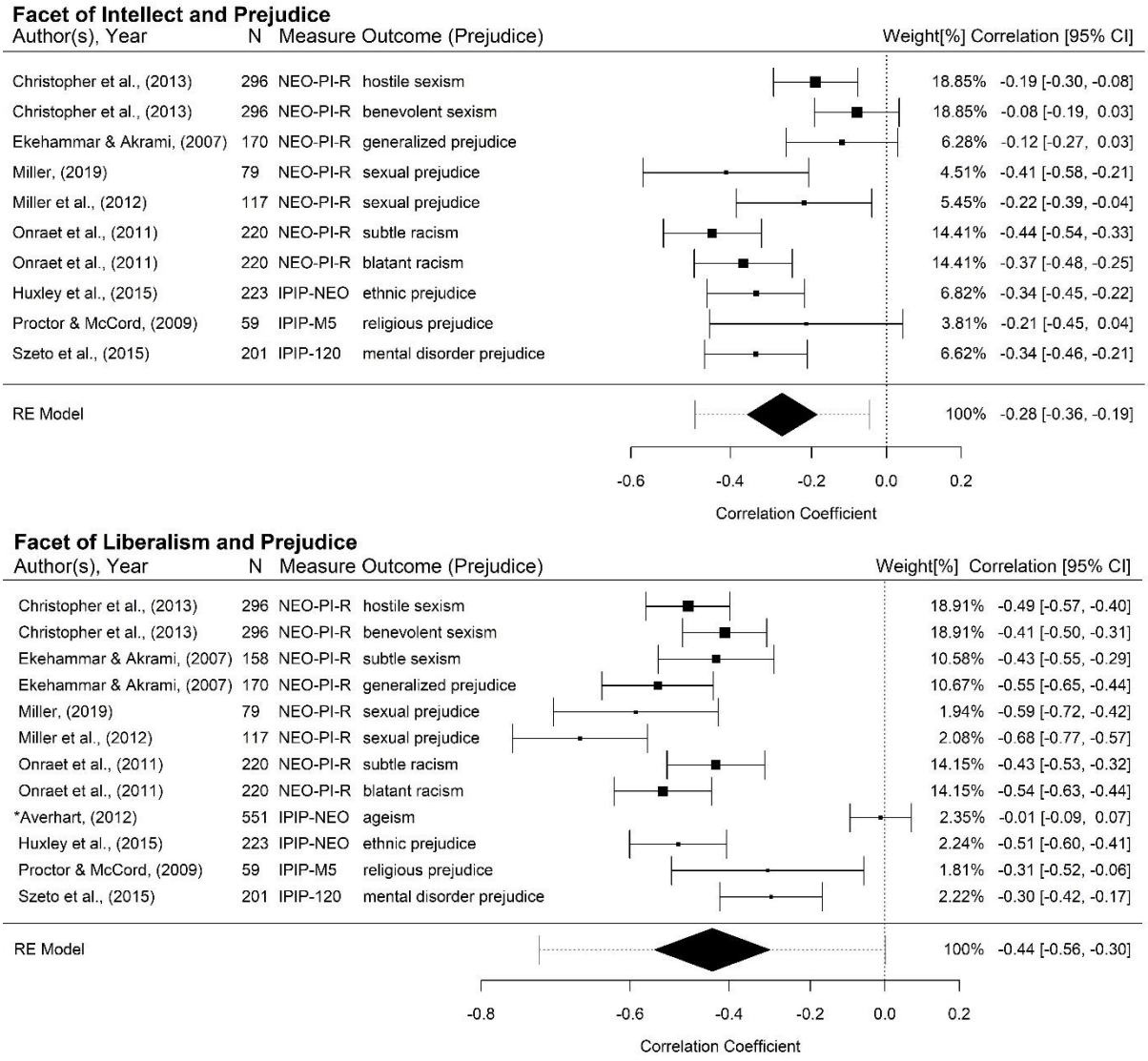


Figure 4.1 cont.

Forest Plots for the Associations of Facets of Openness with Prejudice



Note. The aggregated effect sizes are displayed as a polygon at the bottom of each plot with the width reflecting the 95% confidence interval of the average effect size estimate. The dotted line extending from the polygon reflects the 95% prediction interval which accounts for both the uncertainty of the effect size estimate and the uncertainty in the between study variance estimate (Riley, Higgins, and Deeks, 2011). Studies with larger squares contributed more to the summary effect sizes compared to the other studies. Studies with an asterisk (*) were potential outliers and influential cases as per Cook's distances and hat values for each model.

Figure 4.2

Forest Plots for the Associations of Facets of Openness with Social Tolerance

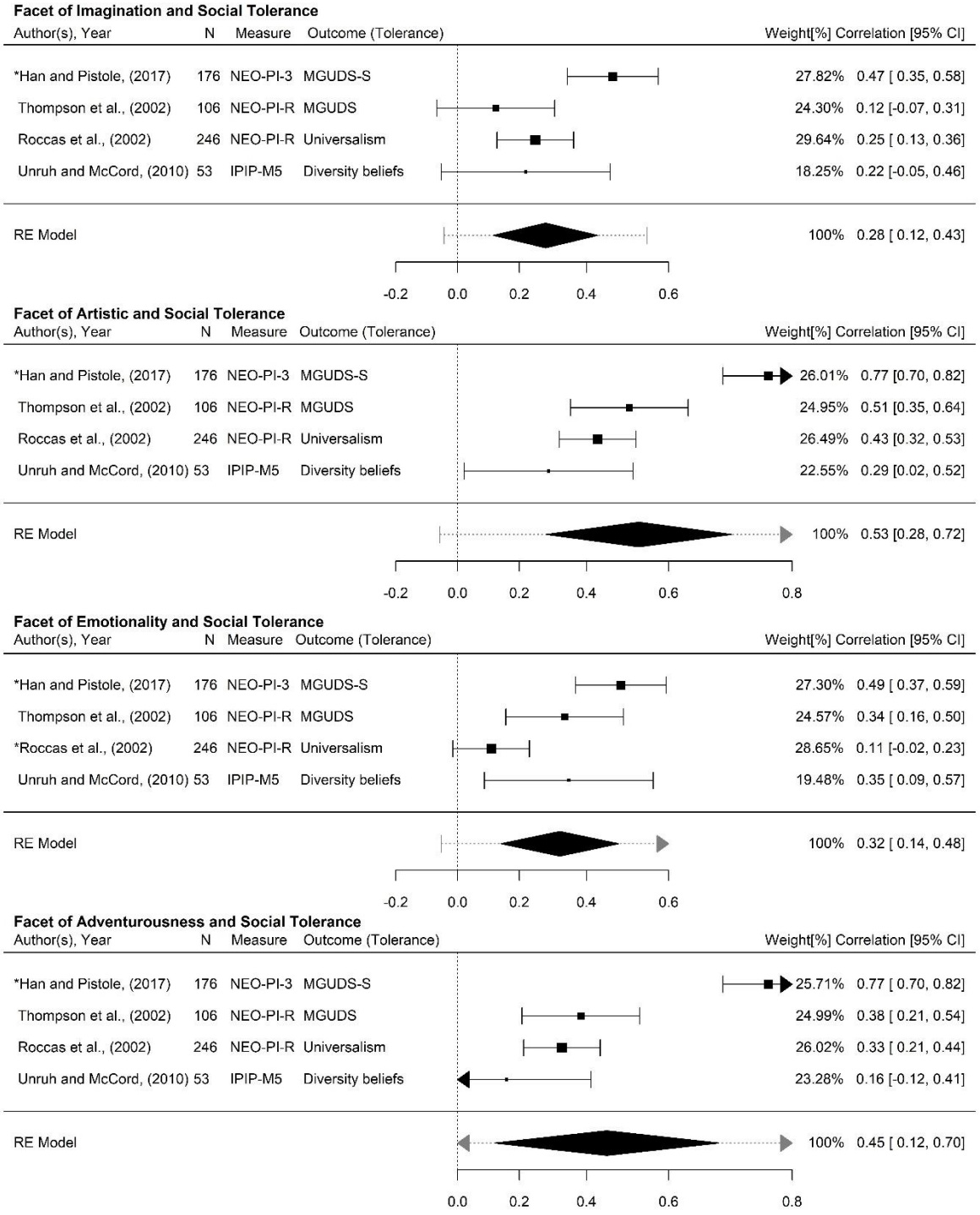
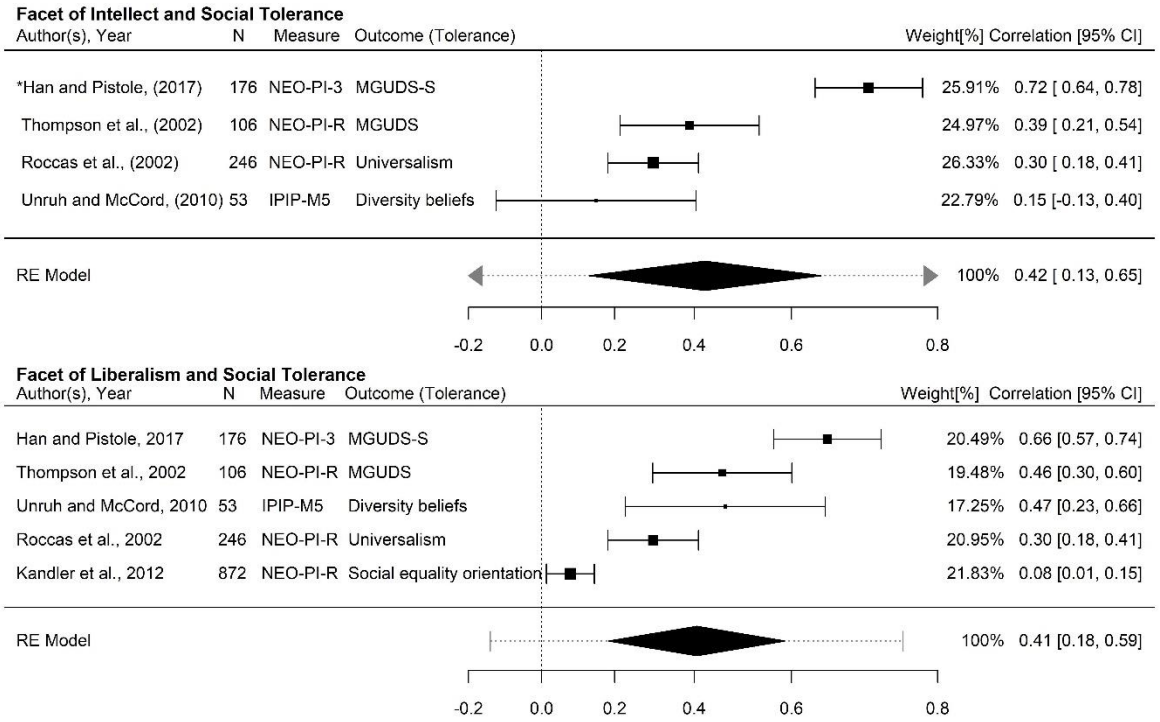


Figure 4.2 cont.

Forest Plots for the Associations of Facets of Openness with Social Tolerance



Note. The aggregated effect sizes are displayed as a polygon at the bottom of each plot with the width reflecting the 95% confidence interval of the average effect size estimate. The dotted line extending from the polygon reflects the 95% prediction interval which accounts for both the uncertainty of the effect size estimate and the uncertainty in the between study variance estimate (Riley et al., 2011). Studies with larger squares contributed more to the summary effect sizes compared to the other studies. Studies with an asterisk (*) were potential outliers and influential cases as per Cook's distances and hat values for each model.

Results

Results of Syntheses

Out of the six facets of openness examined, the facet of liberalism held the largest effect size estimate with prejudice (Figure 4.1), while the facet of artistic interests held the largest effect size with social tolerance (Figure 4.2). As the results have shown, all the facets of openness included in the NEO-PI-R/3 and the IPIP-based measures were significantly associated with prejudice and social tolerance. That is, the 95% confidence interval of the

aggregated correlations for all six facets excluded zero (Figures 4.1 and 4.2). However, as indicated by the wide prediction intervals, there was a large extent of unexplained heterogeneity among the included studies. Several facets of openness also reported prediction intervals including zero, suggesting that the correlations of the facets of openness and group attitudes may not always report significant results across study settings (Figures 4.1 and 4.2).

Study Heterogeneity

The heterogeneity of the effect sizes was assessed using the Q and I^2 statistics (Table 4.2). All Q statistics reached statistical significance, meaning that significant heterogeneity in the effect sizes of the included studies was observed. In other words, the facet-level associations of openness with prejudice and social tolerance do not share common effect sizes across study settings. Further highlighting the extent of study heterogeneity, the I^2 values found moderate to high heterogeneity among the included studies, where most of the variation (i.e., 48.90% - 94.45%; Table 4.2) observed in the meta-analytic effect sizes were due to systematic between-study differences (Higgins et al., 2003). Outliers and influential studies were also identified among the included studies (Figures 4.1 and 4.2). In sum, the wide prediction interval of effect sizes, the high study heterogeneity, the presence of outliers and influential cases, and the limited number of studies suggest that caution is warranted in generalising the meta-analysis findings.

Table 4.2

Heterogeneity Statistics for the Associations between Facets of Openness and the Two Outcome Variables (Prejudice and Social Tolerance)

Outcomes and facets	*k*	Between-group effect (*Q*)	% of total variance due to heterogeneity (I^2)	95% CI for I^2	
				LL	UL
Prejudice					
Imagination	9	29.57***	72.74	35.76	93.09
Artistic interests	11	39.74***	65.09	32.82	88.97
Emotionality	10	31.32***	48.90	5.15	86.57
Adventurousness	10	36.30***	74.25	40.87	93.38
Intellect	10	33.39***	68.99	34.16	91.01
Liberalism	12	141.51***	91.37	79.98	97.34
Tolerance					
Imagination	4	11.52**	73.47	16.61	97.94
Artistic interests	4	39.31***	91.85	73.93	99.42
Emotionality	4	18.84***	79.38	39.08	98.20
Adventurousness	4	58.40***	94.45	82.36	99.60
Intellect	4	44.46***	92.71	76.75	99.48
Liberalism	5	86.78***	93.63	81.82	99.18

*** $p < .001$. ** $p < .01$.

Publication Bias

Possible publication bias was assessed using Egger's (1997) regression test and Rosenthal's (1979) fail-safe *N* test to determine the validity of the aggregated effect sizes. Among all the meta-analysed models for prejudice, Egger's regression tests were not significant (i.e., imagination: $z = 0.49$, $p = 0.62$; artistic interests: $z = -0.69$, $p = 0.49$; emotionality: $z = 1.18$, $p = 0.24$; adventurousness: $z = 1.12$, $p = 0.26$; intellect: $z = -0.13$, $p = 0.89$; liberalism: $z = -0.72$, $p = 0.47$), meaning that there were no indication of publication bias. According to the fail-safe *N* test, a value five times greater than the number of included studies would suggest a lack of publication bias. The results of the fail-safe *N* tests were 729 (imagination), 536 (artistic interests), 645 (emotionality), 578 (adventurousness), 495 (intellect), and 2131 (liberalism), which all exceeded the criterion (i.e., 60), suggesting a lack of publication bias.

Similarly, there was no indication of publication bias among the meta-analysed models for social tolerance. Egger's regression tests of the models for social tolerance did not yield significant results (imagination: $z = -0.59$, $p = 0.55$; artistic interests: $z = -0.89$, $p = 0.38$; emotionality: $z = 0.39$, $p = 0.69$; adventurousness: $z = -.89$, $p = 0.37$; intellect: $z = -0.87$, $p = 0.39$; liberalism: $z = 1.16$, $p = 0.25$). The results of the fail-safe *N* tests were 64 (imagination), 295 (artistic interests), 79 (emotionality), 210 (adventurousness), 175 (intellect), and 251 (liberalism), which were all above the cut-off criterion (i.e., 25), and provided no evidence of publication bias.

Discussion

The primary objective of this meta-analysis was to obtain 12 meta-analytical estimates of the bivariate relationships between the six facets of openness (imagination, artistic interests, emotionality, adventurousness, intellect, and liberalism) and the two forms of group attitudes (prejudice and social tolerance). First, the meta-analysis shows that of the six facets

of openness examined, liberalism was the most strongly related to prejudice. This result is not surprising given that the facet of liberalism, which refers to individuals' willingness to re-examine social, political, cultural, and religious values (Costa & McCrae, 1992), has also been positively linked with dispositional perspective-taking (Miller, 2019) and negatively related with right-wing authoritarianism (Sibley & Duckitt, 2010). Therefore, it may be argued that the facet of liberalism protects an individual against prejudiced attitudes by enhancing the ability to adopt others' perspectives and resisting various forms of dogmatic and authoritarian attitudes. It is also worth mentioning that the remaining five facets of openness were moderately and negatively associated with prejudice. The results of this meta-analysis suggested that all facets of openness (notably, the six facets of openness examined in this meta-analysis) were influential predictors of predictors, though not equally important.

Second, the meta-analysis indicated that, of the six facets of openness examined, the facet of artistic interests was the most strongly related to social tolerance. In addition, the facets of artistic interests, intellect, and adventurousness were linked more strongly with social tolerance than prejudice. Specifically, these three facets were strongly correlated ($r > .35$) with social tolerance, but only moderately correlated ($-.35 < r < -.15$) with prejudice. The three facets (i.e., artistic interests, intellect, and adventurousness) represent an individual's sensitivity and receptiveness towards the external environment (Griffin & Hesketh, 2004), which may increase the motivation to shape pleasant intergroup interactions with diverse others. For instance, individuals high in the facet of artistic interests are attuned towards appreciating beauty in their environment (e.g., natural, physical, and social environment), individuals high in the facet of intellect are attuned to intellectual concepts (e.g., beliefs, worldviews, philosophy), and individuals high in the facet of adventurousness actively sought out new and unusual experiences (e.g., trying foreign foods, working in foreign countries, travelling to exotic locations; Albrecht et al., 2014). The sensitivity towards

the external environment and the receptiveness towards diverse experiences might influence social tolerance more than prejudice.

As is apparent from the significant *Q* statistic and the wide prediction interval, there was significant unexplained heterogeneity in the effect sizes reported in the included studies, meaning that the few studies investigating the associations between facets of openness and prejudice or social tolerance do not show entirely consistent findings. The discrepancies in the results from included studies were likely related to the variation in the types of outcome measures used (e.g., use of the original Miville Guzman Universality-Diversity scale or the short form version), the variation in the kinds of prejudice and social tolerance examined (e.g., racism, sexism, ethnic prejudice), or variation in the definition of the prejudice and social tolerance examined (e.g., sexism as hostile, benevolent, or subtle). Other differences include the different cultures in which the research was conducted, the different age groups represented in the samples, and the different openness measures used. For instance, the effect sizes may be higher (or lower) in studies that used community samples (versus college samples), in studies that used a NEO-PI variant of personality measure (versus non-NEO-PI variants), in studies that operationalised prejudice as racism (versus other types of prejudice), or in studies that operationalised social tolerance as social equality orientation (versus other types of social tolerance). In other words, there is still uncertainty over whether the effect size estimates of this meta-analysis can be replicated across study settings.

Due to the limited number of studies[12], methods that assess the relative impact of these potential sources of heterogeneity were not conducted. Notwithstanding, as per the law of large numbers, the small number of studies uncovered in this review contributed to the large variation around the aggregated effect size estimates and the high estimates of the

[12] A minimum of ten studies per examined covariate is recommended for meta-regression analyses (Geissbuhler et al., 2021).

heterogeneity of study effect size. Furthermore, the small number of studies, especially where no more than five studies examining social tolerance are available to meta-analyse, also means that caution is warranted in the interpretation of publication bias. That is, the small number of studies suggest that the tests for publication bias (i.e., Egger's weighted regression method and failsafe N test) may lack the statistical power to properly serve as sensitivity analyses for the potential impact of publication bias (Lin & Chu, 2017). More research in this area is needed for a more definite conclusion and future studies looking to summarise this area of research may consider conducting subgroup analysis, using study settings as potential moderators (such as the types of outcome measures and the types of openness measures), and examining how these moderators may affect the associations between facets of openness and prejudice and social tolerance.

Nevertheless, this random-effects meta-analysis found statistically significant associations across all models; that is, none of the 95% confidence intervals of the average effect size estimates across all six facets had contained zero. In other words, the relationships between the facets of openness and the two group attitudes are likely to be significant after controlling for study characteristics. From examining the literature, it is clear that more research using consistent, broad measures of prejudice (e.g., a generalised prejudice measure) and social tolerance (e.g., Miville Guzman Universality-Diversity scale) is needed to elucidate the relationship between the facets of openness with prejudice and social tolerance.

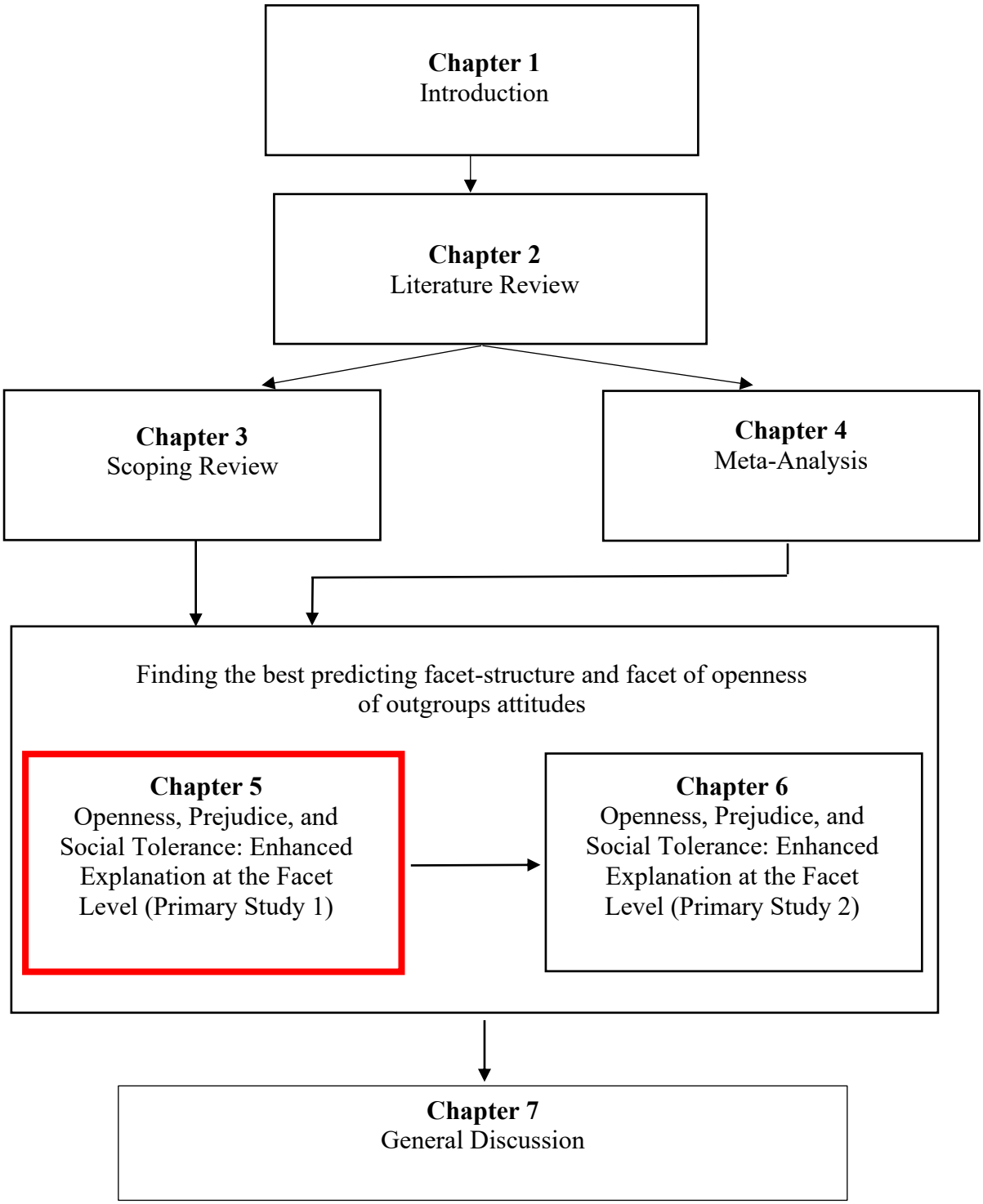
Limitations

The search strategy used in this meta-analysis had included various generic and specific terms for group attitudes (i.e., attitude, prejudice, discrimination, tolerance, diversity, and ideology) and openness (i.e., Big Five, five factor, openness, and intellect). Despite the broad search strategy, various terms for group attitudes (e.g., ethnocentrism, xenophobia,

xenophilia) and openness (e.g., culture, intellectance, and absorption) were left out in the search string, potentially leading to some relevant articles being excluded in this review.

Conclusion

Among the facets of openness examined in this meta-analysis, liberalism was the strongest predictor of prejudice, and artistic interest was the strongest predictor of social tolerance. These findings support the claim that prejudice and social tolerance are separate constructs with different causal predictors. However, results identified significant study heterogeneity, where the effect sizes vary substantially across study characteristics (e.g., sample demographics, outcome measures, and openness measures), suggesting that more studies are needed to examine the role of study characteristics (i.e., the outcome measures and openness measures used) in the relationship between facets of openness and group attitudes.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Literature Review
Chapter 3
Scoping Review
Chapter 4
Meta-Analysis
Finding the best predicting facet-structure and facet of openness of outgroups attitudes
Chapter 5
Openness, Prejudice, and Social Tolerance: Enhanced Explanation at the Facet Level (Primary Study 1)
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Openness, Prejudice, and Social Tolerance: Enhanced Explanation at the Facet Level (Primary Study 2)
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General Discussion

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Chapter 5

Openness, Prejudice, and Social Tolerance: Enhanced Explanation at the Facet Level (Primary Study 1)

D. X. Ng*, Patrick K. F. Lin, Nigel V. Marsh, and Jonathan E. Ramsay

School of Social and Health Sciences, James Cook University, Singapore

*Corresponding author:

Mr Da Xuan Ng

Email: da.ng@my.jcu.edu.au

Address: James Cook University, 149 Sims Drive, Singapore 387380

Statement of the Contribution of Others

Chapter 5 contributed to an in-preparation manuscript to the *Journal of Personality*. The manuscript was written with three co-authors, with the candidate as the primary author. The candidate's contribution to the work included the following:

- Research conception
- Methodology (i.e., candidate developed and designed research methodology)
- Software (i.e., candidate developed R code for analysis)
- Validation (i.e., candidate verified the overall reproducibility of results)
- Formal analysis (i.e., candidate analysed and synthesised study data)
- Investigation (i.e., candidate collected research data)
- Resources (i.e., candidate secured access to tools like RStudio, SPSS, and Excel)
- Data curation (i.e., candidate maintained research data throughout the research phase)
- Writing – Original draft
- Writing - Review & editing
- Visualisation
- Project administration
- Funding Acquisition (i.e., HDR MRF Competitive Pool Funding 2021; HDRCF202102).

The nature of the co-author contribution is listed below in order of authorship:

Co-author	Affiliation	Contribution
Dr Patrick Lin	James Cook University Singapore	Editorial support
Prof Nigel Marsh	James Cook University Singapore	Editorial support
A/Prof Jonathan Ramsay	James Cook University Singapore	Editorial support; Supervision

Declaration by co-authors

The undersigned hereby certify that:

- The above declaration correctly reflects the nature of the candidate's contribution to this work and the nature of the contribution of each of the co-authors.
- All authors have been included in the manuscript.

Signatures:

_____ _____

Dr Patrick Lin/ Date **Prof Nigel Marsh/ Date**

_____

A/Prof Jonathan Ramsay/ Date

Abstract

Openness is the Big Five personality factor that most consistently predicts group attitudes. Research gaps remain, including limited exploration of the relationships at a facet level, inadequate investigation of facet structures beyond the NEO-PI, absence of clear differentiation between prejudice and social tolerance, and heavy reliance on evidence primarily derived from the USA. This chapter presents results from an online survey examining three openness facet structures (IPIP-NEO, SFOS, and HEXACO-PI) to identify the facet structure and facet of openness that best predicts prejudice and social tolerance. Community samples were recruited from Singapore and the United States to determine whether results were consistent across cultures. Across cultures, multiple regression with dominance analyses indicated that the SFOS facet structure of openness and its constituent facet of tolerance were the best predictors of both social tolerance and prejudice. Cultural differences were also observed, where the facet structures of openness predicted social tolerance more strongly in Singapore but predicted prejudice more strongly in the United States. The hypothesised trends in the relationships between the facets of openness and group attitudes were partially supported. Limitations of the research design and implications of results were discussed.

Keywords: Openness to Experience[1], Prejudice[2], Tolerance[3], Facet[4], Culture[5]

Openness, Prejudice, and Social Tolerance: Enhanced Explanation at the Facet Level (Primary Study 1)

Introduction

Research has shown that not all facet structures of openness are the same (Schwaba et al., 2020) and that some facet structures of openness are more predictive of group attitudes than others (Anglim et al., 2020). As discussed in Chapter 3, current evidence on the relationship between openness and group attitudes has over-relied on the NEO-PI facet structure of openness, meaning that the predictive roles of other facet structures of openness have largely been neglected. Although studies have found NEO facet structures of openness (i.e., NEO-PI-R and IPIP-NEO) to be significantly predictive of group attitudes (Duckitt & Sibley, 2010; Blais-Rochette et al., 2022), there is ongoing debate as to the validity of the NEO facet structures of openness (i.e., De Raad et al., 2021), which means that the characteristics of openness (i.e., the facet structure and the underlying facets of openness) are still contested and that doubts remain as to whether the NEO facet structures of openness is fully representative of the openness trait. In other words, the current conclusion that "openness strongly predicts group attitudes" (i.e., Duckitt & Sibley, 2010; Blais-Rochette et al., 2022) might be more accurately construed as "the NEO facet structure of openness strongly predicts group attitudes". Primary studies should seek to compare the predictive role of different measures of openness and, by so doing, isolate the forms of openness (i.e., the facet structure and the facet of openness) that best explain group attitudes to establish a more definitive conclusion on the role of openness in group attitudes.

Despite the prominent role of openness in predicting prejudice and social tolerance (Blais-Rochette et al., 2022), research gaps remain, such as limited exploration of the relationships at a facet level (i.e., the scoping review from Chapter 3 uncovered only 17 relevant studies and most of the studies examined the NEO facet structures of openness),

absence of differentiation between prejudice and social tolerance (i.e., no examination of how the facets of openness relate differently to the two group attitude constructs), and a USA-centric evidence base (i.e., no studies were identified from major parts of Asia). This study aims to address the research gaps detailed in Chapter 2.

The Present Study

Although openness is defined as the disposition towards exploring novel situations (De Raad et al., 2021), measures like IPIP-NEO, SFOS, and HEXACO-PI operationalise openness as different facet structures and highlight different components of the openness construct (Christensen et al., 2019). For instance, the NEO-PI-R, and its open-access equivalent, the International Personality Item Pool (IPIP-NEO[13]; Goldberg, 1999), operationalise openness as a six-facet structure, focusing on facets that emphasise "variety-seeking" (Figure 5.1; Connelly et al., 2014a). In the IPIP-NEO, openness is interpreted as the tendency to engage with novel situations to see and experience the world in unusual ways (Costa & McCrae, 2009), where the facet of artistic interests represents the core facet of openness (John et al., 2008). On the other hand, the HEXACO-PI (Lee & Ashton, 2004) adopts a narrower interpretation of openness and excludes facets pertaining to religious and ideological beliefs (Lee et al., 2018). Particularly, HEXACO-PI uses a four-facet structure that emphasises "complex thinking" (Figure 5.1; Connelly et al., 2014a). In the HEXACO-PI, openness is interpreted as the tendency to engage with novel situations to learn, think, and imagine new possibilities (Lee et al., 2021), where the facet of unconventionality represents the core facet of openness. Woo and colleagues' (2014) Six Facet Openness Scale (SFOS) introduces a balanced mix of facets, blending "complex thinking" (i.e., intellectual efficiency, ingenuity, and curiosity) and "variety-seeking" (i.e., aesthetics, depth, and tolerance;

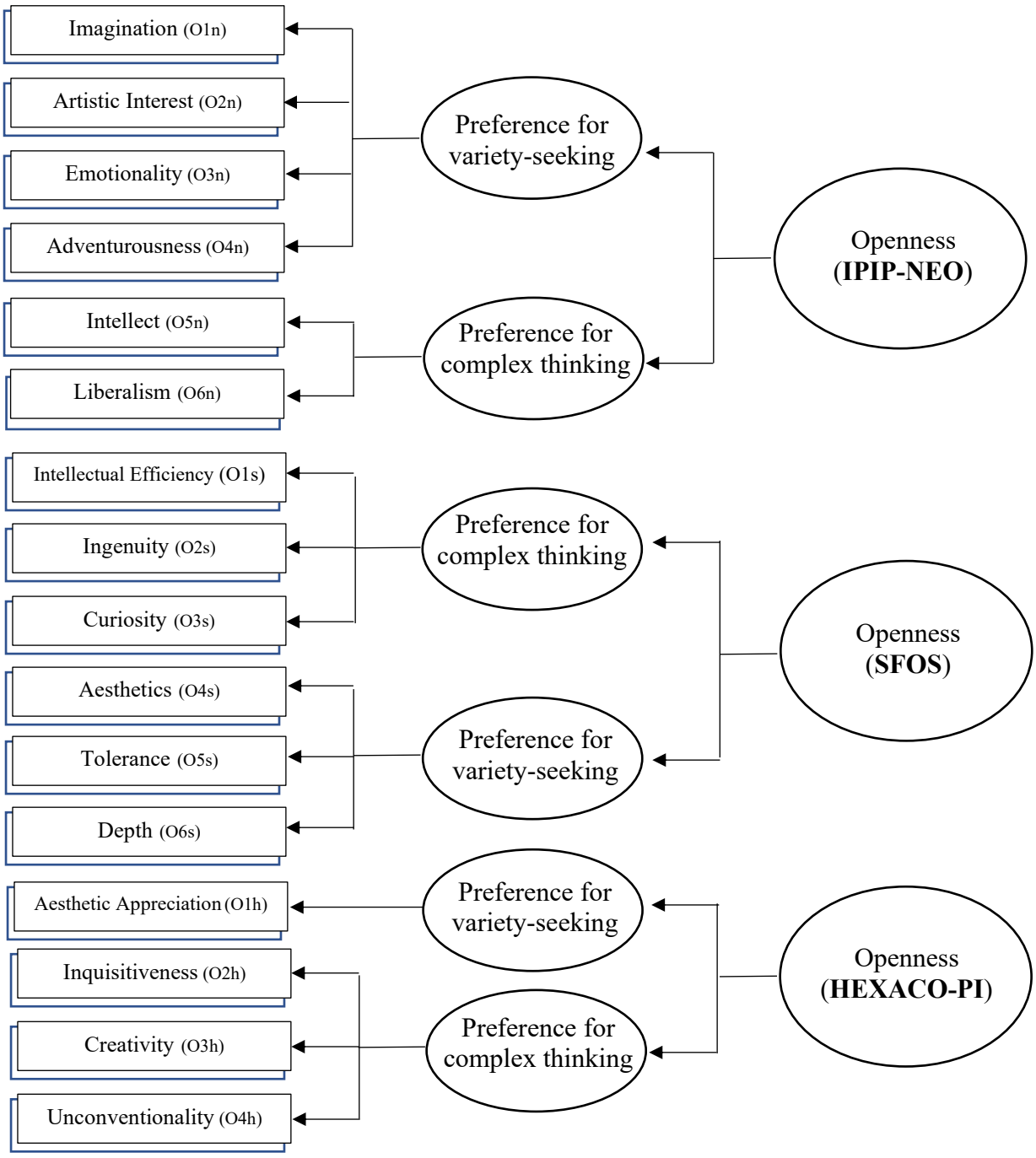
[13] References to either NEO-PI-R or IPIP-NEO will be referred to as simply IPIP-NEO for clarity. Accordingly, the facets of openness are named as per the IPIP-NEO terminology.

Connelly et al., 2014a; Figure 5.1). Openness, as operationalised in the SFOS, can be understood as the tendency to approach novel stimuli both as a form of encoded symbols (e.g., abstract ideas) and as an enriching experience (Woo et al., 2014). These three facet structures (Table 5.1) were recognised as indicative assessments of the openness construct and collectively best capture the diverse components that characterise openness (Christensen et al., 2019; Schwaba et al., 2020). To my best knowledge, no prior research has directly compared the predictive utility of these three facet structures of openness (IPIP-NEO, HEXACO, and SFOS) in relation to group attitudes with the aim of determining the facet structure and facet of openness that is most predictive of such attitudes.

In practice, the openness factor is operationalised by combining scores from the scales of its underlying facets (Ziegler & Backstrom, 2016). For example, the IPIP-NEO calculates the openness factor by averaging the scores from the scales corresponding to its six underlying facets (Figure 5.1). This approach presupposes that merging the scales of these facets into a unified factor scale enables the inference of a latent trait that explains the interconnected characteristics associated with those facets (McCrae & Sutin, 2018). However, the validity of personality factors as the latent common causes of underlying facets has been questioned (Mottus, 2016). Considering that the number of facets constrains the personality factor and may not comprehensively summarise all facets of openness (Ziegler & Backstrom, 2016), many psychologists advocate treating personality factors as merely descriptive variables or summary statistics that capture the emergent quality of a network of interconnected psychological attributes (i.e., the facet structure; Mottus & Allerhand, 2018), Instead of inferring a latent causal construct from personality facets, which can lead to circular reasoning (Baumert et al., 2017), the emphasis should be on specifying and understanding the predictive relationship of the personality trait with the relevant outcomes, avoiding attempts at causal inference (Yarkoni & Westfall, 2017).

Figure 5.1

Facets of Openness and Their Characteristics Across Different Facet Structures



Note. The classification of facets was based on the taxonomy outlined by Connelly et al. (2014a).

Table 5.1

Facet Structure and Facets of Openness in IPIP-NEO, HEXACO-PI, and SFOS

Openness facet	Description	Example item
IPIP-NEO		
Imagination (O1n)	Uses imagination to create an interesting inner world	"Have a vivid imagination"
Artistic Interests (O2n)	Appreciation of natural and artificial beauty	"See beauty in things that others might not notice"
Emotionality (O3n)	Awareness of one's inner feelings	"Experience my emotions intensely"
Adventurousness (O4n)	Eager to try new activities and experience new things	"Prefer variety to routine"
Intellect (O5n)	Willingness to consider new and unusual ideas	"Love to read challenging material"
Liberalism (O6n)	Readiness to challenge authority and reexamine values	"Believe that there is no absolute right or wrong"
SFOS		
Intellectual Efficiency (O1s)	Perceived efficiency in processing novel information	"I grasp scientific theories easily"
Ingenuity (O2s)	Preparedness to create intellectual knowledge	"I like coming up with imaginative plans"
Curiosity (O3s)	Attraction to novel intellectual ideas	"I love to do experiments and see the results"
Aesthetics (O4s)	Appreciation of various forms of art	"I see the beauty in art when others do not"
Tolerance (O5s)	Interest in learning about different culture, customs and traditions	"I like to hear different people's views on political issues"
Depth (O6s)	Desire to gain insights, to improve, and self-actualize	"I take the time to reflect on my thoughts and actions"
HEXACO-PI		
Aesthetic appreciation (O1h)	Appreciation of beauty in arts and nature	"I can spend a long time studying a painting that I like"
Inquisitiveness (O2h)	Eager to experience all aspects of nature and human world	"I enjoy looking at maps of different places."
Creativity (O3h)	Preference for originality and innovative	"I would enjoy creating a work of art."
Unconventionality (O4h)	Willingness to accept the unusual	"I like hearing about opinions that are very different from those of most people."

The present study sought to understand the complex relationship between openness and group attitudes. Specifically, this study compared the predictive utility of three different facet-level structures and operationalisations of openness (IPIP-NEO, HEXACO, and SFOS) with respect to prejudice and social tolerance. This investigation sought to identify which overall facet structure and specific facets of openness were most strongly associated with these group attitudes. Moreover, the study adopted a cross-cultural approach by comparing research findings in different cultural contexts, namely Singapore and the United States. Importantly, this study treated prejudice and social tolerance as distinct constructs and explored how these constructs related differently to the openness trait. This study contributes towards a deeper understanding of the complex relationship between openness and group attitudes.

Hypotheses

Firstly, given that prejudice has been linked to a tendency for conformity (Gollwitzer et al., 2017) and an aversion to embracing diverse emotions (Makwana et al., 2021), we hypothesised that the IPIP-NEO facet structure of openness, emphasising the variety-seeking aspect of openness (Figure 5.1), would explain the most variance in prejudice. This expectation aligns with the idea that a proclivity for conformity and resistance to diverse experiences may be key factors driving prejudice (Duckitt & Sibley, 2010). Secondly, I expected that the SFOS facet structure of openness, which equally emphasises openness's complex-thinking and variety-seeking aspects (Figure 5.1), would account for the most variance in social tolerance. The extant literature suggests that social tolerance is a direct result of learning (Côté & Erickson, 2009) and reflects both an individual's abstract thinking capability (Van Zalk & Kerr, 2014; Miklikowska, 2015) and empathic reasoning skills (Brenick et al., 2019). As such, a balanced emphasis on complex thinking and variety-seeking should predispose someone towards social tolerance.

Hypothesis 1: IPIP-NEO accounts for the most variance in prejudice.

Hypothesis 2: SFOS accounts for the most variance in social tolerance.

Thirdly, I expected that some facets of openness would be more strongly correlated with prejudice and social tolerance than others. According to the results of my meta-analysis (Ng et al., 2021; see Chapter 4), the IPIP-NEO facets of imagination (O1n), emotionality (O3n), and liberalism (O6n) are moderately correlated ($.15 < r < .35$) with prejudice. Based on this finding, I hypothesised that the three IPIP-NEO facets of openness and the SFOS and HEXACO-PI facets of similar themes (Table 5.2) would exhibit moderate correlations with prejudice in this study. The same review (Chapter 4) found all facets of openness, except imagination (O1n), in the IPIP-NEO facet structure to be moderately correlated with social tolerance (Ng et al., 2021). As such, I hypothesised that all facets within the IPIP-NEO, SFOS, and HEXACO facet structure of openness, except those facets associated with the theme of imagination, would demonstrate at least moderate correlations with social tolerance in this study.

Hypothesis 3: Prejudice is moderately correlated with the facets of imagination (O1n), emotionality (O3n), liberalism (O6n), ingenuity (O2s), tolerance (O5s), and creativity (O3h).

Hypothesis 4: Social tolerance is moderately correlated with the facets of artistic interest (O2n), emotionality (O3n), adventurousness (O4n), intellect (O5n), liberalism (O6n), intellectual efficiency (O1s), curiosity (O3s), aesthetics (O4s), tolerance (O5s), depth (O6s), aesthetic appreciation (O1h), inquisitiveness (O2h), and unconventionality (O4h).

Table 5.2

Themes of Facets as Identified in Christensen et al (2019)

Themes	Facet Structure		
	IPIP-NEO	SFOS	HEXACO
Imaginative	Imagination (O1n)	Ingenuity (O2s)	Creativity (O3h)
Aesthetic Appreciation	Artistic Interest (O2n)	Aesthetic (O4s)	Aesthetic Appreciation (O1h)
Openness to Emotions	Emotionality (O3n)	-	-
Variety Seeking	Adventurousness (O4n)	-	-
Intellectual Curiosity	Intellect (O5n)	Curiosity (O3s)	-
Inclusivity	Liberalism (O6n)	Tolerance (O5s)	-
Self-assessed Intelligence	-	Intellectual Efficiency (O1s)	-
Intellectual Interests	-	Depth (O6s)	Inquisitiveness (O2h)
			Unconventionality (O4h)

Lastly, the link between openness and group attitudes has been found to be stronger in Western cultures than in non-Western cultures (Alper & Yilmaz, 2019). It has been argued that Western culture promotes the free expression of thoughts, allowing personality dispositions to develop into corresponding attitudes and behaviours (Fatke, 2017). In contrast, Asian cultures are more conservative (Beugelsdijk & Welzel, 2018) and may suppress this personality disposition from expressing its corresponding attitudes and behaviours. As such, I hypothesised that the associations between the facets of openness and the two group attitudes (prejudice and social tolerance) would be stronger in the United States than in Singapore.

Hypothesis 5: The variance of prejudice and social tolerance accounted for by facets of openness are higher in the United States sample than in the Singapore sample.

Method

Participants

As this is the first study examining the comparative predictive utilities of the three facet structures of openness, I chose a slightly conservative effect size (R^2 = 0.14) for the a priori power analyses [i.e., *F* test – Multiple Regression omnibus (R^2 deviation from zero)], taking into account that previous research (i.e., Anglim et al., 2019; Ekehammar & Akrami, 2007; Han & Pistole, 2017; Miller, 2019) reported R^2 ranging between 0.04 - .48 for these facet structures of openness in the prediction of group attitudes. G*Power (Faul et al., 2009) recommended a minimum sample size of 137 for a multiple regression model with six predictors (α error = 0.05, power = 0.95).

The recruited sample comprised 155 Singapore residents (86 female and 69 male) with a mean age of 39.53 (*SD* = 12.78, range = 18 – 72 years) and 163 United States residents (130 female and 29 male) with a mean age of 44.42 (*SD* = 17.00, range = 18 – 85 years). Using sensitivity power analyses [i.e., F test – Multiple Regression omnibus (R^2 deviation

from zero)] in G*Power, I found that the smallest effect size (R^2) I could detect at 95% power (α = .05) would be 0.12 for 155 participants and 0.11 for 163 participants. Post hoc analyses (i.e., Exact test for Correlations – Difference from constant) also revealed that the sample size recruited from Singapore and the United States provided 94.5% and 95.5% power for detecting a correlation of r = .15 (two-tailed test, α = .05, ρ = .42).

Measures

Self-report measures were administered to examine the three key psychological constructs: facets of openness, prejudice, and social tolerance. All measures used in this study are available in Appendix I.

Measures of Facets of Openness. Facets of openness were assessed using three measures (IPIP-NEO, SFOS, and HEXACO-PI). These measures have previously been reported to show measurement invariance across cultures (McCrae et al., 2005; Lee et al., 2018; Woo et al., 2014). The 60-item IPIP-NEO (Goldberg, 1999) openness scale measures six facets of openness with ten items per facet, the 54-item SFOS (Woo et al., 2014) measures six facets of openness with nine items per facet, and the 32-item HEXACO-PI (Lee & Ashton, 2004) openness subscale measures four facets of openness with eight items per facet (Table 5.1). Items for all three measures (IPIP-NEO, SFOS, and HEXACO-PI) were scored on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), where higher scores indicate a higher disposition to the facets of openness. Reliability indices of internal consistency for the facets of openness ranged from .33 to .87, where 23 (72%) of the reliability indices were above .70 (Table 5.3). All nine (28%) reliability indices of less than .70 came from the Singapore sample.

Table 5.3

Descriptive Statistics for Facets of Openness, Prejudice, and Social Tolerance (Study 1)

Facets of Openness	Singapore (*n* = 155)			United States (*n* = 163)			Overall (*n* = 318)		
	Alpha	Mean	*SD*	Alpha	Mean	*SD*	Alpha	Mean	*SD*
IPIP_Openness	.88	3.23	0.36	.91	3.48	0.46	.91	3.36	0.43
Imagination (O1n)	.63	3.33	0.52	.80	3.65	0.69	.75	3.49	0.63
Artistic Interests (O2n)	.82	3.47	0.68	.79	3.95	0.65	.83	3.71	0.70
Emotionality (O3n)	.58	3.33	0.47	.75	3.66	0.64	.71	3.50	0.58
Adventurousness (O4n)	.67	3.26	0.52	.76	3.29	0.59	.72	3.28	0.56
Intellect (O5n)	.78	3.18	0.60	.82	3.51	0.70	.81	3.35	0.67
Liberalism (O6n)	.33	2.84	0.39	.72	2.83	0.66	.61	2.83	0.54
SFOS_Openness	.92	3.29	0.42	.94	3.51	0.51	.93	3.40	0.48
Intellectual Efficiency (O1s)	.70	3.04	0.53	.83	3.21	0.68	.78	3.12	0.62
Ingenuity (O2s)	.80	3.25	0.61	.80	3.46	0.67	.80	3.36	0.65
Curiosity (O3s)	.69	3.55	0.52	.77	3.74	0.63	.75	3.65	0.59
Aesthetics (O4s)	.83	3.18	0.69	.87	3.58	0.81	.86	3.39	0.78

Tolerance (O5s)	.61	3.43	0.48	.71	3.59	0.56	.67	3.51	0.53
Depth (O6s)	.44	3.30	0.38	.78	3.46	0.62	.69	3.38	0.52
HEX_Openness	.86	3.21	.45	.89	3.42	0.54	.88	3.32	0.51
Aesthetic Appreciation (O1h)	.73	3.18	0.64	.74	3.59	0.67	.75	3.39	0.69
Inquisitiveness (O2h)	.76	3.34	0.64	.79	3.41	0.74	.77	3.38	0.69
Creativity (O3h)	.68	3.14	0.57	.77	3.29	0.72	.74	3.22	0.66
Unconventionality (O4h)	.50	3.19	0.46	.71	3.39	0.60	.64	3.30	0.55
Prejudice	.94	47.52	23.24	.93	32.83	22.32	.94	39.99	23.90
Social Tolerance	.86	4.00	0.61	.85	4.02	0.65	.85	4.01	0.63

Measure of Prejudice. Generalised prejudice was measured using a feeling thermometer scale, a common practice in the literature (e.g., Asbrock et al., 2010). Specifically, participants were asked to rate how warm their feelings were towards fifteen culturally relevant target groups, which differed for the Singapore and United States[14] samples. Target groups include gender/gender identity, race/ethnicity, religious affiliation, sexual orientation, and nationality/citizenship. Responses ranged from 0 (*very cold or unfavourable feeling*) to 100 (*very warm or favourable feeling*). All responses were reverse scored, where high scores indicated high levels of prejudice. Reliability coefficients were high, with Cronbach's alphas of .96 (Singapore) and .95 (United States; Table 5.3).

Measure of Social Tolerance. Social tolerance was measured using the 8-item self-report scale developed by Hjerm and colleagues (2020). Items include: "I respect other people's opinions even when I do not agree" and "Society benefits from a diversity of traditions and lifestyles". The 8-item tolerance measure was scored on a five-point Likert scale from 1 (*completely disagree*) to 5 (*completely agree*), where high scores indicate high levels of social tolerance. Cronbach alphas were .86 (Singapore) and .85 (United States; Table 5.3).

Response Quality and Demographic Items. Following the recommendations of Meade and Craig (2012), two self-reported response quality items ("Do you commit to providing your thoughtful and honest answers to the questions in this survey?" and "You will receive credit for this study no matter what, however, in your honest opinion, should we use your data in our analyses in this study?") were used where participants who indicated "no"

[14] A total of nineteen target groups were examined in the samples from Singapore and the United States, with distinct sets of groups analysed in each location. The final analyses focused exclusively on marginalised groups related to race, gender identity, and sexual orientation. In the Singaporean sample, the analysis included the following ten target groups: Singaporean Malay, Singaporean Indian, Indian immigrants, Filipino immigrants, Hindus, Muslims, lesbian women, gay men, transgender women, and transgender men. In the United States sample, the analysis included the following ten target groups: African Americans, Asian Americans, Latino Americans, Chinese immigrants, Latino immigrants, Muslims, lesbian women, gay men, transgender women, and transgender men.

for these two items were removed from analyses. Other demographic variables were also measured, such as religion, race, age, gender, educational level, and residential status (Appendix I).

Procedures

The hypotheses and research methodology were preregistered before data collection (https://osf.io/mzk9n). A commercial research panel provider (i.e., Qualtrics) recruited participants from Singapore and the United States following approval by the James Cook University Singapore Human Research Ethics Committee (H8484; Appendix F). All potential participants read the information sheet, and only those who gave consent to the study and clicked on a checkbox could complete the online survey. Quota sampling was used, with the age and educational background quotas set based on the 2020 population census in Singapore (Singapore Department of Statistics, 2020) and the United States (data.census.gov). Inclusion criteria were residence of the country examined (Singapore or the United States) and being at least 18 years of age. Data quality issues (i.e., speeding, inattentiveness, inconsistent answers, duplications, and bot responding) were automatically screened and removed by the panel provider. Nine out of 164 (5%) responses from the Singapore sample and eight out of 171 (5%) responses from the United States sample were removed for failing the two response quality items.

Data Analysis

All analyses were conducted using the *psych* (Revelle, 2022) and *relaimpo* (Grömping, 2006) packages in *R* (R Development Core Team, 2015). Raw data and the *R* codes are available at https://osf.io/r7qtf/. The pre-registered data analysis plan (https://osf.io/mzk9n) include the generation of 12 multiple regression models (i.e., two cultures X three openness measures X two group attitudes) and the adjusted R^2 of the model would indicate which of the three facet structures of openness best predicted prejudice and

social tolerance. For the validation of hypotheses three and four, Pearson bivariate correlations were conducted using the false discovery rate method to control for false-positive results arising from multiple comparisons (Jones et al., 2008). Interpretations of the effect sizes were based on recent empirical benchmarks where $r < .15$ is small, $.15 < r < .35$ is medium, and $r > .35$ is large (Gignac & Szodorai, 2016).

Dominance weight analyses[15] (Tonidandel & LeBreton, 2011) were also conducted to determine the relative importance of facets of openness within each of the three openness measures. Dominance weight analysis is a type of multiple regression interpretation technique that partitions the overall R^2 and assigns an unweighted average of explained variance to each predictor within the multiple regression model (Tonidandel & LeBreton, 2011). The predictor determined to hold 'dominance' over the rest of the predictors would be assigned with the highest explained variance in the model (Azen & Budescu, 2003). The reason for using dominance weight analysis to assess for relative importance is because this method is less sensitive to multicollinearity (i.e., produces results that are consistent and not sample specific; Kraha et al., 2012). It is to note that dominance weight analysis is regarded as the analysis of choice for the investigation of rank order relations (Stadler et al., 2017). Typical multivariate coefficients (i.e., beta coefficient or semi-partial correlations) can be problematic as these measures fail to properly partition variance to the different predictors, often discount the contribution of the least important predictors, and tend to overemphasise predictors that hold the most unique contribution in the regression model (Stadler et al., 2017). In this thesis, the results of dominance weight analyses were used to compare the rank-order relations of facets of openness and group attitudes between the two cultures to address hypothesis five.

[15] Dominance analyses were conducted using the LMG method developed by Lindeman, Merenda, and Gold (1980, as cited in Grömping, 2007), a default method generally used in dominance analyses (Grömping, 2006).

Post-hoc analyses were also conducted to draw direct comparisons across cultures, where cultural group was examined as a moderator via moderated multiple regression, to determine whether the relations between facet structure of openness and group attitudes differ significantly between the two cultural groups. Hierarchical multiple regression modeling was conducted, where the three facet structures of openness and culture (0 = United States, 1 = Singapore) were included as independent variables in model 1, and the interaction terms (i.e., CultureXIPIP_Openness, CultureXSFOS_Openness, and CultureXHEX_Openness) were added in Model 2. Post hoc analysis (Multiple Regression: Special R^2 increase) revealed that the sample size recruited in this study (i.e., 318) has a power of .93 in detecting a R^2 change of 0.05 (α = .05, numerator = 3, number of predictors = 7).

Hierarchical multiple regression models with all 16 facets of openness and the related interaction terms as predictors for both group attitudes were also included to examine the moderating role of culture on the relations between facets of openness and group attitudes. However, it is emphasized that post hoc analysis revealed that the sample size recruited in this study (i.e., 318) only has a power of .67 in detecting a R^2 change of 0.05 (α = .05, numerator = 16, number of predictors = 33).

Results

Facet Structure of Openness and Group Attitudes

Table 5.4 shows the total variance in prejudice (i.e., adjusted *R* square) explained by each facet structures (IPIP-NEO, SFOS, HEXACO-PI), the bivariate correlations between the facets of openness and group attitudes, as well as the dominance weight of the facets of openness within each facet structures for the two cultures examined. When it comes to predicting prejudice, post hoc dominance analyses revealed that SFOS and IPIP-NEO were equivalent in terms of predictive utility (Table 5.5). In addition, post-hoc analyses using

moderated regression analyses failed to find any significant interaction between culture and the facet structures of openness in the prediction of prejudice (Table 5.5).

Table 5.6 presents the variance in social tolerance (i.e., adjusted *R* square) explained by the facet structures (IPIP-NEO, SFOS, HEXACO-PI), the bivariate correlations between the facets of openness and group attitudes, as well as the dominance weight assigned to each of the facets of openness. When it comes to predicting social tolerance, post hoc dominance analyses revealed that SFOS and IPIP-NEO were equivalent in terms of predictive utility (Table 5.7). In addition, post-hoc analyses using moderated regression analyses failed to find any significant interaction between culture and the facet structures of openness in the prediction of social tolerance (Table 5.7).

Table 5.4

Univariate and Multivariate Coefficients and Dominance Weight Analysis Results for Prejudice

Measures	Prejudice							
	Singapore				United States			
	r	*β*	D. W.	Rank Order	*r*	*β*	D. W.	Rank Order
IPIP								
Imagination (O1n)	-.12	0.02	<.01	5	-.30***	-0.10	.03	3
Artistic Interests (O2n)	-.26**	-0.03	.02	2	-.37***	-0.20*	.06	2
Emotionality (O3n)	-.19*	-0.08	.01	3	-.30***	-0.05	.03	4
Adventurousness (O4n)	-.19*	-0.02	.01	4	-.26**	-0.02	.02	6
Intellect (O5n)	-.30**	-0.24*	.05	1	-.29***	-0.02	.02	5
Liberalism (O6n)	.02	0.02	<.01	6	-.37***	-0.29***	.06	1
			_R_ Square = .01 ≤ R^2 ≤ .18				**_R_ Square** = .13 ≤ R^2 ≤ .35	
SFOS								
Intellectual Efficiency (O1s)	-.18*	-0.11	.01	5	-.10	0.10	.01	6
Ingenuity (O2s)	-.20*	0.08	.01	6	-.27***	0.02	.01	5

Curiosity (O3s)	-.23**	0.09	.01	4	-.34***	-0.05	.03	4
Aesthetics (O4s)	-.28**	-0.10	.03	3	-.36***	-0.10	.04	3
Tolerance (O5s)	-.38***	-0.35***	.08	1	-.48***	-0.36***	.11	1
Depth (O6s)	-.33***	-0.10	.04	2	-.41***	-0.14	.05	2
			***R* Square** = .08 ≤ R^2 ≤ .28				***R* Square** = .16 ≤ R^2 ≤ .38	
HEXACO								
Aesthetic Appreciation (O1h)	-.22*	-0.21	.03	1	-.39***	-0.23*	.07	1
Inquisitiveness (O2h)	-.19*	-0.06	.02	2	-.33***	-0.10	.04	2
Creativity (O3h)	-.04	0.14	.01	3	-.26**	-0.02	.02	4
Unconventionality (O4h)	-.13	-0.09	.01	4	-.32***	-0.15	.04	3
			***R* Square** = .01 ≤ R^2 ≤ .13				***R* Square** = .07 ≤ R^2 ≤ .27	

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$. D. W. refers to dominant weight coefficients. Note. The p-values for all bivariate correlations were corrected for multiple comparisons using the Benjamini-Hochberg procedure.

Table 5.5

Moderated Regression Analyses with Culture as a Moderator (Prejudice)

Independent Variables	Prejudice				
	R^2	ΔR^2	Univariate *r*	β	VIF
MODEL 1	.24	.24			
1. IPIP_Openness			-.42**	-.21*	3.30
2. SFOS_Openness			-.42**	-.25**	3.77
3. HEX_Openness			-.34**	.06	3.11
4. Culture			.31**	.20***	1.09
MODEL 2	.25	.01(*ns*)			
5. CultureXIPIP_Openness			-.25**	.10	5.15
6. CultureXSFOS_Openness			-.18**	.15	4.99
7. CultureXHEX_Openness			-.28**	-.20	5.88

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$. D. W. refers to dominant weight coefficients.

Table 5.6

Univariate and Multivariate Coefficients and Dominance Weight Analysis Results for Social Tolerance

Measures	Social Tolerance							
	Singapore				United States			
	r	*β*	D. W.	Rank Order	*r*	*β*	D. W.	Rank Order
IPIP								
Imagination (O1n)	.28**	0.07	.02	5	.28**	0.05	.02	4
Artistic Interests (O2n)	.47***	0.27*	.10	1	.42***	0.30**	.09	1
Emotionality (O3n)	.31***	0.06	.03	4	.31***	0.06	.03	3
Adventurousness (O4n)	.41***	0.16	.06	2	.22**	-0.04	.01	5
Intellect (O5n)	.43***	0.09	.06	3	.34***	0.15	.04	2
Liberalism (O6n)	.05	0.03	<.01	6	.14	<-0.01	<.01	6
			***R* Square** = .16 ≤ R^2 ≤ .38				***R* Square** = .10 ≤ R^2 ≤ .30	
SFOS								
Intellectual Efficiency (O1s)	.15	-0.12	.01	6	.12	-0.13	.01	6
Ingenuity (O2s)	.41***	0.07	.05	4	.32***	0.09	.03	4

Curiosity (O3s)	.47***	0.29*	.08	2	.40***	0.22*	.06	2
Aesthetics (O4s)	.39***	0.16	.05	3	.25**	-0.08	.01	5
Tolerance (O5s)	.45***	0.26**	.08	1	.53***	0.48***	.17	1
Depth (O6s)	.34***	-0.08	.03	5	.35***	-0.06	.03	3
			***R* Square** = .18 ≤ R^2 ≤ .42				***R* Square** = .21 ≤ R^2 ≤ .43	
HEXACO								
Aesthetic Appreciation (O1h)	.36***	0.13	.05	2	.26**	0.14	.03	2
Inquisitiveness (O2h)	.33***	0.13	.04	3	.24**	0.08	.02	3
Creativity (O3h)	.27**	0.03	.02	4	.18*	-0.01	.01	4
Unconventionality (O4h)	.43***	0.31***	.11	1	.27**	0.18*	.04	1
			***R* Square** = .12 ≤ R^2 ≤ .34				***R* Square** = .02 ≤ R^2 ≤ .18	

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$. D. Weight refers to dominant weight coefficients. Note. The p-values for all bivariate correlations were corrected for multiple comparisons using the Benjamini-Hochberg procedure.

Table 5.7

Moderated Regression Analyses with Culture as a Moderator (Social Tolerance)

Independent Variables	Social Tolerance				
	R^2	ΔR^2	Univariate *r*	β	VIF
MODEL 1	.22	.22			
1. IPIP_Openness			.43**	.28*	3.30
2. SFOS_Openness			.43**	.28**	3.77
3. HEX_Openness			.36**	-.06	3.121
4. Culture			-.02	.11*	1.09
MODEL 2	.24	.02 (*ns*)			
5. CultureXIPIP_Openness			.34**	.07	5.15
6. CultureXSFOS_Openness			.32**	-.12	5.88
7. CultureXHEX_Openness			.30**	.19	4.99

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$.

Facets of Openness and Group Attitudes

Prejudice and Singapore Participants. As predicted in hypothesis 3, results found moderate correlations between the facets of emotionality (O3n), ingenuity (O2s), and tolerance (O5s) with prejudice (Table 5.4). However, the facets of imagination (O1n), liberalism (O6n), and creativity (O3h) did not moderately correlate with prejudice. Hence, hypothesis 3 was only partially supported in Singapore (Table 5.4).

Prejudice and United States Participants. The facets of imagination (O1n), emotionality (O3n), liberalism (O6n), ingenuity (O2s), tolerance (O5s), and creativity (O3h)

were moderately correlated with prejudice, meaning that hypothesis 3 was fully supported in the United States (Table 5.4).

Social Tolerance and Singapore Participants. As predicted in hypothesis 4, results found moderate correlations between the facets of artistic interests (O2n), emotionality (O3n), adventurousness (O4n), intellect (O5n), curiosity (O3s), aesthetics (O4s), tolerance (O5s), depth (O6s), aesthetic appreciation (O1h), inquisitiveness (O2h), and unconventionality (O4h) with social tolerance. However, liberalism (O6n) and intellectual efficiency (O1s) did not moderately correlate with social tolerance, meaning that hypothesis 4 was only partially supported in Singapore (Table 5.6).

Social Tolerance and United States Participants. The facets of artistic interests (O2n), emotionality (O3n), adventurousness (O4n), intellect (O5n), curiosity (O3s), aesthetics (O4s), tolerance (O5s), depth (O6s), aesthetic appreciation (O1h), inquisitiveness (O2h), and unconventionality (O4h) were moderately correlated with social tolerance. However, liberalism (O6n) and intellectual efficiency (O1s) did not moderately correlate with social tolerance, meaning that hypothesis 4 was only partially supported in the United States (Table 5.6).

Overall, the results suggested that the SFOS and IPIP-NEO are both strong predictors of group attitudes (prejudice and social tolerance), and that the strongest predicting facet of openness for group attitudes may be the facet of tolerance (O5s). Post-hoc moderated regression analyses failed to find any significant moderating role of culture in these relationships (Tables 5.5, 5.7, and 5.8).

Table 5.8

Moderated Regression Analyses with Culture as a Moderator

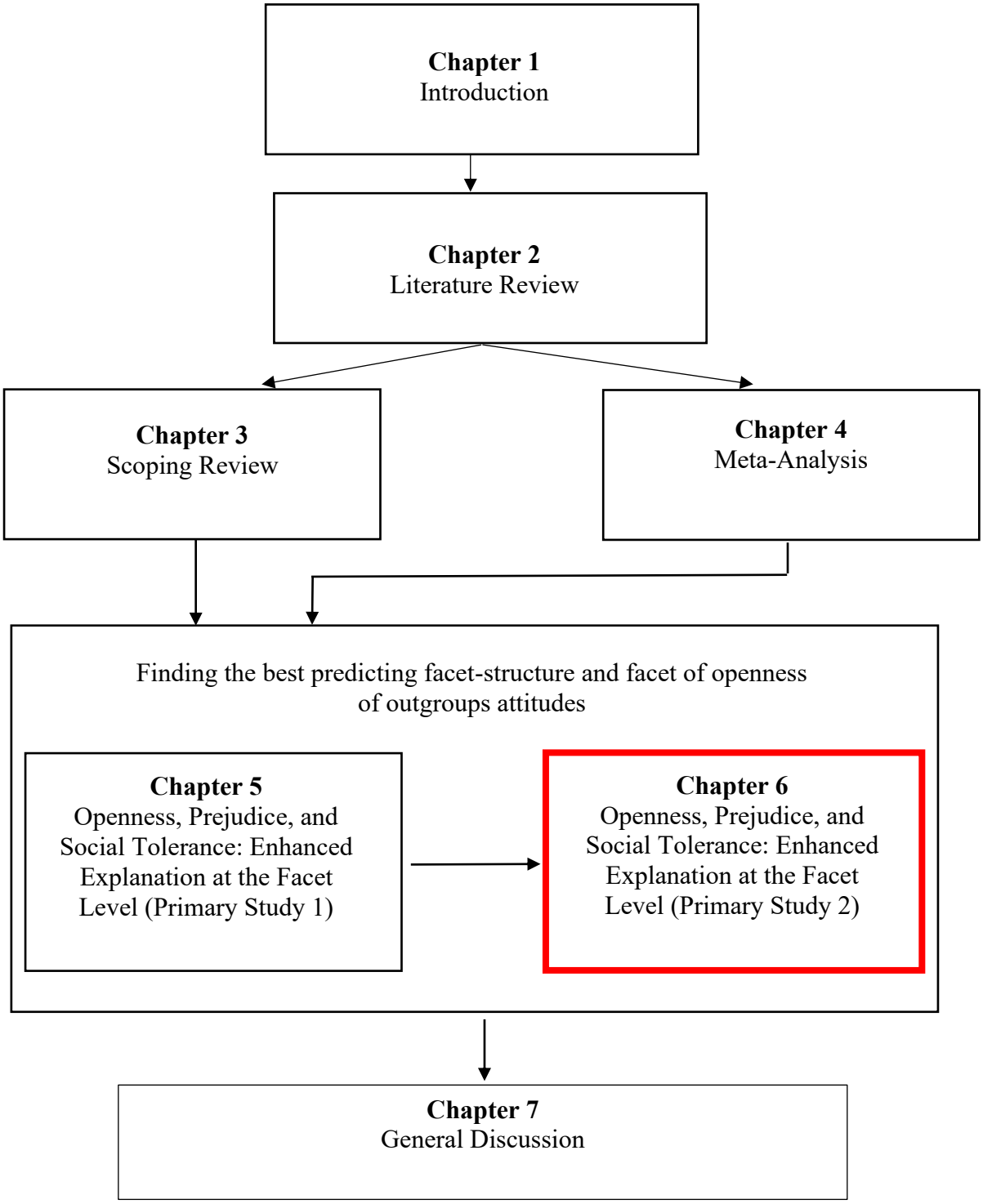
Independent Variables	Prejudice				Social Tolerance			
	R^2	ΔR^2	β	VIF	R^2	ΔR^2	β	VIF
MODEL 1	.31***				.35***			
1. Imagination (O1n)			-.05	2.10			.02	2.10
2. Artistic Interests (O2n)			.01	4.29			.31**	4.29
3. Emotionality (O3n)			-.01	2.14			.01	2.14
4. Adventurousness (O4n)			-.03	1.90			-.01	1.90
5. Intellect (O5n)			-.03	3.28			.09	3.28
6. Liberalism (O6n)			-.11*	1.25			-.06	1.25
7. Intellectual Eff. (O1s)			.02	2.01			-.11	2.01
8. Ingenuity (O2s)			-.02	3.70			.13	3.70
9. Curiosity (O3s)			.05	2.95			.20*	2.95
10. Aesthetics (O4s)			-.10	4.30			-.09	4.30
11. Tolerance (O5s)			-.31***	2.15			.31***	2.15
12. Depth (O6s)			-.10	2.72			-.11	2.72
13. Aesthetic Apprec. (O1h)			-.05	4.01			-.04	4.01
14. Inquisitiveness (O2h)			<-.01	2.08			-.05	2.08
15. Creativity (O3h)			.12	2.61			-.13	2.61
16. Unconventionality (O4h)			.04	1.78			.12	1.78

17. Culture	.22***	1.29	.15**	1.29
MODEL 2	.03		.04	
18. CultureXImagination	.11	3.24	-.03	3.24
19. CultureXArtistic Interests	.09	8.77	-.05	8.78
20. CultureXEmotionality	-.01	3.29	.03	3.29
21. CultureXAdventurousness	.03	3.78	.08	3.79
22. CultureXIntellect	-.22	5.81	-.02	5.81
23. CultureXLiberalism	.10	1.62	.07	1.62
24. CultureXIntelleffi	-.06	3.24	.01	3.24
25. CultureXIngenuity	-.02	7.21	-.11	7.26
26. CultureXCuriosity	.07	5.47	.08	5.49
27. CultureXAesthetics	-.17	7.58	.19	7.59
28. CultureXTolerance	-.06	3.88	-.23*	3.88
29. CultureXDepth	.01	3.65	-.02	3.66
30. CultureXAestheticApprc	.10	7.71	-.20	7.71
31. CultureXInquisitiveness	.05	3.63	.11	3.63
32. CultureXCreativity	.14	4.41	.04	4.42
33. CultureXUnconventionality	-.06	2.86	.15	2.86

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$.

Discussion

Mixed support for the hypotheses was found in this study. Firstly, both SFOS and IPIP-NEO facet structures of openness were identified as strong predictors of prejudice and social tolerance. These findings suggested that these two facet structures likely captured the characteristics that best predict prejudice and social tolerance, unlike what was hypothesised (i.e., IPIP-NEO accounts for the most variance in prejudice while SFOS accounts for the most variance in social tolerance). Secondly, the mixed findings for hypotheses 3 and 4 indicate that more research is needed before a firm conclusion on the correlational patterns between the diverse facets of openness and group attitudes can be reached. Thirdly, although culture significantly predicted prejudice and social tolerance (Tables 5.5 and 5.7), culture did not significantly moderate the links between facet-structures and group attitudes and most of the links between facets of openness and group attitudes, meaning that the strength of these relationships is likely consistent across the two cultures examined. Overall, the results in Study 1 found that IPIP-NEO and SFOS facet structure explained the most variance in prejudice and social tolerance. Tolerance (O5s) was also identified as the facet of openness that best predicted prejudice and social tolerance.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Chapter 6

Openness, Prejudice, and Social Tolerance:

Enhanced Explanation at the Facet Level (Primary Study 2)

D. X. Ng*, Patrick K. F. Lin, Nigel V. Marsh, and Jonathan E. Ramsay

School of Social and Health Sciences, James Cook University, Singapore

*Corresponding author:

Mr Da Xuan Ng

Email: da.ng@my.jcu.edu.au

Address: James Cook University, 149 Sims Drive, Singapore 387380

Statement of the Contribution of Others

Chapter 6 contributed to an in-preparation manuscript to the *Journal of Personality*. The manuscript was written with three co-authors, with the candidate as the primary author. The candidate's contribution to the work included the following:

- Research conception
- Methodology (i.e., candidate developed and designed research methodology)
- Software (i.e., candidate developed R code for analysis)
- Validation (i.e., candidate verified the overall reproducibility of results)
- Formal analysis (i.e., candidate analysed and synthesised study data)
- Investigation (i.e., candidate collected research data)
- Resources (i.e., candidate secured access to tools like RStudio, SPSS, and Excel)
- Data curation (i.e., candidate maintained research data throughout the research phase)
- Writing – Original draft
- Writing - Review & editing
- Visualisation
- Project administration
- Funding Acquisition (i.e., HDR MRF Competitive Pool Funding 2021; HDRCF202102).

The nature of the co-author contribution is listed below in order of authorship:

Co-author	Affiliation	Contribution
Dr Patrick Lin	James Cook University Singapore	Editorial support
Prof Nigel Marsh	James Cook University Singapore	Editorial support
A/Prof Jonathan Ramsay	James Cook University Singapore	Editorial support; Supervision

Declaration by co-authors

The undersigned hereby certify that:

- The above declaration correctly reflects the nature of the candidate's contribution to this work and the nature of the contribution of each of the co-authors.
- All authors have been included in the manuscript.

Signatures:

_____ _____

Dr Patrick Lin/ Date **Prof Nigel Marsh/ Date**

_____

A/Prof Jonathan Ramsay/ Date

Abstract

As the meta-analysis in Chapter 4 has shown, the relationships between the facets of openness and group attitudes vary in conjunction with study characteristics, and findings may not be generalisable across different outcome measures. In this study, I sought to examine whether the results and conclusions of the primary study in Chapter 5 can be replicated using other measures of group attitudes. Following the same methodology as the previous study, I conducted an online survey to compare three different openness facet structures (IPIP-NEO, SFOS, and HEXACO-PI) in their capacity to predict prejudice and social tolerance. Community samples were recruited from both Singapore and the United States. Across cultures, multiple regression with dominance analyses found that the SFOS facet structure and the facet of tolerance were the best predictors of social tolerance, while the IPIP-NEO facet structure and the facet of liberalism were the best predictors of prejudice.

Keywords: Openness to Experience[1], Prejudice[2], Tolerance[3], Facet[4], Culture[5]

Openness, Prejudice, and Social Tolerance: Enhanced Explanation at the Facet Level (Primary Study 2)

Introduction

The meta-analytic findings in Chapter 4 indicated that the effect sizes of the associations between the facets of openness and group attitudes vary to a large extent across studies. The variation in the effect sizes may be attributed to the fact that the studies in the meta-analysis (Chapter 4) used different measures to examine group attitudes; notably, no two studies used the same measure for prejudice and social tolerance (see Table 4.1). It is important to point out that prejudice, defined as a negative evaluative response toward minorities (Crawford & Brandt, 2019), manifests in various forms (Liao et al., 2016). For instance, this evaluative response may be in the form of a negative affect (i.e., reduced warmth; Akiba et al., 2021; Lin et al., 2005), negative stereotypes (Lin & Alvarez, 2020), or negative action tendencies (i.e., standing away from minorities or avoiding them physically; Crawford & Brandt, 2019). These evaluative responses can then be expressed either blatantly, where minority groups are directly viewed as inherently inferior, thus rationalising prejudice (blatant prejudice), or subtly, where the worthiness of minority cultures is undermined, resulting in prejudice being directed towards the perceived inferior culture (subtle prejudice; Alvarez-Castillo et al., 2018).

Social tolerance, a positive evaluative response towards diversity (Hjerm et al., 2020), also comes in various forms. The positive evaluative response may be expressed affectively (i.e., feeling comfortable around diverse others), cognitively (i.e., appreciating the similarities and differences between oneself and others), and behaviourally (i.e., interacting with diverse others; Kegel & DeBlaere, 2014). These positive evaluative responses may then take the form of a democratic political ideology (recognition of human rights and civil liberties; Marquart-Pyatt & Paxton, 2007; Rapp & Freitag, 2015), a value towards humanism (greater valuing of

social harmony; Hamer et al., 2019), or an abstract-communal or universalist orientation (desire for peace, beauty, and equality; Menadue et al., 2021; Lall-Trail et al., 2021). Due to the varied manifestations of prejudice and social tolerance, different measures may have captured distinct expressions of these group attitudes, which relate to the facets of openness to varying degrees and magnitudes. Although the heterogeneity in the effect sizes reported by the included studies in Chapter 4 suggests that the impact of the facets of openness on group attitudes is likely contingent on the specific measurement approach employed for assessing these attitudes, I hypothesized that the rank-order relationships will remain stable across measurement approaches. In other words, the facet of openness that best predicts prejudice and social tolerance is likely consistent across different measurement approaches.

In Primary Study 1 (Chapter 5), prejudice was examined using a feeling thermometer scale and social tolerance was analysed using a diversity attitude scale. The results found that both the IPIP-NEO and the SFOS facet structure of openness, as well as the facet of tolerance (O5s), best predicted prejudice and social tolerance. In this study, I examined whether the same conclusions are found when using different measures of prejudice and social tolerance. In addition, I sought to replicate the findings in Study 1 by conducting a new round of data collection, particularly given that several hypotheses in Study 1 were only partially supported or unsupported by the findings.

The Present Study

In Study 2, I sought to replicate the findings of Study 1 by using the same research methodology but different measures of group attitudes. Accordingly, the hypotheses of Study 2 were mainly based on the findings of Study 1[16] and are as follows:

[16] Readers might notice that the hypotheses in Study 2 (i.e., hypothesis 1-3 and 5) did not fully align with the findings of Study 1, despite the claim that the "hypotheses of Study 2 were mainly based on the findings of Study 1". This is because new analyses (i.e., moderated regression analyses) were introduced to Study 1 based on thesis examiners' feedback. As such, the findings and conclusions of Study 1 has changed accordingly. The author chose to keep the hypotheses in Study 2, as outlined in his pre-registration protocol, in this thesis for the sake of consistency and transparency.

Hypothesis 1: The SFOS facet structure of openness explains the highest variance in prejudice and social tolerance.

Hypothesis 2: The three facet structures of openness account for a higher variance of prejudice in the United States than in Singapore.

Hypothesis 3: The three facet structures of openness account for a higher variance of social tolerance in Singapore than in the United States.

Hypothesis 4: Tolerance (O5s) best predicts prejudice in Singapore and the United States samples.

Hypothesis 5: Artistic interest (O2n) best predicts social tolerance in Singapore, while tolerance (O5s) best predicts social tolerance in the United States.

Method

Participants

Participants from Singapore and the United States were recruited via non-probability sampling by dataSpring (https://www.d8aspring.com) and TGM Research (https://tgmresearch.com), respectively. Using the same a priori parameters as Primary Study 1 (i.e., effect size of $R^2 = 0.14$, $\alpha = 0.05$, and power = 0.95), power analysis [i.e., *F* tests – Multiple Regression: Omnibus (R^2 deviation from zero)] recommended a sample size of 192 for a multiple regression model that contains 16 predictors. In anticipation of possible responses of low quality, the initial plan was to procure 200 good-quality responses from each of the two cultures examined. However, a larger pool of data was deemed essential when I identified a higher occurrence of bot-generated responses in Singapore. Data collection concluded after seven days, following a thorough evaluation to confirm the quality and dependability of the collected responses.

Sixty-one out of 361 responses (17%) from the Singapore sample were removed for poor data quality. Specifically, five responses failed the first response quality item, and 17

responses failed the second response quality item. Additionally, 36 were considered potential bot-generated responses, and three were identified as duplicate entries. For the United States sample, twenty-four out of 250 responses (10%) were removed for poor data quality. Specifically, two responses failed the first response quality item, six responses failed the second response quality item, and 16 responses were identified as potential bot-generated responses.

The final sample consisted of 300 Singapore residents (147 female, 152 male, and one non-binary) with a mean age of 39.62 (*SD* = 12.71, range = 18 – 86 years) and 226 United States residents (154 female, 70 male, one non-binary, and one transgender person) with a mean age of 47.73 (*SD* = 16.96, range = 18 – 79 years). According to sensitivity power analyses, the smallest effect (R^2) I could detect at 95% power (α = .05) would be 0.09 for 300 participants and 0.12 for 226 participants.

Measures

All measures used in this study are available in Appendix I.

Measures of Facets of Openness. Facets of openness were assessed using the same measures in Study 1 (i.e., IPIP-NEO, SFOS, and HEXACO-PI), which collectively best represent the diverse components that characterise openness and are recognised as exemplar evaluations of the openness construct (Christensen et al., 2019; Schwaba et al., 2020). Reliability indices for the internal consistency of the facets of openness ranged from .30 to .91, where 17 (53%) of the reliability indices were above .70 (Table 6.1). Of the 15 reliability indices less than .70, ten (31%) came from the Singapore sample, and five (16%) came from the United States sample.

Table 6.1

Descriptive Statistics for Facets of Openness, Prejudice, and Social Tolerance (Study 2)

Facets of Openness	Singapore (*n* = 300)			United States (*n* = 226)			Overall (*n* = 526)		
	Alpha	Mean	*SD*	Alpha	Mean	*SD*	Alpha	Mean	*SD*
IPIP_Openness	.86	3.18	0.34	.89	3.31	0.44	.88	3.24	.39
Imagination (O1n)	.65	3.25	0.51	.76	3.41	0.67	.71	3.32	.59
Artistic Interests (O2n)	.80	3.39	0.65	.82	3.72	0.74	.82	3.53	.70
Emotionality (O3n)	.55	3.28	0.46	.69	3.43	0.59	.63	3.34	.52
Adventurousness (O4n)	.59	3.17	0.46	.71	3.16	0.61	.66	3.16	.53
Intellect (O5n)	.73	3.17	0.57	.74	3.37	0.64	.74	3.26	.61
Liberalism (O6n)	.30	2.86	0.38	.70	2.76	0.66	.57	2.81	.52
SFOS_Openness	.90	3.24	0.39	.92	3.37	.50	.91	3.30	.45
Intellectual Efficiency (O1s)	.70	3.00	0.53	.77	3.16	0.69	.74	3.07	.61
Ingenuity (O2s)	.68	3.19	0.51	.74	3.34	0.65	.71	3.25	.58
Curiosity (O3s)	.69	3.45	0.52	.71	3.54	0.63	.70	3.49	.57
Aesthetics (O4s)	.81	3.19	0.68	.82	3.37	0.81	.82	3.27	.74

Tolerance (O5s)	.56	3.38	0.44	.61	3.47	0.55	.59	3.42	.49
Depth (O6s)	.53	3.23	0.43	.57	3.34	0.53	.55	3.28	.48
HEX_Openness	.86	3.19	0.44	.89	3.28	.57	.87	3.23	.50
Aesthetic Appreciation (O1h)	.75	3.16	0.63	.73	3.40	0.73	.75	3.26	.68
Inquisitiveness (O2h)	.70	3.31	0.58	.74	3.35	0.74	.72	3.33	.66
Creativity (O3h)	.69	3.09	0.57	.69	3.17	0.68	.69	3.12	.62
Unconventionality (O4h)	.45	3.18	0.44	.60	3.19	0.59	.53	3.18	.51
Prejudice	.78	3.13	0.47	.91	2.75	0.78	.88	2.97	.65
Social Tolerance	.76	3.43	0.46	.82	3.57	0.59	.79	3.49	.52

Measures of Prejudice. Prejudice was measured using the six-item Attitudes Toward Lesbians and Gays Scale (e.g., "Sex between two men is just plain wrong"; Herek, 1994), the six-item adapted version of the Modern Racism scale (e.g., "Racial minorities are getting too demanding in their push for equal rights"; Poteat & Spanierman, 2012), and the eight-item Modern Sexism scale (e.g., "It is rare to see women treated in a sexist manner on television"; Swim et al., 1995). These measures were selected to capture three aspects of prejudice towards sexual, racial and gender minority groups, which often load on a single latent variable of generalised prejudice (Levin et al., 2016). Each item was scored on a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The scores for all twenty items (Appendix I) were summed and averaged, where high scores indicate high levels of prejudice. Cronbach alphas were .78 (Singapore) and .91 (United States; Table 6.1).

Measure of Social Tolerance. Social tolerance was measured using the 15-item Miville-Guzman Universality-Diversity Scale (short-form; MGUDS-S; Fuertes et al., 2000). Items include "I would like to join an organisation that emphasises getting to know people from different countries" and "Knowing about the different experiences of other people helps me understand my problems better" (Appendix I). Items were scored on a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*), where high scores indicated high levels of social tolerance. Cronbach alphas were .76 (Singapore) and .82 (United States; Table 6.1).

Response Quality and Demographic Items. As in Study 1, two self-reported response quality items were used ("Do you commit to providing your thoughtful and honest answers to the questions in this survey?" and "You will receive credit for this study no matter what, however, in your honest opinion, should we use your data in our analyses in this study?"). Information was also collected on the demographic variables of religion, race, age, gender, educational level, and residential status (Appendix I).

Procedures

This online survey study was preregistered (https://osf.io/zm8uw) and approved by the James Cook University Singapore Human Research Ethics Committee (Approval ID H8484; Appendix F). All potential participants read the information sheet and only those who gave consent to the study and clicked on a checkbox were able to complete the online survey. The inclusionary criteria for the study were that participants should be (a) residents of the country examined (Singapore or the United States) and (b) 18 years of age or above.

Data Analysis

All analyses were conducted using the *psych* (Revelle, 2022) and *relaimpo* (Grömping, 2006) packages in *R* (R Development Core Team, 2015). Raw data and the *R* codes are available at https://osf.io/fpu6v/. In order to validate hypotheses 1–3, hierarchical multiple regression modeling was conducted, where the three facet structures of openness and culture (0 = United States, 1 = Singapore) were included as independent variables in model 1, and the interaction terms (i.e., CultureXIPIP_Openness, CultureXSFOS_Openness, and CultureXHEX_Openness) were added in Model 2. Post hoc analysis (Multiple Regression: Special R^2 increase) revealed that the sample size recruited in this study (i.e., 526) has a power of .99 in detecting a R^2 change of 0.05 (α = .05, numerator = 3, number of predictors = 7).

Multiple regression models with all 16 facets of openness as predictors for both group attitudes were also included to identify the rank-order relations across all three facet structures of openness. In order to validate hypotheses 4 and 5, dominance analyses with the Genizi method[17] (Gromping, 2015) were used, where all sixteen facets of openness were included as predictors within a single regression model. The facet assigned the highest

[17] Using the LMG method for a regression model with 16 predictors will typically fail for computational resource reasons (Gromping, 2015). As recommended by Gromping (2015), the Genizi method is a close approximation to LMG and is the preferred method for dominance analysis when there are more than 15 predictors in the regression model.

dominance weight, which reflects the average contribution of the facet of openness to the variance of group attitudes both on its own and when taking all other facets of openness into account (Braun et al., 2019), was determined to be the facet of openness the best predicted the group attitudes. In addition, hierarchical multiple regression models with all 16 facets of openness and the related interaction terms as predictors for both group attitudes were also included to examine moderating role of cultures in the relations between facets of openness and group attitudes. Post hoc analysis (F tests – Multiple Regression Special R^2 increase) revealed that the sample size recruited in this study (i.e., 526) has a power of .92 in detecting a R^2 change of 0.05 (α = .05, numerator = 16, number of predictors = 33).

Results

Openness Facet Structures and Group Attitudes

The SFOS facet structure failed to significantly predict prejudice, despite significantly predicted social tolerance (hypothesis 1 partially supported) (Tables 6.2 and 6.3). Supporting hypothesis 2, culture moderated the effect of the three facet structures of openness in prejudice, where the linear relationship between the three facet structures of openness were significantly stronger in the United States than in Singapore (Table 6.2). However, contrary to hypothesis 3, culture did not significantly moderate the relationship between facet structures of openness and social tolerance (Table 6.3).

Facets of Openness and Group Attitudes

As shown in Table 6.4, liberalism (O6n) was the facet of openness that best predicted prejudice in Singapore and the United States, not the facet of tolerance (O5s), contrary to hypothesis 4. On the other hand, the facet of tolerance (O5s) best predicted social tolerance in both Singapore and the United States, partially supporting hypothesis 5 (Table 6.5).

Overall, the results in Study 2 did not support the hypothesis that SFOS is the facet structure that best predicts prejudice (Table 6.2). Instead, findings suggest that both IPIP-

NEO and SFOS are facet structures that significantly predict social tolerance (Table 6.3). The strongest predicting facet of openness for prejudice was liberalism (O6n; Table 6.4), and the strongest predicting facet of openness for social tolerance was tolerance (O5s; Table 6.5). Post-hoc moderated regression analyses found a significant moderating role of culture in these relationships (Tables 6.6). Culture significantly moderated the effect of liberalism (O6n), intellectual efficiency (O1s), and unconventionality (O4h) in prejudice, and the effect of artistic interests (O2n), adventurousness (O4n), ingenuity (O2s), and aesthetic appreciation (O1h) in social tolerance.

Table 6.2

Moderated Regression Analyses with Culture as a Moderator (Prejudice)

Independent Variables	Prejudice					
	R^2	ΔR^2	Univariate *r*	β	*t*	VIF
MODEL 1	.32***					
1. IPIP_Openness			-.48**	-.67	-10.37***	3.18
2. SFOS_Openness			-.33**	.03	.35 (*ns*)	3.76
3. HEX_Openness			-.22**	.28	4.56***	2.80
4. Culture			.29**	.21	5.80***	1.03
MODEL 2		.04***				
5. CultureXIPIP_Openness			-.21 (*ns*)	.22	2.58**	5.64
6. CultureXSFOS_Openness			-.10 (*ns*)	.21	2.34*	6.68
7. CultureXHEX_Openness			-.08 (*ns*)	-.21	-2.71**	4.93

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$.

Table 6.3

Moderated Regression Analyses with Culture as a Moderator (Social Tolerance)

Independent Variables	Social Tolerance					
	R^2	ΔR^2	Univariate *r*	β	*t*	VIF
MODEL 1	.50***					
1. IPIP_Openness			.67**	.38	6.88***	3.18
2. SFOS_Openness			.67**	.34	5.63***	3.76
3. HEX_Openness			.57**	.02	.34 (*ns*)	2.80
4. Culture			-.13**	-.02	-.51 (*ns*)	1.03
MODEL 2		<.01(*ns*)				
5. CultureXIPIP_Openness			.45**	-.13	-1.69 (*ns)*	5.64
6. CultureXSFOS_Openness			.48**	.16	1.95 (*ns)*	6.68
7. CultureXHEX_Openness			.39**	.01	0.90 (*ns)*	4.93

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$.

Table 6.4

Dominance Weights of Facet of Openness (Prejudice)

	Prejudice							
	Singapore				United States			
Facets	*r*	*β*	DW	Rank Order	*r*	*β*	DW	Rank Order
Imagination (O1n)	-.23***	-.17*	.03	3	-.36***	-.24***	.04	4
Artistic Interests (O2n)	-.19**	-.07	.01	7	-.38***	-.21*	.03	5
Emotionality (O3n)	-.24***	-.08	.02	4	-.41***	-.16**	.06	2
Adventurousness (O4n)	-.17**	.01	.01	12	-.25***	.06	.01	13
Intellect (O5n)	-.16*	-.07	.01	8	-.29***	.08	.01	11
Liberalism (O6n)	-.33***	-.32***	.10	1	-.53***	-.54***	.25	1
Intellectual Efficiency (O1s)	.04	-.02	<.01	16	-.28***	-.21***	.03	6
Ingenuity (O2s)	-.03	.14	.01	11	-.22**	.07	.01	15
Curiosity (O3s)	-.11	.05	<.01	15	-.38***	-.11	.03	8
Aesthetics (O4s)	-.12*	.10	<.01	14	-.31***	.06	.01	10
Tolerance (O5s)	-.17**	-.08	.01	9	-.44***	-.18*	.05	3

Depth (O6s)	-.20**	-.18*	.02	6	-.42***	-.03	.03	7
Aesthetic Appreciation (O1h)	-.14*	-.09	.01	10	-.30***	.03	.01	9
Inquisitiveness (O2h)	.07	.20**	.02	5	-.17**	.05	<.01	16
Creativity (O3h)	-.06	.13	.01	13	-.15*	.19*	.01	12
Unconventionality (O4h)	-.24***	-.17**	.03	2	-.23***	.05	.01	14
		Adjusted *R* square = .24***			**Adjusted *R* square** = .55***			

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$, *ns* refers to non-significance finding.

Note. The p-values for all bivariate correlations were corrected for multiple comparisons using the Benjamini-Hochberg procedure.

Table 6.5

Dominance Weights of facet of Openness (Social Tolerance)

	Social Tolerance							
	Singapore				United States			
Facets	*r*	*β*	DW	Rank Order	*r*	*β*	DW	Rank Order
Imagination (O1n)	.39***	.04	.02	13	.47***	.07	.03	9
Artistic Interests (O2n)	.58***	.08	.04	8	.62***	.28***	.08	2
Emotionality (O3n)	.45***	.10*	.04	3	.49***	.12*	.06	3
Adventurousness (O4n)	.54***	.05	.04	5	.49***	.23***	.05	4
Intellect (O5n)	.55***	.05	.04	9	.52***	.08	.04	8
Liberalism (O6n)	.06	.02	<.01	16	.08	-.06	<.01	16
Intellectual Efficiency (O1s)	.31***	-.10	.01	15	.17*	-.19**	.01	15
Ingenuity (O2s)	.54***	.13*	.04	7	.41***	-.09	.02	13
Curiosity (O3s)	.64***	.15*	.08	2	.58***	.02	.05	5
Aesthetics (O4s)	.49***	-.06	.02	12	.56***	-.01	.04	6
Tolerance (O5s)	.70***	.36***	.14	1	.72***	.49***	.16	1

Depth (O6s)	.58***	.04	.04	4	.54***	-.01	.04	7
Aesthetic Appreciation (O1h)	.52***	.12	.03	10	.52***	-.14	.03	11
Inquisitiveness (O2h)	.48***	.10	.04	6	.47***	.14*	.03	10
Creativity (O3h)	.41***	-.09	.01	14	.39***	-.07	.01	14
Unconventionality (O4h)	.41***	.06	.02	11	.42***	-.02	.02	12
		Adjusted *R* square = .61***				**Adjusted *R* square** = .64***		

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$, *ns* refers to non-significance finding.

Note. The p-values for all bivariate correlations were corrected for multiple comparisons using the Benjamini-Hochberg procedure.

Table 6.6.

Moderated Regression Analyses with Culture as a Moderator.

Independent Variables	Prejudice				Social Tolerance			
	R^2	ΔR^2	*B*	VIF	R^2	ΔR^2	β	VIF
MODEL 1	.48***				.63***			
1. Imagination (O1n)			-.22***	1.93			.04	1.93
2. Artistic Interests (O2n)			-.15*	3.52			.19***	3.52
3. Emotionality (O3n)			-.13**	1.76			.10**	1.76
4. Adventurousness (O4n)			.07	2.09			.14***	2.09
5. Intellect (O5n)			.01	3.17			.07	3.17
6. Liberalism (O6n)			-.45***	1.18			-.04	1.18
7. Intellectual Eff. (O1s)			-.15***	1.92			-.13***	1.92
8. Ingenuity (O2s)			.08	2.97			.01	2.97
9. Curiosity (O3s)			<.01	2.89			.08	2.89
10. Aesthetics (O4s)			.05	3.63			-.02	3.63
11. Tolerance (O5s)			-.13**	2.24			.43***	2.24
12. Depth (O6s)			-.11*	2.55			.01	2.55
13. Aesthetic Apprec. (O1h)			-.02	4.00			.01	4.00
14. Inquisitiveness (O2h)			.12**	2.19			.09*	2.19
15. Creativity (O3h)			.16**	2.65			-.08	2.65
16. Unconventionality (O4h)			-.06	1.83			.02	1.83

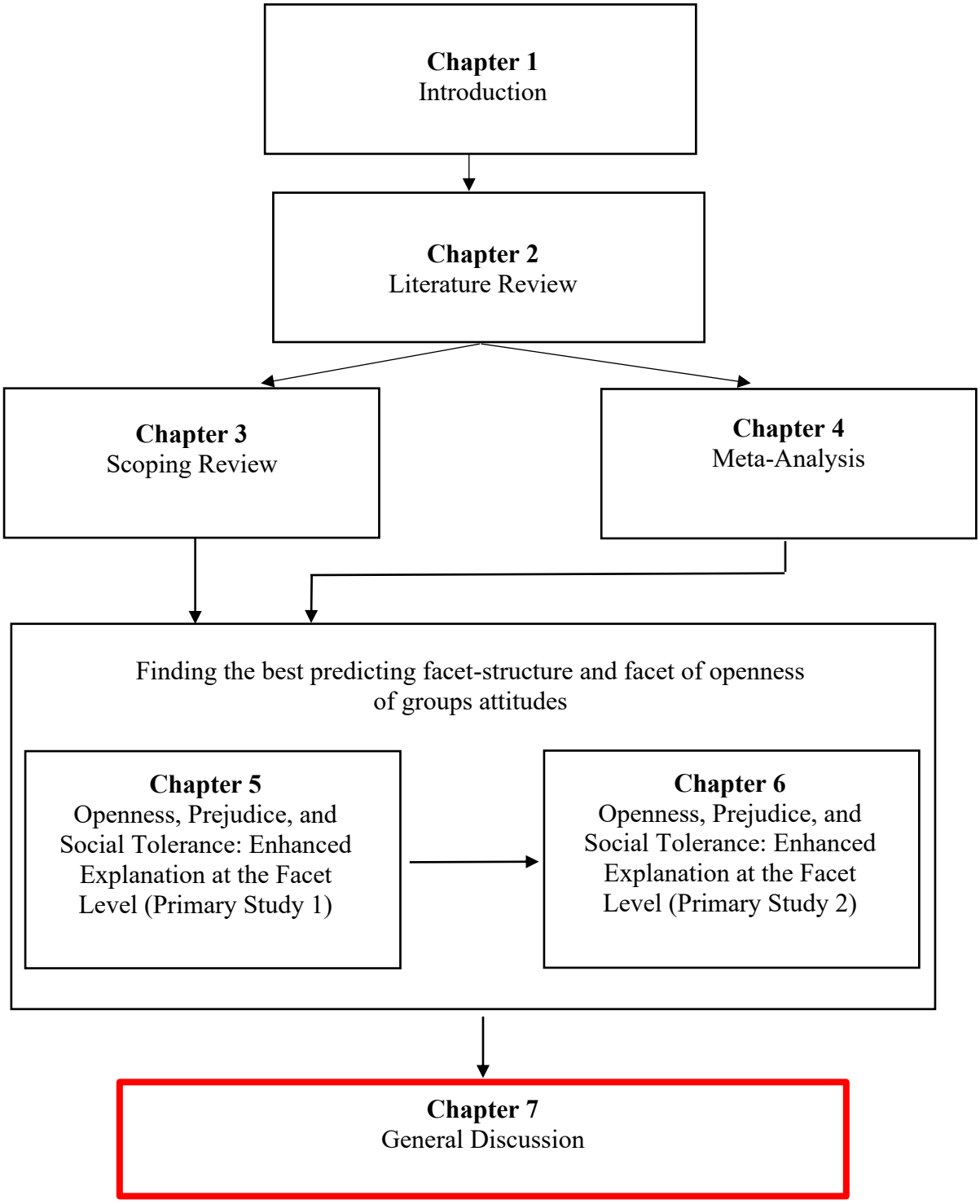
17. Culture	.23***	1.14	-.03	1.14
MODEL 2	.05***		.02**	
18. CultureXImagination	.07	3.47	-.02	3.47
19. CultureXArtistic Interests	.13	7.28	-.16*	7.28
20. CultureXEmotionality	.07	3.23	-.02	3.23
21. CultureXAdventurousness	-.04	3.84	-.11*	3.84
22. CultureXIntellect	-.10	6.72	-.02	6.72
23. CultureXLiberalism	.11*	1.76	.04	1.76
24. CultureXIntellEff	.13*	3.59	.06	3.59
25. CultureXIngenuity	.03	5.51	.14*	5.51
26. CultureXCuriosity	.11	5.82	.08	5.82
27. CultureXAesthetics	.01	7.27	-.04	7.27
28. CultureXTolerance	.09	4.33	-.10	4.33
29. CultureXDepth	-.08	4.95	.03	4.95
30. CultureXAestheticApprc	-.08	7.98	.19*	7.98
31. CultureXInquisitiveness	.07	4.27	-.03	4.27
32. CultureXCreativity	-.07	5.22	-.01	5.22
33. CultureXUnconventionality	-.13*	3.31	.05	3.31

***$p < 0.001$, **$p < 0.01$, and *$p < 0.05$.

Discussion

The IPIP-NEO and the SFOS facet structures were again identified as significant predictors of social tolerance (Table 6.3), where the specific facet of tolerance (O5s) was found to be the most effective predictor of social tolerance (Table 6.5). Most importantly, given that the same findings were uncovered in both studies 1 and 2, these finding suggest that the importance of facet structures, specifically the IPIP-NEO and the SFOS facet structures, and the facet of tolerance (O5s) as significant predictors of social tolerance is consistent across measures.

However, unlike in Study 1, results in Study 2 did not find the SFOS facet structure or the facet of tolerance (O5s) to be the most important predictor of prejudice (Table 6.2). Instead, results in Study 2 identified the IPIP-NEO and the HEXACO facet structure, and the facet of liberalism (O6n), as important predictors of prejudice (Tables 6.2 and 6.4). Also, unlike in Study 1, culture significantly moderated the link between the three facet structures of openness and prejudice (Table 6.2), where the three facet structures of openness explain a greater amount of variance in prejudice in the United States than in Singapore, suggesting potential cultural influences in these relationships. Culture also significantly moderated the relationships between prejudice and some facets of openness [i.e., liberalism (O6n), intellectual efficiency (O1s), and unconventionality (O4h)], and social tolerance and some facets of openness [i.e., artistic interests (O2n), adventurousness (O4n), ingenuity (O2s), and aesthetic appreciation (O1h)]. Possible explanations for the discrepancies in the findings from the two studies are provided in the next chapter – Chapter 7: General Discussion.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Chapter 7

General Discussion

This research thesis represents the first known attempt to investigate the relationship between group attitudes and the various facet structures and conceptualisations of openness with the aim of identifying the facet structure and facet of openness that best explains these broad social attitudes. To achieve this research aim, four research questions were used to guide the research process:

1. Which facet structure of openness (IPIP-NEO, HEXACO-PI, and SFOS) best predicts prejudice and social tolerance?
2. Which specific facet of openness best predicts prejudice and social tolerance?
3. Do the facets of openness relate differently to prejudice and social tolerance?
4. Are the relationships between the facets of openness and the attitudes of prejudice and social tolerance cross-culturally stable?

The focus of the preceding chapters were as follows: the main research aim of this thesis (Chapter 1), current research gaps (Chapter 2), a systematic scoping review (Chapter 3) of the current evidence and the dominant methodologies, a meta-analysis (Chapter 4) of the effect sizes from existing literature, a primary study (Chapter 5) that attempts to identify the facet structures and facets of openness that best predict group attitudes, and a replication study (Chapter 6) that examined if the conclusions can be generalised across different measures of group attitudes. In this last chapter (Chapter 7), I will focus on bringing together the findings from previous chapters. The findings will be broadly summarised and discussed in the following paragraphs per the four research questions outlined above.

Facet Structures of Openness, Prejudice, and Social Tolerance

Facet Structures of Openness and Social Tolerance

It should be noted that while all three facet structures held significant bivariate correlational relationships with social tolerance, only the SFOS and the IPIP-NEO facet structures were identified as significant predictors of social tolerance after accounting for all three facet structures and culture (Tables 5.7 and 6.3). When the contribution of each of the three facet structures were directed compared in multiple regression analyses, results from the two studies found that the IPIP-NEO and the SFOS facet structure of openness were both significantly predictive of social tolerance (Table 5.7 and 6.3). This finding is consistent with previous studies that reported that the three facet structures of openness are not equivalent measures of openness (Schwaba et al., 2020) and that the facet structures of openness vary in their ability to predict attitudes and behaviours (Anglim et al., 2020). That is, the predictive power of certain facet structures of openness may be more applicable to social tolerance than others.

The SFOS, IPIP-NEO, and Prejudice

In this research, prejudice was significantly predicted by the IPIP-NEO and SFOS facet structure of openness in Study 1 (Chapter 5; Table 5.5) but significantly predicted by the IPIP-NEO and HEXACO facet structure of openness in Study 2 (Chapter 6; Table 6.2). Given the findings, I suggest one possible reason for the discrepancies might be how prejudice was operationalised in these two studies. According to many social psychologists (e.g., Duckitt, 2019, p. 15), prejudice is a multifaceted construct that includes several components related to cognition (e.g., stereotypes), affect (e.g., mistrust or unease), and action (e.g., behavioural distance or discrimination). The feeling thermometer scale, used to examine prejudice in Study 1, measured participants' general evaluations of a social group that is affect-based and without any semantic content (Lin & Alvarez, 2020). In contrast, study 2 used specific scales, such as the Attitudes Toward Lesbians and Gays Scale (Herek, 1994), Modern Racism Scale (Poteat & Spanierman, 2012), and Modern Sexism Scale (Swim

et al., 1995), that assessed participants' beliefs regarding minority social groups and reflected the cognitive underpinning of a person's negative group evaluation (Correll et al., 2010). As highlighted in my meta-analysis study (Chapter 4), studies that used different prejudice measures do not share common effect sizes. It is plausible that the feeling thermometer scale in Study 1 and the measures in Study 2 assessed distinct components of prejudiced attitudes best explained by different facet structures of openness.

These diverse measures may have tapped into distinct components of prejudice (Ditonto et al., 2013). For instance, the SFOS may have significantly predicted the affect-based prejudice (measured via the feeling thermometer scale in Study 1) but did not predict the cognitive-based prejudice (measured via specific scales in Study 2). In contrast, HEXACO-PI may have significantly predicted the cognitive-based prejudice (in Study 2) but did not predict the affect-based prejudice (in Study 1). Interestingly, IPIP-NEO was the facet structure of openness that consistently predicted prejudice across the two studies, despite the difference in the measures of prejudice, suggesting that IPIP-NEO may be capable of capturing the common aspect of these separate components of prejudice.

It is important to emphasise that the study findings do not imply that either of these prejudice scales is a less valid measure of prejudice, especially when these prejudice scales have been validated by many researchers (Correll et al., 2010). In addition, the prejudice scales used in the two studies gave rise to reasonably satisfactory alpha coefficients (i.e., $\alpha > .70$). Nevertheless, further research is needed to ascertain the behavioural criterion of these two prejudice scales by comparing them against other criteria of prejudice, such as behavioural measures (e.g., Tykocinski & Bareket-Bojmel, 2009) or implicit measures (e.g., Greenwald et al., 2009).

Facets of Openness, Prejudice and Social Tolerance

The Tolerance Facet and Social Tolerance

The systematic reviews in Chapters 3 and 4 (i.e., Tables 3.6 and 4.2) and the two primary studies in Chapters 5 and 6 (i.e., Tables 5.6 and 6.5) found that most facets of openness were significantly correlated with social tolerance. Although the meta-analysis (Chapter 4) identified the facet of artistic interest (O2n) as the strongest predicting facet of social tolerance within the IPIP-NEO facet structure of openness, the facet of tolerance (O5s) emerged as the most robust predictor of social tolerance among all the facets of openness examined, as evidenced by the consistency of its predictive power across national samples, facet-structures of openness, and outcome measures. Notably, Study 2 found that the facet of tolerance (O5s) accounted for 14% and 16% of the variance in social tolerance in the Singaporean and American samples, respectively, which is more than twice the variance explained by artistic interest (O2n; Table 6.5).

The two primary studies have shown that facets of similar themes do not necessarily share equivalent predictive utility. For example, the facet of liberalism (O6n) accounted for less than 1% of the variance in social tolerance for all samples across both studies despite sharing a similar theme with the facet of tolerance (O5s): openness towards diverse lifestyles and cultures. Individuals who score high on the facet of tolerance (O5s) are those who embrace a variety of attitudes, beliefs, and lifestyles and are comfortable interacting with people who hold different opinions or come from different cultural backgrounds (Woo et al., 2014). These individuals are interested in learning about different customs and traditions and attending cultural events. On the other hand, the facet of liberalism (O6n) characterised those who are receptive to new perspectives and, at the same time, ready to challenge traditions, orthodox norms, and authoritative figures. Individuals who score high on the facet of liberalism (O6n) are those who reject conservative political ideology and religious doctrines and advocate for a more liberal perspective. Many social psychologists (e.g., Napier & Frost, 2008; Brandt et al., 2014) argue that social tolerance is linked with the epistemic motives to

maximise understanding and the existential motives to broaden community, as opposed to the epistemic motives to reduce uncertainty and existential motives to minimise ideological threats. Similarly, the findings of this research thesis suggest that one's interest in learning about different cultures (i.e., the facet of tolerance – O5s) is more likely to be associated with social tolerance than the disposition towards challenging traditional norms and authority figures (i.e., the facet of liberalism – O6n).

The Tolerance Facet, Liberalism Facet, and Prejudice

The results of the two primary studies could not provide conclusive evidence for which facet of openness best predicts prejudice. For instance, multiple regression analyses in Study 1 found that the facet of tolerance (O5s) was the strongest predictor of prejudice (Table 5.8). However, study 2 failed to replicate this finding. Instead, dominance analyses identified the facet of liberalism (O6n) as the strongest predictor of prejudice in study 2 (Table 6.4). As previously argued, one possible reason for the discrepancies might be how prejudice was operationalised in these two studies. Overall, the results suggested that the facets of tolerance (O5s) and liberalism (O6n) are important predictors of different aspects of prejudice (i.e., affect-based and cognitive-based aspects of prejudice).

The facets of tolerance (O5s) and liberalism (O6n) share similar themes (i.e., openness towards diverse lifestyles and cultures), but the behavioural emphasis of these two facets is slightly different. The results suggest that one's interest in learning about other cultures (i.e., the facet of tolerance – O5s), a characteristic of variety seeking, makes an individual likelier to seek out intergroup contact and, hence, reduces negative affect towards minorities (i.e., affect-based prejudice). On the other hand, the disposition towards challenging traditional norms and authority figures (i.e., the facet of liberalism – O6n), a characteristic of complex thinking, makes an individual more sceptical of stereotypical views of minorities and hence,

reducing the negative cognitions towards minorities (i.e., cognitive-based prejudice). Further research is needed to confirm these findings.

Variation in Predictive Ability Across Cultures

The findings in this thesis did not support the claim of a cultural variation in the link between facet structures of openness and social tolerance (Tables 5.7 and 6.3). For instance, culture did not significantly moderate the effect of facet structures of openness in both Study 1 and 2, suggesting a degree of cross-cultural consistency in the relationships between the facets of openness and social tolerance. Interestingly, culture was found to significantly moderate the link between some facets (i.e., artistic interests – O2n, adventurousness – O4n, ingenuity – O2s, and aesthetic appreciation – O1h) and social tolerance, though only in Study 2 and only to a small extent (Table 6.6). The presence of a cultural variation at the facet level, but not the facet structure level, highlighted the importance for the nuanced facet-level investigation of the relationship between openness and social tolerance.

The findings are inconclusive with respect to claims for cultural variation in the link between facet structures of openness and prejudice, as culture was not a significant moderator in Study 1 (Table 5.5) but was identified as a significant moderator in Study 2 (Table 6.2). Statistically speaking, when it comes to predicting prejudice in Study 2, regression lines using the facet-structures of openness as predictors explained more of the variance in prejudice in the United States than in Singapore (Table 6.2). From this finding, I argue that culture may have moderated the effect of the facet structures of openness in cognitive-based prejudice in Study 2, but not affect-based prejudice in Study 1. In addition, the findings in Study 2 also found culture significantly moderated the link between some facets (i.e., liberalism - O6n, intellectual efficiency – O1s, and unconventionality – O4h) and prejudice. Interestingly, culture was often uncovered as a significant predictor of prejudice and social

tolerance (Tables 5.5, 5.7, 5.8, 6.2, 6.3, 6.6), suggesting significant cultural variations in levels of prejudice and social tolerance.

Moderating Role of Culture in the link between Openness and Prejudice

According to the dual process model (Duckitt et al., 2010), the link between openness and prejudice strengthens when the social situation is perceived as dangerous, unpredictable, and threatening. The "dangerous world" perception moderates the importance of collective safety and societal cohesion (otherwise known as right-wing authoritarianism), which indirectly influences low openness individuals towards prejudice via the perceiving of minority groups and their members as a potential threat towards societal stability (Duckitt & Sibley, 2017, p.190). Therefore, a possible theoretical explanation for the stronger openness-prejudice link observed in the United States sample is that the United States participants perceive minorities as a more significant social threat than the Singapore participants. Another possible explanation is that participants in the United States, with their greater permissiveness for norm violation and deviant behaviours (i.e., loose culture[18]; Gelfand et al., 2011), are more likely to express social attitudes that are aligned with their personality disposition (i.e., openness; see Jackson et al., 2019); hence, a stronger relationship between openness and prejudice. In comparison, participants in Singapore (a tight culture; Gelfand et al., 2011), a nation known for its strong governance characterised by authoritative systems that manage dissent and implement strict regulations against non-conforming behaviours (Tan, 2012), tend to reflect social attitudes that conform to prevailing norms and societal expectations (Gerber et al., 2010; Alper & Yilmaz, 2019); hence, a weaker relationship between openness and prejudice. In summary, a national culture marked by heightened social

[18] The United States was rated as 5.1 and Singapore was rated as 10.4 on a tightness scale, where higher values were indicative of a tighter national culture (Gelfand et al., 2011).

danger and loose culture may exhibit a stronger link between openness and prejudice, albeit restricted to the cognitive aspect of prejudice as suggested by the findings of this thesis.

Theoretical and Practical Implications

This research provided three main benefits. One, the findings of this thesis will improve the existing theoretical model (i.e., DPM) by identifying the facet structure and facet of openness that best explain prejudice and social tolerance. Second, the findings of this thesis further the understanding of the nomological network behind the relationships between the facets of openness and the two distinct group attitudes. Lastly, this thesis is the first that examined the link between the facets of openness and group attitudes in Southeast Asia (i.e., Singapore) and compared the results in Singapore with those in the United States, which contributed further insight into the universality of the link between openness and group attitudes.

Enhanced Dual Process Motivational Model of Prejudice

The Dual Process Model (Duckitt & Sibley, 2010) postulates that openness predicts prejudice. However, the model provides limited insight into the predictive role of the facet structures of openness, and no previous study has examined which facet structure of openness best predicts prejudice. While no studies have compared the predictive utility of different facet structures of openness in the prediction of prejudice, past studies of DPM have suggested that the facet structure and facet of openness that characterised the "preference for complex thinking" are more significant in the prediction of prejudice (e.g., Leone et al., 2012; Onraet et al., 2011; see also, Forsberg et al., 2018). Supporting this claim, the meta-analysis chapter (i.e., Chapter 4) found that the facet of liberalism (O6n), a facet of openness that characterised a preference for complex thinking (Figure 5.1), was the facet of openness in the IPIP-NEO facet structure of openness that best predicted prejudice. That is, past literature

suggests that the preference for complex thinking might be the key driver for the relationship between openness and prejudice.

However, the results of my primary studies contradict the claim that a preference for complex thinking is the strongest predicting factor of prejudice. Particularly, the facet of liberalism (O6n), which characterised "preference for complex thinking" (Figure 5.1), strongly predicted only the cognitive aspect of prejudice but not the affective aspect of prejudice; the affective aspect of prejudice was strongly predicted by the facet of tolerance (O5s), a facet of openness that characterised "preference for variety-seeking." The results of the two primary studies do not support the claim that the preferences for complex thinking in openness are the key driver for the relationship between openness and prejudice. Instead, the findings suggest that facet structures of openness that characterised variety-seeking (i.e., the IPIP-NEO and the SFOS) are better suited for predicting prejudice.

The idea that prejudice is multifaceted is not new to the Dual Process Model. For example, prejudice has been differentiated into three types (prejudice against derogated/dissident/dangerous groups), and past studies (i.e., Asbrock et al., 2010; Bizumic et al., 2009; Sibley et al., 2007) have examined how these different types of prejudice are associated with ideological motivations; that is, right-wing authoritarianism (RWA) and social dominance orientation (SDO). It was revealed that RWA predicted prejudice against dissident and dangerous groups, possibly due to a fear of social threat or of losing the traditional way of living (i.e., "affect-based"). On the other hand, SDO predicted prejudice against derogated groups, possibly because of a desire to maintain their current social status and a deliberate attempt to cast out these individuals to minimise competition (i.e., "cognitive based"). Accordingly, the Dual Process Model has classified prejudice as either RWA-induced prejudice or SDO-induced prejudice (Asbrock et al., 2010; Bizumic et al., 2009;

Sibley et al., 2007), which can also be labelled as affect-based prejudice and cognitive-based prejudice respectively.

According to the dual process model (Duckitt & Sibley, 2010), openness influences affect-based prejudice via RWA, while agreeableness influences cognitive-based prejudice via SDO. However, the findings of this research suggest that openness influences affect-based and cognitive-based prejudice. Specifically, SFOS and the facet of tolerance (O5s) were strong predictors of the affect-based aspect of prejudice, and the facet structure of IPIP-NEO and the facet of liberalism (O6n) were strong predictors of the cognitive-based aspect of prejudice. There is no theoretical account for why the two aspects of prejudice (affect and cognitive) were strongly predicted by different facet structures and facets of openness, suggesting that the dual process model may need further theoretical refinement. Future studies are required to validate the findings of this research thesis and possibly examine how the relationship between the facet structures of openness and the separate aspects of prejudice are mediated by the ideological motivations of RWA and SDO.

Empirical Differentiation of Prejudice and Social Tolerance

According to Pittinsky and Simon's (2007) two-dimensional model of intergroup attitudes, the attitudes of prejudice and social tolerance are postulated to be (a) largely independent of each other and (b) preceded by different causal mechanisms. The findings reported in this research thesis generally supported these claims. Firstly, the two attitudes were weakly or moderately correlated (i.e., $-.34 < r < -.28$) across the two studies, a finding consistent with the claim that prejudice and social tolerance are distinct but related to each other (Gonzalez et al., 2015). Secondly, the findings of this research thesis showed that prejudice and social tolerance were not always strongly predicted by the same facet of openness. For instance, within the HEXACO-PI facet structure of openness, the aesthetic appreciation (O1h) facet best predicted prejudice, and the unconventionality (O4h) facet best

predicted social tolerance (Tables 5.4 and 5.6). Within the IPIP-NEO facet structure of openness, the liberalism (O6n) facet best predicted prejudice, and the artistic interest (O2n) facet best predicted social tolerance (see Figure 4.1, Figure 4.2, Table 5.4, and Table 5.6). Among all the sixteen facets of openness examined, the liberalism (O6n) facet best predicted prejudice, and the tolerance (O5s) facet best predicted social tolerance (Tables 6.4 and 6.5). That is, the facets of openness relate to prejudice and social tolerance in a differentiated manner, suggesting that these two group attitudes do not share the same causal mechanism, a conclusion that is consistent with previous research (e.g., Blais-Rochette et al., 2022).

However, some aspects of prejudice may be more similar to social tolerance than other aspects of prejudice. As evident from the current results, the affective aspect of prejudice and social tolerance were best predicted by the same facet structures of openness, the IPIP-NEO and the SFOS facet structures (Tables 5.5, 5.7, and 6.3), and the same facet of openness, the facet of tolerance (O5s; Table 5.8). The difference, however, is that the cognitive aspect of prejudice was best predicted by the IPIP-NEO and the HEXACO facet structures and the facet of liberalism (O6n) instead (Tables 6.2 and 6.4). Consistent with past studies (Crawford et al., 2015; Van Zalk et al., 2013), this finding highlighted that prejudice and social tolerance may be related constructs but not entirely equivalent. Overall, this research provides new empirical support for the differentiation of prejudice and social tolerance and challenges the previously held idea that social tolerance is simply the absence of prejudice (e.g., Brandt et al., 2015; Rapp & Freitag, 2015). More importantly, this research highlighted the need for more research on these two distinct group attitudes so as to better inform social and educational policy in an effort to both increase social tolerance levels and reduce prejudice levels (see Kende et al., 2022; Verkuyten et al., 2020).

An Argument for More Cross-Cultural Research

There are cultural differences in openness (Connelly et al., 2014b), prejudice (Jackson et al., 2019), and social tolerance (Kirkland et al., 2022). Some researchers have also argued that openness (Schmitt et al., 2007) and group attitudes (Kirkland et al., 2022) may take on different forms or functions in different cultures. Results of the present research suggest (a) significant cultural variations in group attitudes, and that (b) culture may play a moderating role in the link between facet structures of openness (i.e., IPIP-NEO, SFOS, and the HEXACO-PI) and prejudice (particularly, cognitive-based prejudice). This is not surprising given that other studies have also reported similar findings (Bergh & Akrami, 2016; see also Kende et al., 2018) where culture moderates the relationship between openness and prejudice.

The cultural differences in the relationship between openness and prejudice may be attributed to the fact that different cultures have varying exposure to diverse social groups (Kende et al., 2018; Sparkman et al., 2016), ranging emphasis on the education of democracy (Whitley & Webster, 2019), and varying opinions on the dangerousness of groups (Ahmed et al., 2020; Kirkland et al., 2022). The finding by Roets and colleagues (2015) best illustrated the moderating role of culture, where they found that higher levels of ideological motivation towards collective security (RWA), the key mediator between openness and prejudice, prompted Singaporeans towards lower levels of prejudice. The opposite is true for participants in Belgium, where a higher level of RWA was associated with higher prejudice (Roets et al., 2015). This finding suggests that while participants from some cultures (i.e., Belgium) are more likely prejudiced in the attempt to gain collective security, participants from other cultures (i.e., Singapore) become less prejudiced in the attempt to gain collective security. In sum, more cross-cultural studies are needed to uncover the moderating effect of specific cultural factors (i.e., threat perception, contact experience, knowledge of democratic norms) in the relationship between openness and prejudice.

Limitations and Future Directions

Firstly, most facet scales of openness had low reliabilities, particularly in Singapore. This is despite past research which has reported satisfactory internal consistencies of these scales in Asia and the United States (i.e., Lee et al., 2018; McCrae et al., 2005; Woo et al., 2014). The low reliability of these scales represented systematic measurement error variance, which add bias and noise to the regression parameter estimates, including adjusted *R* square and dominance weights (Braun et al., 2019). The reason for the low reliability in Singapore may be attributed to the slightly less appropriateness of the language of the items used in these scales of facets of openness (McCrae, 2015). For example, the facet scale of liberalism (O6s) contained phrases that highlighted the Western political ideology of left versus right political thinking, which might not be easily transferred to the context of Singapore (Rodan, 2012).

Although the low reliability suggests that the scales of the facets of openness may not be valid (i.e., not measuring what they are supposed to measure), some personality psychologists (e.g., McCrae, 2015) have argued that the low internal consistency of these personality scales may not be that serious of an issue. That is, reliability coefficients were only minimally relevant when it came to the determination of predictive validity (McCrae, 2015). McCrae (2015) found that internal consistency has minimal impact on the longitudinal stability, heritability, and cross-observer validity of personality; instead, he argued that test-retest reliability is a more relevant indicator of the validity of personality constructs. McCrae (2015) also argued that the internal consistency of facet scales for a factor such as openness is likely to be low due to the heterogeneity of the factor. Nevertheless, the low reliabilities of the facets of openness scales, particularly in Singapore, suggest that caution is warranted in interpreting the results of these two studies. More studies are needed to examine the measurement invariance of these scales of facets of openness in Singapore.

Secondly, I also acknowledged that various method artefacts, aside from different facet structures in NEO, HEXACO, and SFOS, could generate different patterns of results across instruments and the two studies. For instance, the similar response format for the modern racism and sexism scale and the IPIP-NEO scale may have inflated the relationship between IPIP-NEO and the prejudice scales in Study 2. Future research may consider running multigroup path (nested within countries, measures of openness, measure of group attitudes) or SEM analyses to present the regression results more parsimoniously and model for method effects.

Another factor that could impact the results, across studies and between the United States and Singapore, is the salience of different ethnic and racial minorities. That is, the operationalization and the definition of what is prejudice did not always reflect negative attitudes towards equivalent group targets. For instance, the target groups examined in Study 1 were not equivalent across cultures, and the items that ask about 'racial minorities" in Study 2 bring to mind different target groups in the United States and Singapore sample (e.g., African Americans vs Indonesians). Therefore, the difference in results between Singapore and the United States may depend on the stereotypes people have about specific minorities. Future studies may consider running measurement invariance studies on these scales to ensure that the prejudice construct measured is equivalent across cultures.

Thirdly, a more nuanced distinction needs to be made between (a) psychometric structures and (b) specific scales/questionnaires based on those psychometric structures. For instance, the facet structures (as described in Table 5.1) examined in this thesis are psychometric structures of openness, while the scales (i.e., IPIP-NEO, SFOS, and HEXACO-PI) are simply the operational definition of these structures. In this thesis, only one questionnaire was used to measure the NEO, SFOS, and HEXACO facet structures. Thus, any differences observed between the SFOS and the IPIP-NEO could reflect differences

between the psychometric structures (Table 5.2) or reflect differences between those specific questionnaires and scales (e.g., differences in scale reliability, idiosyncratic item content, etc.). Specifically, the findings of this research cannot conclude if the pattern of findings are peculiar to these specific measures, or if they have a degree of method independence, and will generalise to other measures of those same psychometric structures. Convergent evidence from multiple measures of these structures (e.g., NEO-PI-3, HEXACO-PI-R) are needed to draw firm conclusions about psychometric structures.

Fourthly, I acknowledge a lack of individual-level measurement of cultural variables, such as the collectivism scales (Oyserman et al., 2002), which means that any difference between the national samples cannot be empirically attributed to cultural sources (Matsumoto & Yoo, 2006). I tried to circumvent this issue by conducting moderated regression analyses with the national origin of the participants as a moderator to test whether the moderating role of culture is significantly different from chance occurrence. However, a strong claim for the moderating role of culture cannot be ascertained because the moderating role of culture were only significant in Study 2 and not Study 1. Without assessing specific cultural variables, the difference between samples, regardless whether the samples are from the same national origin or not, may simply indicate a failure in replicability (i.e., chance occurrence). Specifically, the effect of openness and prejudice in Singapore may be weaker than the effect of these relationship in the United States (i.e., Study 2) due to methodological artefacts or other issues, and not because of the difference in culture.

Although the approach of using the national origin of the participants to make cultural inferences is common practice in existing literature (e.g., Beugelsdijk & Welzel, 2018), dimensions of cultural variability (e.g., individualism vs collectivism, power distance, uncertainty avoidance, tightness-looseness index) may be measured in future studies to examine which specific cultural dimensions best explain the cultural differences in the

linkage between openness and group attitudes. Measures such as the Belief in a Dangerous World scale (Duckitt et al., 2002) may also be used to examine if participants from the United States perceive their world as more dangerous than participants from Singapore. In order to make more specific claims, future studies might also need to recruit a larger sample for a higher statistical power.

Lastly, I emphasized that the terms "predict" and "explain" were not meant to claim causal explanation but instead used throughout this thesis in a strictly statistical sense, particularly when discussing regression findings (see Yarkoni & Westfall, 2017). Especially given that the facets of openness are defined based on correlated reports of behaviours (Woo et al., 2014), claiming that these latent constructs "explain" those same behaviours is likely to be a circular explanation or tautology (Baumert et al., 2017). Notably, some of the items for the SFOS facet of tolerance (e.g., "I like to hear different people's views on political issues") captured similar behaviours as the social tolerance scale (e.g., "I respect other people's opinions even when I do not agree"). Instead of inferring causality from the results, readers are advised to treat the findings as evidence of convergent validity, where measures of equivalent constructs (i.e., the facet of tolerance and social tolerance) correlate strongly together, and possibly discriminant validity, where measures of dissimilar constructs (i.e., the facet of intellectual efficiency and social tolerance) do not correlate strongly with each other.

Conclusion

The studies reported here represent the first attempt to identify the facet structure and the facet of openness that best predicts the two distinct group attitude constructs: prejudice and social tolerance. Specifically, findings suggest that the IPIP-NEO and the SFOS facet structures of openness and the facet of tolerance (O5s) best predict social tolerance and affect-based prejudice, and the facet structures of IPIP-NEO and HEXACO and the facet of liberalism (O6n) best predict cognitive-based prejudice. In addition, the two primary studies

in Chapters 5 and 6 are the first to examine the link between openness and group attitudes in Southeast Asia, which also uncovered the potential role of cultural factors in these relationships by comparing the findings between two national cultures. Overall, the empirical evidence uncovered in the two primary studies addressed existing research gaps, informed future theoretical refinement of the link between openness and group attitudes, provided empirical differentiation of prejudice and social tolerance, and highlighted the role of national culture. To build a more culturally inclusive theory, further research is needed to sieve out the specific cultural factors responsible for the link between openness and group attitudes.

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Appendix A

ProQuest Databases

List of databases within ProQuest:

1. APA PsycArticles (1894 – current)
2. APA PsycInfo (1806 – current)
3. ABI/INFORM Collection (Business/Management/Trade)
4. Accounting, Tax & Banking Collection
5. Advanced Technologies & Aerospace Database
6. Agriculture Science Database
7. Arts & Humanities Database
8. Asian & European Business Collection
9. Australia & New Zealand Database
10. Australia & New Zealand Newsstream
11. Biological Science Database
12. Business Market Research Collection
13. Coronavirus Research Database
14. Continental Europe Database
15. Criminal Justice Database
16. Canadian Business & Current Affairs Database
17. Canadian Newsstream
18. Career & Technical Education Database
19. Computer Science Database
20. Consumer Health Database
21. Ebook Central
22. East & South Asia Database
23. East Europe, Central Europe Database
24. ERIC (1966 – current)
25. Education Database
26. Earth, Atmospheric & Aquatic Science Database
27. Engineering Database
28. Environmental Science Database
29. Global Breaking Newswires
30. Health & Medical Collection
31. Healthcare Administration Database
32. International Newsstream
33. India Database
34. Latin America & Iberia Database
35. Library Science Database
36. Linguistics Database
37. Middle East & Africa Database
38. Material Science Database
39. Military Database
40. Nursing & Allied Health Database
41. Public Health Database
42. PTSDpubs (1871 – current)
43. Political Science Database
44. Psychology Database
45. Publicly Available Content Database
46. Religion Database
47. Research Library
48. Social science Database
49. Sociology Database
50. Science Database
51. Turkey Database
52. UK & Ireland Database
53. Telecommunications
54. U.S. Newsstream

Appendix B

Search Strategy

Electronic Databases: SCOPUS, PsycINFO, ProQuest (14/9/2020)

Name of Database/ Disciplines:	SCOPUS / Multidisciplinary
Date coverage:	1970-2020
Library:	James Cook University
Date of search:	16/9/2020
Limits:	No limits applied
Search string:	TITLE-ABS-KEY (prejudice OR discrimination OR toleran* OR intoleran* OR diversity OR attitude* OR religio* OR ideology) AND TITLE-ABS-KEY (openness OR intellect OR “Big five” OR “five factor”) AND ALL (facet*)
Number of hits:	655

Name of Database:	Web of Science / Multidisciplinary
Date coverage:	1900-2020
Library:	James Cook University
Date of search:	16/9/2020
Limits:	No limits applied
Search string:	TOPIC: (prejudice OR discrimination OR toleran* OR intoleran* OR diversity OR attitude* OR religio* OR ideology) AND TOPIC: (openness OR intellect OR “Big five” OR “five factor”) AND ALL FIELDS: (facet*)
Number of hits:	151

Name of Database:	ProQuest / Multidisciplinary
Date coverage:	1900-2020
Library:	James Cook University
Date of search:	16/9/2020
Limits:	No limits applied
Search String:	noft(prejudice OR discrimination OR toleran* OR intoleran* OR diversity OR attitude* OR religio* OR ideology) AND noft(openness OR intellect OR "Big five" OR "five factor") AND facet*
Number of hits:	1412

Appendix C

Title and Abstract Screening Tool

1. Is the citation written in English[1]?

   - ❒ Yes, proceed to Q2.
   - ❒ No, exclude (proceed to the next citation)

2. Is the citation type classified under any of these categories?

   - Thesis
   - Journal articles
   - Conference papers
   - Book or Book Chapters

   - ❒ Yes, proceed to Q3.
   - ❒ Unsure, proceed to Q3.
   - ❒ No, exclude (proceed to the next citation)

3. Is the study primary research?
   (i.e., NOT opinion papers, theoretical papers or lecture notes)

   - ❒ Yes, proceed to Q4.
   - ❒ Unsure, proceed to Q4.
   - ❒ No, exclude (proceed to the next citation)

4. Does the abstract or title mentions the use of personality measures?
   (related terms include: NEO-PI-R, BFI, HEXACO-PI, IPIP)

   - ❒ Yes, proceed to Q5.
   - ❒ Unsure, proceed to Q5.
   - ❒ No, exclude (proceed to the next citation)

5. Does the abstract or title mentions Openness to Experience and/or its facets?
   (related terms include: Intellect, Openness, Experiencing, “Big Five”, “five factor”)

   - ❒ Yes, proceed to Q6.
   - ❒ Unsure, proceed to Q6.
   - ❒ No, exclude (proceed to the next citation)

6. Does the abstract or title mentions terms related to prejudice or diversity tolerance?
   (related terms include: intergroup relations, stigma, multiculturalism, multicultural competence, cultural humility, discrimination, conservatism)

   - ❒ Yes, include (select article for full-text screening)
   - ❒ Unsure (select article for full-text screening)
   - ❒ No, exclude (proceed to the next citation)

Appendix D

Full Text Screening Tool

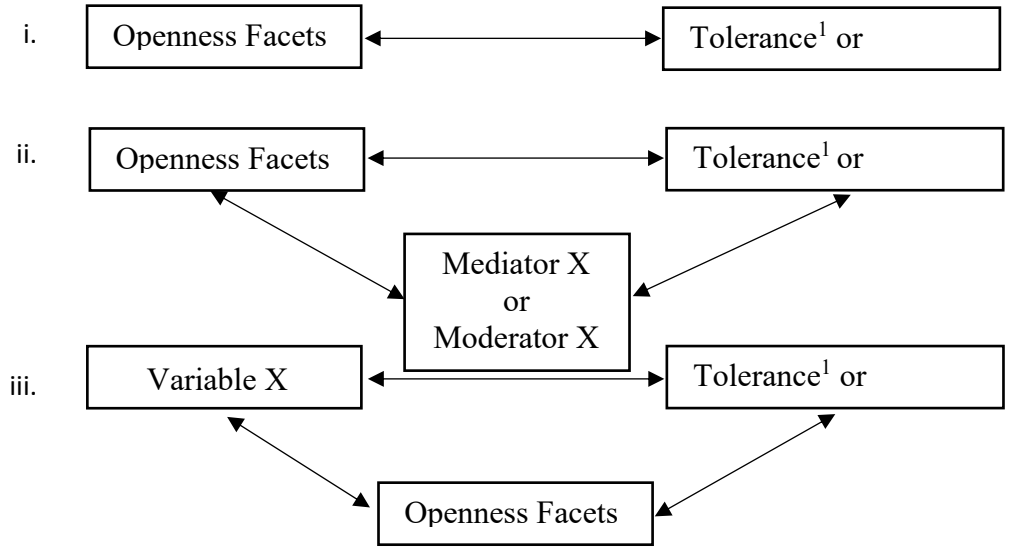
1. Does the Method or Result sections describe the measurement and resulting analysis of facets of openness to experience?

   - ❒ Yes, proceed to Q2.
   - ❒ Unsure[3], proceed to Q2.
   - ❒ No, exclude (proceed to the next citation)

2. Does the Method or Result section describe the measurement and resulting analysis of social tolerance[1] or prejudice[2]?

   - ❒ Yes, proceed to Q3.
   - ❒ Unsure[3], proceed to Q3.
   - ❒ No, exclude (proceed to the next citation)

3. Does the study investigate one of the following:



   - ❒ Yes, include article for analysis.
   - ❒ Unsure[3].
   - ❒ No, exclude (proceed to the next citation)

[1] Tolerance is defined as the acceptance of diversity, respect for diversity, and appreciation for diversity. Related terms: xenophilia, openness to diversity, multiculturalism, pluralism, universalism, universal-diversity. Excluded terms: liberalism, egalitarianism, identification with all humanity, global citizenship, color-blindness.

[2] Prejudice is defined as a negative attitude (with cognitive, affective, & behavioural components) towards a specific or generalised target group. Related terms: Racism, homophobic, stigma (others), xenophobic, ethnocentrism. Excluded terms: political ideology, political attitude, conservatism, right wing authoritarianism, social dominance orientation, dogmatism, fundamentalism, extremist ideology

[3] Reviewers should only select the "Unsure" option if the article may be relevant. If the article is obviously not relevant, "No" should be selected. Articles that are labelled as "Unsure" should be brought up during deconflict meetings between reviewers.

Appendix E

Data Extraction Instrument (page 1 of 2)

Basic Information of study				
Article title				
Authors			Year	
Types of Prejudice (e.g., generalised, racism, islamophobia, etc)				
Types of Tolerance (e.g., Universalism, openness to diversity,etc)				
Sample Characteristics				
Total N		Demographics status (age, gender, etc)		
Country		Sampling Recruitment methods		
Theoretical Frameworks and Structural Models used in Study				
Theories used (to explain link between Openness and prejudice (or tolerance)) – (search from introduction of paper)		*Additional variable/s examined*		
Structural Model used in examining the link between Openness and prejudice (or tolerance) – (search from methods or results section of paper)				

Data Extraction Instrument (page 2 of 2)

Tools					
Construct	Names of Variable(s) examined	Name of measure used (Author, YY)	Cronbach Alpha	Scoring methods	Implicit or Explicit
1) Openness					
2) Prejudice					
3) Tolerance					
4) Additional Variable/s (if available)					
Key Findings					

Appendix F

Ethics Approval

This administrative form has been removed

Appendix G

Information Sheet

JAMES COOK UNIVERSITY
AUSTRALIA

PARTICIPANT INFORMATION SHEET
PROJECT TITLE: **An online survey on the relationship between personality and attitudes**

You are invited to take part in a research project that examines at the association between personality and attitudes. The study is being conducted by Da Xuan Ng and will contribute to his dissertation for a Doctor of Philosophy (Health) degree at James Cook University (JCU).

Your participation will involve completing an online survey consisting of some demographic questions as well as a series of questionnaire items on personality and social attitudes. The survey is expected to take approximately 30-40 minutes. Your identity and responses will be completely anonymous and non-identifiable.

Your participation in this study is entirely voluntary. If you do not wish to take part you may choose to withdraw at any time. To withdraw, please close the relevant browser tab or window. However, once responses have been provided, the researcher will not be able to identify and delete your responses should you choose to withdraw.

Data collected during the study will be stored securely as per JCU Research Data Management policies and procedures. These data will be shared openly upon study completion. The data will also be used in generating academic publications and other research outputs. As your participation is anonymous, you will not be identified in any way in these publications. If you wish to receive a copy of a summary of the study's findings, please email the Principal Investigator with your request. The summary will be available in early 2024.

In completing the survey, you will receive:
(a compensation of USD$2.50) – Only available in the info sheet for U.Ss participants
(either a compensation of SGD$5 or 2 credit points) – Only available in the info sheet for SG participants
for your time.

This project has minimal risk and is not expected to pose any significant distress. However, if after participating in this survey you feel a need to seek support, please feel free to contact any of the followings:

- National Suicide Prevention Lifeline (24 hrs) on 1800-273-8255; or your General Practitioner (GP) for additional support. - Only available in the info sheet for U.Ss participants
- SOS (24 hrs) on 1800 221 4444; 2) James Cook University Psychology Clinic at 149 Sims Dr, Singapore 387380 on 6377 6825; or 3) your General Practitioner (GP) for additional support. - Only available in the info sheet for SG participants

For more information, you may wish to contact the Principal Investigator at da.ng@my.jcu.edu.au.

Principal Investigator:
Da Xuan Ng
School of Social and Health Sciences
James Cook University
Singapore
Phone:
Email: da.ng@my.jcu.edu.au

Primary Supervisor:
Associate Professor Jonathan Ramsay
School of Social and Health Sciences
James Cook University
Singapore
Phone:
Email: jonathan.ramsay@jcu.edu.au

If you have any concerns regarding the ethical conduct of the study, please contact:
Human Ethics, Research Office
James Cook University, Townsville, Qld, 4811
Phone: (ethics@jcu.edu.au)

Appendix H

Consent Form

This administrative form has been removed

Appendix I

Online Survey Items

(The below demographics items will be applicable and made available for only Singaporean sample)

i. What is your religion?

- ☐ Christians/Christianity
- ☐ Muslims/Islam
- ☐ Hindus/Hinduism
- ☐ Buddhists/Buddhism
- ☐ Others

ii. What is your race?

- ☐ Chinese
- ☐ Malay
- ☐ Indian
- ☐ Europeans
- ☐ Others

iii. What is your age (in years)?

[ ]

iv. What is your gender?

- ☐ Male
- ☐ Female
- ☐ Others
- ☐ Prefer not to say

v. What is your Singapore residential status?

- ☐ Singapore Citizen
- ☐ Singapore Permanent Resident

☐ Others

vi. What is your highest education level?

☐ Primary/Elementary school level

☐ Secondary/Middle school level

☐ Junior College/High school level

☐ Pre-University/Diploma/Undergraduate level

☐ Postgraduate level (e.g., Masters, PhD)

(The below demographics items will be applicable and made available for only U.S.sample)

i. What is your religion?

☐ Christians/Christianity
☐ Muslims/Islam
☐ Buddhists/Buddhism
☐ Hindus/Hinduism
☐ Jews/Judaism
☐ Others

ii. What is your race?

☐ Europeans
☐ Africans
☐ Hispanic
☐ Asian
☐ Others

iii. What is your age?

iv. What is your gender?

☐ Male
☐ Female
☐ Others
☐ Prefer not to say

v. What is your U.S. residential status?

☐ U.S. Citizen
☐ U.S. Permanent Resident
☐ Others

vi. What is your highest education level?

☐ Primary/Elementary school level
☐ Secondary/Middle school level
☐ Junior College/High School level
☐ Pre-University/Diploma/Undergraduate level
☐ Postgraduate level (e.g., Masters, PhD)

vii. Response Quality Item 1

We care about the quality of our survey data and hope to receive the most accurate measure of your opinions, so it is important to us that you thoughtfully provide your best answer to each question in the survey. Do you commit to providing your thoughtful and honest answers to the questions in this survey?

- ☐ I will provide my best answers
- ☐ I will not provide my best answers
- ☐ I can't promise either way

viii. IPIP-NEO Openness Inventory

Below are some phrases describing people's behaviours. Please use the rating scale next to each phrase to describe how accurately each statement describes you.

Describes yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age.

Please read each statement carefully, and then click the circle that corresponds to the accuracy of the statement.

	Very Inaccurate	Moderately Inaccurate	Neither Accurate Nor Inaccurate	Moderately Accurate	Very Accurate
1. Have a vivid imagination	1	2	3	4	5
2. Enjoy wild flights of fantasy	1	2	3	4	5
3. Love to daydream	1	2	3	4	5
4. Like to get lost in thought	1	2	3	4	5
5. Indulge in my fantasies	1	2	3	4	5
6. Spend time reflecting on things	1	2	3	4	5
7. Seldom daydream (R)	1	2	3	4	5
8. Do not have a good imagination (R)	1	2	3	4	5
9. Seldom get lost in thought (R)	1	2	3	4	5
10. Have difficulty imagining things (R)	1	2	3	4	5

11. Believe in the importance of art	1	2	3	4	5
12. Like music	1	2	3	4	5
13. See beauty in things that others might not notice	1	2	3	4	5
14. Love flowers	1	2	3	4	5
15. Enjoy the beauty of nature	1	2	3	4	5
16. Do not like art (R)	1	2	3	4	5
17. Do not like poetry (R)	1	2	3	4	5
18. Do not enjoy going to art museums (R)	1	2	3	4	5
19. Do not like concerts (R)	1	2	3	4	5
20. Do not enjoy watching dance performances (R)	1	2	3	4	5
21. Experience my emotions intensely	1	2	3	4	5
22. Feel others' emotions	1	2	3	4	5
23. Am passionate about causes	1	2	3	4	5
24. Enjoy examining myself and my life	1	2	3	4	5
25. Try to understand myself	1	2	3	4	5
26. Seldom get emotional (R)	1	2	3	4	5
27. Am not easily affected by my emotions (R)	1	2	3	4	5
28. Rarely notice my emotional reactions (R)	1	2	3	4	5

29. Experience very few emotional highs and lows (R)	1	2	3	4	5
30. Don't understand people who get emotional (R)	1	2	3	4	5
31. Prefer variety to routine	1	2	3	4	5
32. Like to visit new places	1	2	3	4	5
33. Interested in many things	1	2	3	4	5
34. Like to begin new things	1	2	3	4	5
35. Prefer to stick with things that I know (R)	1	2	3	4	5
36. Dislike changes (R)	1	2	3	4	5
37. Don't like the idea of change (R)	1	2	3	4	5
38. Am a creature of habit (R)	1	2	3	4	5
39. Dislike new foods (R)	1	2	3	4	5
40. Am attached to conventional ways (R)	1	2	3	4	5
41. Like to solve complex problems	1	2	3	4	5
42. Love to read challenging material	1	2	3	4	5
43. Have a rich vocabulary	1	2	3	4	5
44. Can handle a lot of information	1	2	3	4	5
45. Enjoy thinking about things	1	2	3	4	5
46. Am not interested in abstract ideas (R)	1	2	3	4	5
47. Avoid philosophical discussions (R)	1	2	3	4	5
48. Have difficulty understanding abstract ideas (R)	1	2	3	4	5

49. Am not interested in theoretical discussions (R)	1	2	3	4	5
50. Avoid difficulty reading material (R)	1	2	3	4	5
51. Tend to vote for liberal political candidates	1	2	3	4	5
52. Believe that there is no absolute right or wrong	1	2	3	4	5
53. Believe that criminals should receive help rather than punishment	1	2	3	4	5
54. Believe in one true religion (R)	1	2	3	4	5
55. Tend to vote for conservative political candidates (R)	1	2	3	4	5
56. Believe that too much tax money goes to support artists (R)	1	2	3	4	5
57. Believe laws should be strictly enforced (R)	1	2	3	4	5
58. Believe that we coddle criminals too much (R)	1	2	3	4	5
59. Believe that we should be tough on crime (R)	1	2	3	4	5
60. Like to stand during the national anthem (R)	1	2	3	4	5

Items 1-10 = Imagination, Items 11-20 = Artistic Interests, Items 21-30 = Emotionality, Items 31-40 = Adventurousness, Items 41-50 = Intellect, Items 51-60 = Liberalism.

ix. HEXACO-PI Openness Inventory

Please read each statement and decide how much you agree or disagree with that statement. Then indicate your response on the scale beside each statement. Please answer every statement, even if you are not completely sure of your response.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I would be quite bored by a visit to an art gallery (R)	1	2	3	4	5
2. I tend to appreciate the beauty of nature more than most people do.	1	2	3	4	5

3. I wouldn't spend my time reading a book of poetry. (R)	1	2	3	4	5
4. If I had the opportunity, I would like to attend a classical music concert.	1	2	3	4	5
5. Sometimes I like to just watch the wind as it blows through the trees.	1	2	3	4	5
6. I don't really enjoy looking at sculptures. (R)	1	2	3	4	5
7. Attending a play is not something that I would enjoy. (R)	1	2	3	4	5
8. I can spend a long time studying a painting that I like.	1	2	3	4	5
9. I'm interested in learning about the history and politics of other countries.	1	2	3	4	5
10. I find TV nature programs to be very boring. (R)	1	2	3	4	5
11. I enjoy looking at maps of different places.	1	2	3	4	5
12. I know the capital cities of many countries.	1	2	3	4	5
13. I would like to visit the ruins of ancient civilizations.	1	2	3	4	5
14. I would be very bored by a book about the history of science and technology. (R)	1	2	3	4	5
15. I like to keep up with news about scientific discoveries.	1	2	3	4	5
16. I’ve never really enjoyed looking through an encyclopedia. (R)	1	2	3	4	5
17. I prefer doing things the way I've always done them, rather than waste time looking for a new way. (R)	1	2	3	4	5

18. I would like a job that requires following a routine rather than being creative. (R)	1	2	3	4	5
19. I think I could develop some good ideas for television commercials.	1	2	3	4	5
20. I would like the job of drawing a comic strip or an editorial cartoon.	1	2	3	4	5
21. I have often solved problems by using new ideas that other people had not imagined.	1	2	3	4	5
22. I would enjoy creating a work of art, such as a novel, a song, or a painting.	1	2	3	4	5
23. People have often told me that I have a good imagination.	1	2	3	4	5
24. I don't think of myself as the artistic or creative type. (R)	1	2	3	4	5
25. I like hearing about opinions that are very different from those of most people.	1	2	3	4	5
26. I think that paying attention to radical ideas is a waste of time. (R)	1	2	3	4	5
27. People sometimes describe me as unconventional.	1	2	3	4	5
28. I would avoid hanging around with people who have unusual opinions. (R)	1	2	3	4	5
29. I like people who have unconventional views.	1	2	3	4	5

30. Most people would consider some of my beliefs to be quite strange.	1	2	3	4	5
31. I find it boring to discuss philosophy. (R)	1	2	3	4	5
32. I think of myself as a somewhat eccentric person.	1	2	3	4	5

Items 1-8 = Aesthetic Appreciation, Items 9-16 = Inquisitiveness, Items 17-24 = Creativity, Items 25-32 = Unconventionality

x. The SFOS openness Inventory

Please read each statement and decide how much you agree or disagree with that statement. Then indicate the response that best matches your agreement.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Tasks that require a lot of thinking confuse me easily (R)	1	2	3	4	5
2. I am a slow learner (R)	1	2	3	4	5
3. I always have difficulty applying new concepts (R)	1	2	3	4	5
4. I often need people to explain things to me (R)	1	2	3	4	5
5. I am usually not very quick in my thinking but have strengths in other areas (R)	1	2	3	4	5
6. I have to read complex information several times before I fully understand it (R)	1	2	3	4	5
7. I need things explained to me only once	1	2	3	4	5
8. I am very quick at processing information	1	2	3	4	5

9. I grasp scientific theories easily.	1	2	3	4	5
10. I'm hopeless with inventing new things (R)	1	2	3	4	5
11. I rarely take an idea and apply it in a new way (R)	1	2	3	4	5
12. I avoid situations where I might have to come up with something new (R)	1	2	3	4	5
13. Compared to other people I don't think I am very creative (R)	1	2	3	4	5
14. I like coming up with imaginative plans	1	2	3	4	5
15. I improvise if I don't have the right tool for a job	1	2	3	4	5
16. I would rather have a job that involves creativity than one that doesn't	1	2	3	4	5
17. I can develop inventive ideas of high quality	1	2	3	4	5
18. People come to me if they are stuck for fresh ideas	1	2	3	4	5
19. I don't like trying new things and would rather stick with what I know (R)	1	2	3	4	5
20. I have no interest in learning new information (R)	1	2	3	4	5
21. I have never really been interested in science (R)	1	2	3	4	5
22. I seldom seek new opportunities to extend my knowledge (R)	1	2	3	4	5

23. In a quiz, I like to know what the answers are if I get the questions wrong	1	2	3	4	5
24. I like to analyse things instead of taking them at face value	1	2	3	4	5
25. I love to do experiments and see the results	1	2	3	4	5
26. I continually strive to uncover information about topics that are new to me	1	2	3	4	5
27. I try to learn something new every day.	1	2	3	4	5
28. I think viewing art is a waste of time (R)	1	2	3	4	5
29. Art bores me (R)	1	2	3	4	5
30. I don’t find classical ballet interesting (R)	1	2	3	4	5
31. I don’t find literature especially interesting (R)	1	2	3	4	5
32. I have a passion for art	1	2	3	4	5
33. I enjoy art exhibition	1	2	3	4	5
34. I see the beauty in art when others do not	1	2	3	4	5
35. I have been touched emotionally by a great musical performance	1	2	3	4	5

36. If I see artwork I like in a gallery, I will visit it more than once to fully appreciate it	1	2	3	4	5
37. Immigrants really irritate me (R)	1	2	3	4	5
38. I think it is rude when others speak in a language I can't understand (R)	1	2	3	4	5
39. I prefer to visit countries when they speak my language (R)	1	2	3	4	5
40. I like to hear different people's views on political issues	1	2	3	4	5
41. I understand that people can have different attitudes toward certain things than I do	1	2	3	4	5
42. Like most people I am open to listening to what others have to say	1	2	3	4	5
43. I enjoy experiencing the rituals associated with different religions	1	2	3	4	5
44. I learn a great deal from people with differing beliefs	1	2	3	4	5
45. I enjoy (racial) diversity in the community.	1	2	3	4	5
46. I believe in-depth discussions are a complete waste of time (R)	1	2	3	4	5
47. I regard philosophy as a disease of the idle (R)	1	2	3	4	5
48. Sometimes I avoid getting involved in philosophical discussion (R)	1	2	3	4	5
49. I'm happiest when conversations are practical rather than philosophical (R)	1	2	3	4	5

50. I take the time to reflect on my thoughts and actions	1	2	3	4	5
51. For me personal growth is more important than success	1	2	3	4	5
52. I am always interested in learning more about philosophy	1	2	3	4	5
53. For me, there is nothing better than taking the time to think deeply about something	1	2	3	4	5
54. I am fascinated by meditation and processes which encourage one to look inward.	1	2	3	4	5

Items 1-9 = Intellectual efficiency, Items 10-18 = Ingenuity, Items 19-27 = Curiosity, Items 28-36 = Aesthetics, Items 37-45 = Tolerance, Items 46-54 = Depth.

xi. Hjerm et al., (2020) Tolerance inventory (Study 1)

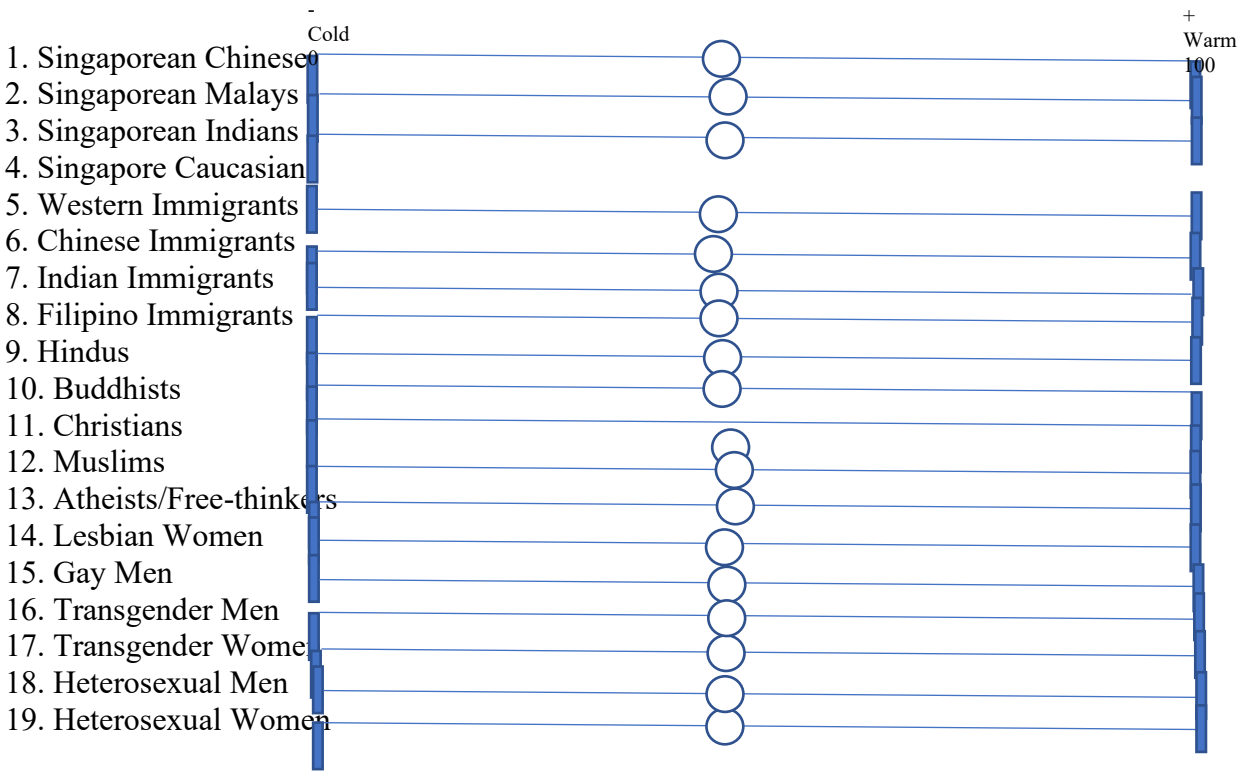
The following statement describes your beliefs and opinions. Please read each statement and decide how much you agree or disagree with each statement.

	Completely Disagree	Disagree	Neutral	Agree	Completely Agree
1. People should have the right to live how they wish.	1	2	3	4	5
2. It is important that people have the freedom to live their life as they choose	1	2	3	4	5
3. It is okay for people to live as they wish as long as they do not harm other people	1	2	3	4	5
4. I respect other people's beliefs and opinions.	1	2	3	4	5

5. I respect other people's opinions even when I do not agree.	1	2	3	4	5
6. I like to spend time with people who are different from me.	1	2	3	4	5
7. I like people who challenge me to think about the world in a different way.	1	2	3	4	5
8. Society benefits from a diversity of traditions and lifestyles.	1	2	3	4	5

xii. Feeling Thermometer Items (Study 1)

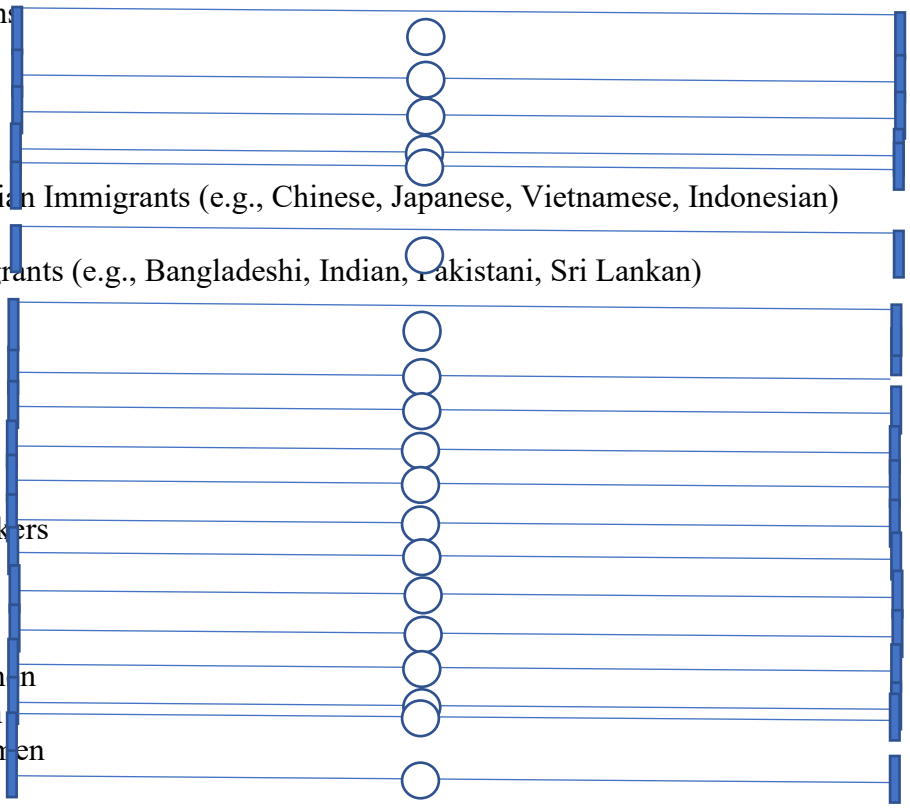
We would like to get your feelings toward ten groups of people using something we call the feeling thermometer. The LEFT end of the slider bar represents 0 degrees (very cold or unfavorable feeling) and the RIGHT end represents 100 degrees (very warm or favorable feeling). If you didn't feel particularly warm or cold toward a group, you would rate it at the 50-degree mark.
Please indicate below how warm or cold you feel towards each groups.
(The below items will be applicable and made available for only Singaporean sample)



*All items (excluding Items 1, 10, 18-19) were summed and averaged to derive an overall prejudice score.

(The below items will be applicable and made available for only United States based sample)

1. European Americans
2. African Americans
3. Asian Americans
4. Latino Americans
5. Native Americans
6. East/South East Asian Immigrants (e.g., Chinese, Japanese, Vietnamese, Indonesian)
7. South Asian Immigrants (e.g., Bangladeshi, Indian, Pakistani, Sri Lankan)
8. Latino Immigrants
9. Hindus
10. Buddhists
11. Christians
12. Muslims
13. Atheists/Free thinkers
14. Lesbian Women
15. Gay Men
16. Transgender Men
17. Transgender Women
18. Heterosexual Men
19. Heterosexual Women



*All items (excluding Items 1, 11, 18-19) were summed and averaged to derive an overall prejudice score.

xiii. Prejudice Items (Study 2)

Attitude Toward Lesbians and Gay-Short Scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Sex between two men is just plain wrong	1	2	3	4	5
2. Male homosexuals are disgusting	1	2	3	4	5
3. Male homosexuality is a natural expression of sexuality in men (R)	1	2	3	4	5
4. Sex between two women is just plain wrong	1	2	3	4	5
5. Lesbians are disgusting	1	2	3	4	5

6. Female homosexuality is a natural expression of sexuality in women (R)	1	2	3	4	5

Modern Racism Scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Discrimination against racial minorities is no longer a problem in Singapore (United States)	1	2	3	4	5
2. It is easy to understand the anger of racial minorities in Singapore (United States)(R)	1	2	3	4	5
3. Racial minorities are getting too demanding in their push for equal rights	1	2	3	4	5
4. Racial minorities should not push themselves where they are not wanted	1	2	3	4	5
5. Over the past few years, racial minorities have gotten more economically than they deserve	1	2	3	4	5
6. Over the past few years, the government and news media have shown more respect to racial minorities than they deserve	1	2	3	4	5

Modern Sexism Scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Discrimination against women is no longer a problem in Singapore (United States).	1	2	3	4	5
2. Women often miss out on good jobs due to sexual discrimination (R)	1	2	3	4	5
3. It is rare to see women treated in a sexist manner on television	1	2	3	4	5
4. On average, people in our society treat husbands and wives equally	1	2	3	4	5

5. Society has reached the point where women and men have equal opportunities for achievement	1	2	3	4	5
6. It is easy to understand the anger of women's groups in Singapore (United States)(R)	1	2	3	4	5
7. It is easy to understand why women's groups are still concerned about societal limitations of women's opportunities (R)					
8. Over the past few years, the government and news media have been showing more concern about the treatment of women than is warranted by women's actual experiences.					

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xiv. Social Tolerance Scale (Study 2)

Miville-Guzman Universality-Diversity Scale-Short form (MGUDS-S)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I would like to join an organization that emphasises getting to know people from different countries	1	2	3	4	5
2. Persons with disabilities can teach me things I could not learn elsewhere	1	2	3	4	5
3. Getting to know someone of another race is generally an uncomfortable experience for me (R)	1	2	3	4	5
4. I would like to go to dances that feature music from other countries	1	2	3	4	5
5. I can best understand someone after I get to know how he/she is both similar to and different from me.	1	2	3	4	5

6. I am only at ease with people of my race (R)	1	2	3	4	5
7. I often listen to music of other cultures	1	2	3	4	5
8. Knowing how a person differs from me greatly enhances our friendship	1	2	3	4	5
9. It's really hard for me to feel close to a person from another race (R)	1	2	3	4	5
10. I am interested in learning about the many cultures that have existed in this world	1	2	3	4	5
11. In getting to know someone, I like knowing both how he/she differs from me and is similar to me	1	2	3	4	5
12. It is very important that a friend agrees with me on most issues(R)	1	2	3	4	5
13. I attend events where I might get to know people from different racial backgrounds	1	2	3	4	5
14. Knowing about the different experiences of other people helps me understand my own problems better.	1	2	3	4	5
15. I often feel irritated by persons of a different race (R)	1	2	3	4	5

xv. Response Quality Item 2

Lastly, it is vital to our study that we only include responses from people that devoted their full attention to this study. Otherwise, years of effort (the researchers' and the time of other participants) could be wasted. You will receive credit for this study no matter what, however, in your honest opinion, should we use your data in our analyses in this study?

☐ Yes

☐ No