

Cognitive-Affective Processes and Academic Conscientiousness

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Abstract

There has been an increasing interest in understanding the personality processes that interact with the environment and lead to trait-manifesting behaviour. Researchers have noted that combining trait and cognitive-affective-motivational approaches to personality can lead to a greater understanding of trait expressions, the identification of moderators of trait expressions, and the development of new interventions to change personality and individual differences (Baumert & Schmitt, 2012). However, thus far, the research has primarily focused on the traits of neuroticism, extraversion, and agreeableness, and have not included the trait of conscientiousness. This is despite the known relationship between conscientiousness and important outcomes, such as academic performance. Alongside this limitation to previous research, attempts to link cognitive-affective processes to other personality traits, that are presumed to have substantial affective components, such as extraversion and neuroticism, have been mixed. These mixed results may be partly due to methodological limitations, such as the use of broadly valenced stimuli that do not necessarily have specific personal relevance to the participants in the study. Consequently, the research reported in this thesis focused upon the question, “How are personality traits, and conscientiousness in particular, related to cognitive-affective processes for relevant stimuli?” It was expected that the results of the studies in the thesis would further the understanding of the affective core of conscientiousness, and provide insight into the relationship between traits and how associated cognitive-affective processes interact with the environment to lead to trait-manifesting behaviour.

In line with this question and expectations, the current research had four purposes:

- Firstly, to see whether conscientiousness was associated with cognitive-affective processes for academic-related stimuli, in the categories of academic-approach,

academic-avoidance, performance-evaluative, and academic-neutral, among samples of university students.

- Secondly, to see whether extraversion and neuroticism were associated with the cognitive-affective processes of these academic-relevant stimuli, which would have personal relevance/significance to the student participants in the studies.
- Thirdly, to see whether the situational context (week-of-semester in which the study was conducted) moderated the relationships between traits and cognitive affective processes.
- Finally, to see whether cognitive-affective processes were related to intention to commit academic-conscientious behaviour in the coming week.

These main aims were investigated across three studies and three different cognitive-affective processes: chronic accessibility, attentional bias, and appraisals. Study 1 investigated chronic accessibility (how accessible and readily activated a concept is) using a lexical decision task with 85 undergraduate students. The results indicated that conscientiousness was positively associated with chronic accessibility of academic-neutral words. Furthermore, extraversion was positively and neuroticism was negatively associated with chronic accessibility of academic-approach words. Week-of-semester in which the study was conducted moderated the relationship between neuroticism and chronic accessibility of academic-avoidance stimuli, although the simple slopes were not significant.

Study 2 investigated attentional bias (the preferential attention of one category of stimuli over another) in 120 undergraduate students, using the dot-probe task across two stimulus durations: 100ms, which should capture relatively automatic attentional processing; and 500ms, which should capture more controlled attentional processing. The results indicated that conscientiousness was positively associated with attentional bias for performance-evaluative stimuli at both 100ms and 500ms. Additionally, intention to commit

academic-conscientiousness behaviours (e.g., “Show up for a class more than 5 minutes early”) in the next week was associated with attentional bias for performance-evaluative stimuli at 100ms. Neuroticism was positively associated with attentional bias for academic-avoidance stimuli at both 100ms and 500ms. The relationship between neuroticism and attentional bias for academic-avoidance stimuli at 100ms was moderated by week-of-semester, in that the relationship was only significant later in the semester.

Study 3 investigated the relationship between traits and the appraisal (the cognitive categorisation of stimuli) of pleasantness and relevance/significance of stimuli in 120 undergraduate students. Conscientiousness had a medium to strong relationship with both appraisal types (i.e., pleasantness- and relevance/significance-appraisals) across all stimulus categories, except for pleasantness-appraisals of academic-avoidance stimuli. Overall, stimulus-appraisals accounted for 35% of the variance in conscientiousness, and 43% of the variance in achievement striving. Pleasantness-appraisals of academic-neutral stimuli mediated the relationship between conscientiousness and intentions to commit conscientious academic behaviours in the next week. Neuroticism was associated with the relevance/significance, but not pleasantness, appraisals of academic-avoidance stimuli, and extraversion was associated with the pleasantness, but not relevance/significance, appraisals of academic-approach stimuli.

The results of these studies have important implications for understanding personality and cognitive-affective processes. Firstly, the results of these studies indicate that conscientiousness is associated with the cognitive-affective processing of trait-relevant/significant stimuli. This calls into question the assumption that conscientiousness is a trait which primarily reflects self-regulation, and is unrelated to the affective processing of stimuli. Secondly, the finding that relevance/significance appraisals are important in explaining the relationships between traits and the stimuli indicates that future research may

benefit from explicitly considering stimuli relevance/significance when designing cognitive-affective research. Investigations of stimuli relevance/significance may be more useful than broader stimuli-valence when seeking to investigate the affective core of traits. Thirdly, the finding that week-of-semester moderated the relationship between neuroticism and cognitive-affective processes provides initial evidence that naturally occurring situational contexts moderate the relationship between Big Five traits and cognitive-affective processes. Finally, it is expected that this research may have practical implications for a new generation of game-based personality assessments, which measure personality traits through cognitive or cognitive-affective tasks.

Declaration

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

(Signed) _____ (Date) 22/12/2017

Daniel Cummings

Preface

Publications During Candidature

Papers

- Cummings, D. J., Poropat, A. E., & Loxton, N. J. (2017). Chronic accessibility of academic stimuli: Conscientiousness, extraversion, neuroticism. *Personality and Individual Differences, 115*(1), 114-147. doi:10.1016/j.paid.2016.03.020.
- Cummings, D. J., Poropat, A. E., & Loxton, N. J. (2017). An investigation of the cognitive-motivational processes of personality traits using attentional bias methodology. *Under review*.
- Cummings, D. J., Poropat, A. E., Loxton, N. J., & Sheeran, N. (2017). Development and initial validation of multidimensional student performance scales. *Learning and Individual Differences, 59*, 22-33. doi: 10.1016/j.lindif.2017.08.008.
- Cummings, D. J., Loxton, N. J., & Poropat, A. E. (in press). The relevance/significance of stimuli appraisals for personality traits in an academic context. *Learning and Individual Differences*. doi: 10.1016/j.lindif.2018.04.008
- Cummings, D. J., Sheeran, N. (2017). Intrinsically motivated and not neurotic: Which students benefit the most from peer assisted study sessions? *Manuscript prepared for publication*.
- Sheeran, N., & Cummings, D. J., (2017). Connected and engaged? The use of Facebook in university courses *Under review*.

Book Sections

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Cummings, D. J., & Poropat, A. E. (2016). Personality traits. In A. Wilkinson & S. Johnstone (Eds.), *The Encyclopedia of Human Resource Management* (pp. 333-335).

Northampton, Mass. USA: Edward Elgar.

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Conference presentations

Cummings, D. J., & Loxton, N. J. (December, 2017). *Conscientiousness and cognitive flexibility*. Paper presented at the Australian Conference on Personality and Individual Differences, Sydney, Australia.

Cummings, D. J., Poropat, A., & Loxton, N. (July, 2016). *Personality and attentional bias for academic stimuli*. Paper presented at the European Conference on Personality, Timisoara, Romania.

Cummings, D., & Poropat, A. (July, 2014). *Attentional bias modification for academic conscientiousness: A pilot study*. Paper presented at the International Congress of Applied Psychology, Paris, France.

Cummings, D., & Poropat, A. (November, 2013). *Attentional bias modification for academic conscientiousness: A pilot study*. Paper presented at the Australian Conference on Personality and Individual Differences, Brisbane, Australia.

Cummings, D. J., Sheeran, N. (2017). *Connected and engaged? The use of Facebook in university courses*. Paper presented at the Australian Psychology Learning and Teaching Conference, Brisbane, Australia.

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Cummings, D. J., Poropat, A. E., & Loxton, N. J. (2017). An investigation of the cognitive-motivational processes of personality traits using attentional bias methodology. *Under review.*

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Section 9.1 of the Griffith University Code for the Responsible Conduct of Research (“Criteria for Authorship”), in accordance with Section 5 of the Australian Code for the Responsible Conduct of Research, states:

To be named as an author, a researcher must have made a substantial scholarly contribution to the creative or scholarly work that constitutes the research output, and be able to take public responsibility for at least that part of the work they contributed. Attribution of authorship depends to some extent on the discipline and publisher policies, but in all cases, authorship must be based on substantial contributions in a combination of one or more of:

- conception and design of the research project
- analysis and interpretation of research data
- drafting or making significant parts of the creative or scholarly work or

critically revising it so as to contribute significantly to the final output.

Section 9.3 of the Griffith University Code (“Responsibilities of Researchers”), in accordance with Section 5 of the Australian Code, states:

Researchers are expected to:

- Offer authorship to all people, including research trainees, who meet the criteria for authorship listed above, but only those people.
- accept or decline offers of authorship promptly in writing.
- Include in the list of authors only those who have accepted authorship
- Appoint one author to be the executive author to record authorship and manage correspondence about the work with the publisher and other interested parties.
- Acknowledge all those who have contributed to the research, facilities or materials but who do not qualify as authors, such as research assistants, technical staff, and advisors on cultural or community knowledge. Obtain written consent to name individuals.

Included in this thesis are papers in Chapters 3, 4, and 5 which are co-authored with other researchers. My contribution to each co-authored paper is outlined at the front of the relevant chapter. The bibliographic details for these papers including all authors, are:

Chapter 3: Cummings, D. J., Poropat, A. E., & Loxton, N. J. (2017). Chronic accessibility of academic stimuli: Conscientiousness, extraversion, neuroticism. *Personality and Individual Differences, 115*(1), 114-147. doi:10.1016/j.paid.2016.03.020.

For articles published in *Personality and Individual Differences*, authors retain the right to include articles in a thesis or dissertation, provided it is not published commercially. Permission is not required.

Chapter 4: Cummings, D. J., Poropat, A. E., & Loxton, N. J. (2017). *An investigation of the cognitive-motivational processes of personality traits using attentional bias methodology*. Manuscript submitted for publication.

Currently under review. Presented in Chapter 4 is the original manuscript before suggested revisions by anonymous reviewers.

Chapter 5: Cummings, D. J., Loxton, N. J., & Poropat, A. E. (in press). The relevance/significance of stimuli appraisals for personality traits in an academic context. *Learning and Individual Differences*. doi: 10.1016/j.lindif.2018.04.008

Presented in Chapter 5 is a modified version of the original manuscript, before suggested revisions by journal-sourced anonymous reviewers. For articles published in *Learning and Individual Differences*, authors retain the right to include articles in a thesis or dissertation, provided it is not published commercially. Permission is not required.

Appropriate acknowledgements of those who contributed to the research but did not qualify as authors are included in each paper.

(Signed) _____ (Date) __22/12/2017__

Daniel Cummings

Countersigned)

4 January 2018

Supervisor: Natalie Loxton

At the beginning of Chapter 3, Chapter 4, and Chapter 5, the contributions of others to the manuscripts are detailed.

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To all of you, I dedicate this haiku:

You gave me support

This thesis is due to you

Oh! No space left to -

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Chapter 1: Introduction

Personality traits are commonly used to predict and explain behaviours. For instance, conscientiousness, one of the Big Five factors of personality, has been found to predict outcomes ranging from longevity (Kern & Friedman, 2008), to academic (Poropat, 2009) and job performance (Barrick & Mount, 1991; Hurtz & Donovan, 2000). Because of the relationships between personality and important outcomes, personality traits are often measured and interpreted in applied settings. For instance, job candidates commonly undergo personality tests as part of a selection battery (Saccuzzo, 2012).

Despite the wide recognition of the relationship of personality to important behavioural outcomes, relatively little research has investigated how, why, and when personality is related to trait-manifesting behaviour (e.g., Fleeson & Jayawickreme, 2015). Part of this may be due to the use of differing personality frameworks. For instance, the Big Five proposes a comprehensive taxonomy of five broad traits (extraversion, associated with how outgoing and energetic someone is; conscientiousness, which refers to self-discipline and achievement motivation; neuroticism, which is associated with stress reactivity and negative emotions; agreeableness, which is associated with sympathy and altruism; and openness to experience, which is associated with appreciation of art and nature, and intellectual curiosity). However, the Big Five does not provide a general personality theory, or detail the dynamic personality processes that lead to the expression of these traits (Epstein, 2010; John, Naumann, & Soto, 2008; John & Srivastava, 1999; Pervin, 1994).

In contrast, social-cognitive perspectives on personality propose that personality processes interact with environmental stimuli, leading to behavioural manifestations of traits (e.g., Mischel, 1999; Mischel & Shoda, 1995). However, social-cognitive perspectives on personality lack a unifying taxonomy of traits that apply this perspective (Fleeson, 2012; Fleeson & Jayawickreme, 2015). Although social-cognitive perspectives on personality

propose various mechanisms that interact with the environment, they lack detail regarding the application of these mechanisms to specific traits (Fleeson, 2012; Fleeson & Jayawickreme, 2015).

Key Models and Concepts Relevant to this Thesis

In recognition of the opposing strengths and weaknesses of trait and social-cognitive perspectives on personality, researchers have begun attempts to integrate these different perspectives (e.g., Fleeson, 2012; Fleeson & Jayawickreme, 2015; Roberts, 2009). Whole trait theory (Fleeson, 2012; Fleeson & Jayawickreme, 2015) proposes that traits have both an explanatory and descriptive component. The descriptive component ($Trait_{DES}$) is what is measured when using a descriptive, self-report measure. $Trait_{DES}$ is the general, or average level of the trait over time. The explanatory component ($Trait_{EXP}$) comprises the dynamic, cognitive-affective processes, which interact with the situation and lead to state expressions of the trait. However, whole trait theory is agnostic as to which exact processes are involved in $Trait_{EXP}$, and the proponents explicitly note that a great deal more work needs to be done to identify the social-cognitive mechanisms that lead to trait manifesting behaviour (Fleeson & Jayawickreme, 2015).

Consequently, the overarching research question for this thesis was “how are personality traits, and conscientiousness in particular, related to cognitive-affective processes for relevant stimuli”. To do this, the research project reported here was focused on three potential cognitive-affective processes that theoretically should be important to personality traits: chronic accessibility, attentional bias, and stimuli-appraisals.

Chronic accessibility refers to the accessibility and ready activation of a concept (Higgins & Scholer, 2008) and is the foundation of social-cognitive perspectives on personality (Mischel & Shoda, 1995). Previous research on chronic accessibility of concepts and the traits of neuroticism, extraversion, and agreeableness, has produced mixed results,

with some research finding significant relationships, while other research has failed to find significant relationships (Borkenau, Paelecke, & Yu, 2010; Chan, Goodwin, & Harmer, 2007; Meier & Robinson, 2004; Robinson, Solberg, Vargas, & Tamir, 2003; Rusting, 1999; Rusting & Larsen, 1998; Tamir & Robinson, 2004; Tamir, Robinson, & Clore, 2002).

Attentional bias refers to the preferential allocation of attention to one category of stimuli over another. Attentional bias has been extensively researched in the clinical domain (Yiend, 2009), and there has been some research on attentional bias and personality. As with chronic accessibility, attentional bias research has focused on neuroticism, extraversion, and agreeableness, and again, the results have been mixed (Paelecke, Paelecke-Habermann, & Borkenau, 2012; Reed & Derryberry, 1995; Verhaak, Smeenk, van Minnen, & Kraaimaat, 2004; Wilkowski, Robinson, & Meier, 2006).

Finally, stimuli-appraisals in this thesis are defined as the cognitive categorisation of stimuli, and are theoretically related to other cognitive-affective processes like attention (Sander, Grandjean, & Scherer, 2005; Scherer, 2013), and are an important cognitive-affective process in their own right (Kuppens & Tong, 2010; Moors, Ellsworth, Scherer, & Frijda, 2013; Van Reekum & Scherer, 1997). There has been some research on the relationship between personality traits and appraisals, however again, this has largely focused on neuroticism and extraversion (e.g., Boyes & French, 2012; Gallagher, 1990; Hemenover & Dienstbier, 1996; Schneider, Rench, Lyons, & Riffle, 2012; Shewchuk, Elliott, MacNair-Semands, & Harkins, 1999). Research that has included conscientiousness, has found that conscientiousness is strongly related to different types of appraisals (Penley & Tomaka, 2002; Tong et al., 2006). However, previous research has failed to investigate different categories of stimuli (instead, investigating general appraisal tendencies), which limits the ability to draw conclusions about the appraisal processes involved in conscientiousness.

Aims of the Thesis

To address the overarching research question, this research project had four broad aims. The first aim was to investigate whether conscientiousness was associated with cognitive-affective processes related to stimuli thought to be relevant for people high in conscientiousness (henceforth referred to as trait-congruent stimuli), in the categories of academic-approach words, academic-avoidance words, performance-evaluative words, and academic-neutral words (Table 1 shows the target word-stimuli, and a full stimuli list can be found in Appendix A). These stimuli were used across three studies, assessing three cognitive-affective processes. Study 1 investigated the relationships between conscientiousness and the chronic-accessibility of academic-related stimuli in undergraduate students. Study 2 investigated the relationship between conscientiousness and attentional bias toward academic-related stimuli. Study 3 investigated the relationship between conscientiousness and the pleasantness- and relevance/significance-appraisals of academic-related stimuli. From this line of research, it was expected that conscientiousness would be related to cognitive-affective processes, which has implications for understanding the cognitive-affective-motivational basis of conscientiousness. This may have broader implications for the understanding of how and why conscientiousness is related to important outcomes, such as academic performance.

Table 1

List of Target Word-stimuli used in this Research

Academic-approach	Academic-avoidance	Performance-evaluative	Academic-neutral
capable	dropout	test	campus
expert	flunk	mark	semester
intelligent	idiot	grade	university
smart	unqualified	exam	class
competence	quit	assignment	textbook
proficient	defeat	essay	tutor
excellent	dumb	assessment	lecture
success	loser	evaluation	chapter
accomplish	stupid	report	student
brilliant	fail	performance	lesson

A second purpose of this research was to investigate whether extraversion and neuroticism were associated with the cognitive-affective processing of academic-related stimuli. As with conscientiousness, Study 1 investigated the relationship between these traits and the chronic accessibility of academic-related stimuli, Study 2 investigated the relationship between these traits and attentional bias, and Study 3 investigated the relationship between these traits and stimuli-appraisals. The results of this line of research may have implications for how subsequent research on traits and cognitive-affective processes are conducted, specifically around using stimuli that is trait-congruent, and has personal relevance to the participants.

A third purpose of this research was to investigate whether the situational context moderates the relationships between traits and cognitive affective processes. Study 1 and Study 2 included the week-of-semester in which the study was conducted as a moderating variable. As the participants in these studies were university students, and the stimuli used was academic-relevant, it could be expected that as the semester progresses and assessment deadlines are closer, the relationship between personality traits and cognitive-affective processes may change, either due to increased proximity to goals, and/or increased stress. If the week-of-semester does moderate the relationship between personality traits and cognitive-

affective processes, this will provide evidence that these relationships are influenced not only by the type of stimuli, but also the specific situational context. Consequently, the results of this line of the research may have implications for the understanding of the relationships between traits and cognitive-affective processes, and provide a further layer of depth to future research.

A final purpose of this research was to investigate whether cognitive-affective processes were related to intention to commit trait-manifesting behaviour. To do this, Study 2 and Study 3 included a variable related to intention to commit conscientious academic behaviours in the coming week (as measured by the Behavioural indicators of academic-conscientiousness intentions [BIAC-intentions], which can be found in Appendix B). If cognitive-affective processes are related to BIAC-intentions, this may broaden our understanding of the link between traits and trait-manifesting behaviour, such as by linking intention to commit trait-related behaviours with cognitive affective processes.

More broadly, the findings of this research may be applied to the new generation of personality assessments, which have moved away from traditional self-report, and instead measure personality-related processes more directly, and infer personality traits from results on these behaviour-based assessments (e.g., Arctic Shores, 2017).

Structure of the Thesis

This research in this thesis is presented as a series of published and submitted works, and abides by Griffith University's Doctor of Philosophy guidelines. Chapter 2 provides a literature review, focusing on the Big Five personality traits, the integration of social-cognitive and trait perspectives on personality, with a focus on whole trait theory, along with overview of the research that has been conducted on the Big Five traits and the cognitive-affective processes of interest. Chapter 3, Chapter 4, and Chapter 5, detail the studies on chronic accessibility, attentional bias, and stimuli-appraisals respectively. These chapters

have been prepared and formatted as manuscripts for publication. Chapter 6 provides a general discussion and integration of the research, along with implications, limitations, and future directions.

Chapter 2: Literature Review

A Brief History of the Big Five

For several decades, personality psychology has benefited from a unified and largely accepted taxonomy of traits—the Big Five or the five factor model¹ (FFM; John et al., 2008; McCrae & Costa, 1999). This taxonomy was predominantly based upon research guided by the lexical hypothesis, the idea that the most important and salient individual differences would be encoded into language, and that the more important the attribute, the more likely it was to be captured by a single word as opposed to a phrase (John et al., 1988). A corollary of this proposal is that the more important the attribute, the more likely it is to be represented by multiple synonyms (Saucier & Goldberg, 1996). On the basis of this hypothesis, personality descriptors were gathered from dictionaries to form a list of personality relevant words, firstly by Baumgarten (1933) within the German language, and subsequently by Allport and Odbert (1936) within the English language. From an unabridged English dictionary, Allport and Odbert identified 17,953 words which could be used to describe individual differences, which was further refined and recategorised by Norman (1967).

Cattell (1943, 1945a, 1945b) began with 4,500 personality trait words from Allport and Odbert's (1936) study and used a combination of semantic clustering, literature review, and empirical reduction (see John et al., 1988) in an attempt to reduce the personality descriptors to a comprehensive taxonomy, ending with 35 variables, or trait clusters. These variables were factor analysed to produce 12 factors, to which Cattell added four personality

¹ Some authors have argued that the Big Five and FFM are related, though different terms (Saucier & Goldberg, 1996). The Big Five refers to the five factors which were found through the lexical hypothesis. The FFM refers to a questionnaire based approach developed for the well-known NEO Personality Inventory (Costa & McCrae, 1992). The NEO was originally developed for three factors (Neuroticism, Extraversion, Openness to experience, thus the name) revealed through factor analysis of Cattell's 16 Personality Factor Questionnaire. The authors realised that these factors resembled similar factors in the lexical tradition, though they were missing Agreeableness and Conscientiousness, which they added in a later edition (John, Angleitner, & Ostendorf, 1988; John et al., 2008; John & Srivastava, 1999; McCrae & Costa, 1996). Though the terms are often used interchangeably, for the sake of clarity, this document will use these different terms to differentiate between the FFM and the Big Five where applicable.

factors which he believed could only be captured by self-report (Cattell, 1945a). However, subsequent researchers were unable to find Cattell's 12 factors, instead consistently finding five factors, even while using scales derived from Cattell's 35 variables (Borgatta, 1964; Fiske, 1949; Norman, 1963; Smith, 1967) by reanalysing Cattell's original correlation matrices (Digman & Takemoto-Chock, 1981; Tupes & Christal, 1961), or by using Norman's (1967) original trait terms (Goldberg, 1990). These five factors have been called the "Big Five" (Goldberg, 1981), a term chosen to indicate their broadness, not their greatness. For instance, underneath the Big Five, with various levels of refinement, are placed other traits, such as the facets found in the FFM, and presumably more refined traits with greater specificity the further one narrows in from the global traits of the Big Five (John et al., 2008).

The adoption of the Big Five and trait perspective in personality research has allowed for a common framework with which to investigate the relationships between personality traits and other constructs (John et al., 2008). One personality trait that is of particular interest to applied researchers is conscientiousness, as conscientiousness—broadly defined as being dependable and achievement-oriented (Barrick & Mount, 1991; Digman, 1990)—is associated with a number of important outcomes. For instance, conscientiousness is the strongest personality predictor of job performance (Barrick & Mount, 1991; Hurtz & Donovan, 2000), and academic performance, in primary, secondary, and tertiary level education (Poropat, 2009).

Criticisms of Trait Psychology. However, despite the benefits and widespread use of the Big Five or variations in modern research, the trait perspective on personality is still criticised. Perhaps the most well-known criticisms of the trait perspective on personality arise from the person versus situation debate. The person versus situation debate centred on the ability of personality to predict behaviour across different situations. Those from a situationalist perspective argued that a person's behaviour varied from situation to situation,

and that this low cross-situational behavioural consistency calls into doubt the idea of broad, consistent dispositions having a generalised influence on behaviour across situations (Epstein & O'Brien, 1985; Kenrick & Funder, 1988). Though debate on the importance of the person or situation had existed since at least the 1920s (Epstein & O'Brien, 1985), this reached a pinnacle with the publication of Mischel's (1968) *Personality and Assessment*.

Mischel's (1968) central thesis was that the ability of personality traits to predict behaviour across situations was not high, suggesting that other factors were involved. Amongst other arguments, Mischel reviewed research that found that correlations between personality and behaviour rarely exceeded .30, therefore demonstrating that a large portion of the variance was not due to personality traits. Mischel's (1968) work was frequently cited by situationalists as evidence that the effect of the situation on behaviour was stronger than personality traits (Pettigrew & Cherry, 2012; Roberts, 2009). Though Mischel's (1968) criticisms have since largely been refuted (e.g., Funder & Ozer, 1983; Kenrick & Funder, 1988), they were so influential that his work has been attributed as the cause of a decade long drop in research on personality, a drop in graduate programs focusing on personality, and a drop in dissertations with a personality component (Swann & Seyle, 2005).

However, Mischel (1973, 2009) has stated that his purpose was not to provide evidence that personality was not influential, nor to provide evidence for the primacy of the situation. Instead, the purpose of *Personality and Assessment* was to advance a personality psychology that focused on intra-individual dynamic cognitive processes—which as discussed later, has seen a resurgence in recent years. To do this, the first half of Mischel's work highlighted what he saw as problems with personality psychology as it currently stood, while the second half of the work proposed a personality psychology based on idiosyncratic stimuli meanings, personality dynamics, and cognitive processes (Orom & Cervone, 2009).

Though Mischel's (1968) methodological criticisms of a trait perspective on personality have largely been resolved (Funder & Ozer, 1983; Kenrick & Funder, 1988), some of the underlying theoretical issues highlighted by his critique have echoes in one of the central limitations (Block, 2010; Boag, 2011; DeYoung, 2010b; Epstein, 2010) of the (more recent) Big Five model. As previously discussed, the Big Five was developed with the purpose of developing a structural model of inter-individual differences, rather than as a personality theory (John et al., 2008; John & Srivastava, 1999; Saucier & Goldberg, 1996; Wiggins, 1996). Such a structural model has the benefit of providing a unified taxonomy with which to form the basis of further research and theorising (John et al., 2008; John & Srivastava, 1999). However, because the Big Five was not developed according to a general personality theory, it contains no explanatory mechanisms for personality, behaviour, or behavioural variation across situations (other than the descriptive traits themselves), and focuses on behavioural generalities rather than dynamic personality processes (Epstein, 2010; John et al., 2008; John & Srivastava, 1999; Pervin, 1994).

The Rise of Processes in Personality

In contrast with personality trait approaches, cognitive and social-cognitive personality theories have emphasised the way that processes and the underlying system of personality leads to behaviour. In an extension of Mischel's (1968) critique of trait personality, Mischel and Shoda (1995, 1998) advocated a cognitive-affective personality system (CAPS) in which certain situational features activate cognitive-affective units (comprising encodings, expectancies and beliefs, affects, goals and values, competencies, and self-regulatory plans) which then lead to behaviour.

In CAPS, individual differences in personality arise through two mechanisms. The first is in the chronic accessibility of mental representations (Mischel & Shoda, 1995). Chronic accessibility refers to how readily accessible and how easily activated particular

mental representations are, and the concept is foundational for social-cognitive perspectives on personality (Mischel & Shoda, 1995). The chronic accessibility of concepts is caused by repeated activation of concepts (temporary accessibility), through the activation of goals or by situational primes (Higgins & Scholer, 2008). Over time, this repeated temporary accessibility leads to these concepts becoming chronically accessible (Higgins & Scholer, 2008). As such, chronic accessibility is affected by previous experience, and has been referred to as memory bias by some authors (Borkenau et al., 2010).

As examples of how chronic accessibility relates to traits, research has indicated that people with a justice sensitivity have more readily activated and elaborated representations of justice concepts (Baumert, Gollwitzer, Staubach, & Schmitt, 2011), and similar results have been found with individuals high in victim sensitivity and both justice and injustice concepts (Baumert, Otto, Thomas, Bobocel, & Schmitt, 2012). This suggests that people high in trait victim sensitivity will have trait-congruent (justice and injustice) concepts chronically accessible across situations and contexts, causing the activation and utilisation of the concepts.

The second way individuals differ in CAPS (of less particular relevance to the current research) is in the way that the cognitive-affective units are organised and activate each other. One example provided by Mischel and Shoda (1995) is of an individual waiting for medical information who may scan the environment for specific features, activating the encoding of a health threat, leading to anxiety and further scanning for threats, which can lead to the activation of defensive plans.

Moves to Integration

Despite the utility of examining processes as an explanation for behaviour, and processes superiority over trait personality in explaining intra-individual differences, cognitive and social-cognitive models of personality lack a broad framework for describing

how individuals differ. As such, researchers have begun to realise that trait personality and systems like CAPS may benefit from being integrated, as the strengths of one are the weaknesses of the other (e.g., Fleeson, 2012; Fleeson & Jayawickreme, 2015; Roberts, 2009). For instance, the Big Five is not explanatory, and does not describe the personality processes that interact with stimuli or the situation to lead to trait manifesting behaviour (John & Srivastava, 1999), while social-cognitive perspectives *are* explanatory, and focus on the dynamic interplay between situations and personality processes (Mischel & Shoda, 1995). In contrast, social-cognitive perspectives on personality lack a unifying taxonomy of individual differences in personality, and there is no guidance as to which descriptive personality traits to which these personality processes should apply, an area that the Big Five can provide guidance (Fleeson, 2012; Fleeson & Jayawickreme, 2015).

One elegant integration has been provided by Fleeson (2012) who proposed whole trait theory (Fleeson, 2012; Fleeson & Jayawickreme, 2015), in which traits have a descriptive (Trait_{DES}) and explanatory (Trait_{EXP}) side. In whole trait theory, Trait_{DES} is reformulated as a density distribution of personality states around a mean (Fleeson, 2001). As a consequence, there are both trait and state manifestations of Trait_{DES} (Fleeson, 2012; Fleeson & Jayawickreme, 2015). Trait_{EXP} comprises the dynamic cognitive, affective, and motivational processes that are active in any situation causing the state manifestation of Trait_{DES} (Fleeson, 2012; Fleeson & Jayawickreme, 2015). It is important to note that while the proponents of whole trait theory propose particular categories of dynamic processes, which may comprise Trait_{EXP} (including interpretative processes, motivational processes, stability-inducing processes, temporal processes, and random error processes), they explicitly note that a great deal of work needs to be done to identify particular personality processes that are related to personality traits and personality-state manifestation, which will likely add

to and modify existing conceptualisations of personality processes (Fleeson & Jayawickreme, 2015). Therefore, this is an important, and relatively under-researched area.

Personality Processes and the Big Five

While often not explicitly using any framework or model, the role of processing in trait expressions has seen an increase in personality psychology in recent years. For instance, a special issue in the *European Journal of Personality* focused on the interaction of personality and information processing (Baumert & Schmitt, 2012). Research articles focused on topics such as attentional bias (Ford, Tamir, Gagnon, Taylor, & Brunyé, 2012; Paelecke et al., 2012), chronic accessibility (though while using tasks commonly used in chronic accessibility research, see chronic accessibility section, the tasks were not explicitly referred to as chronic accessibility tasks, Baumert et al., 2012), and cognitive bias modification for interpretation (Lang, Blackwell, Harmer, Davison, & Holmes, 2012) and attention (Grafton, Ang, & MacLeod, 2012). The developing emphasis on processes in personality prompted the editors of this special issue to highlight the benefits of research that combines trait and cognitive-affective-motivational approaches to personality: a greater understanding of trait expressions, the identification of moderators of trait expressions, and the development of new interventions to change personality and individual differences (Baumert & Schmitt, 2012).

However, most of the research on the cognitive-affective processes to Big Five traits has focused on extraversion and neuroticism, with some additional research focusing on agreeableness. This is likely due to the association between extraversion and positive affect and neuroticism and negative affect (Reisenzein & Weber, 2009). From a cognitive-affective perspective, this has led authors to suggest that extraversion is associated with the processing of positive stimuli, and neuroticism with the processing of negative stimuli (Rusting, 1998). However, this focus on extraversion and neuroticism may be misplaced, as other traits, such

as conscientiousness are also likely to be associated with the processing of personally relevant, trait-congruent stimuli.

Conscientiousness and Personality Processes. Though some studies on appraisals have found that conscientiousness is a strong predictor of different types of appraisals (discussed in further detail later), there has been no research on the relationship between conscientiousness and other potential personality processes such as attentional bias and chronic accessibility. The limited research on the relationship between conscientiousness and cognitive-affective processes is surprising, as conscientiousness is of particular interest to applied researchers due to conscientiousness's association with various important outcomes, such as job (Barrick & Mount, 1991; Hertz & Donovan, 2000) and academic performance (Poropat, 2009).

Furthermore, there is reason to believe that conscientiousness may be related to different personality processes. For instance, the relationship between conscientiousness and performance is thought to be at least partly due to goals or motivation for both job (Barrick, Mount, & Strauss, 1993; Barrick, Stewart, & Piotrowski, 2002) and academic performance. In the academic domain, research has suggested that the relationship between conscientiousness and academic performance is partly (Corker, Oswald, & Donnellan, 2012) or fully (Klein & Lee, 2006; Richardson & Abraham, 2009; Sorić, Penezić, & Burić, 2017) mediated by goal commitment (Klein & Lee, 2006), goal orientations (Corker et al., 2012; Sorić et al., 2017), or achievement motivation (Richardson & Abraham, 2009). The relationship between conscientiousness and performance or achievement motivation is so strong that some of the early suggestions for the name of the factor that is now known as conscientiousness were “will to achieve” (Digman & Takemoto-Chock, 1981; Fiske, 1949), or “task interest” (Borgatta, 1964).

As many cognitive-affective processes are thought to be related to goals, motivation, and/or experience, due to the relationship between conscientiousness, goals and motivation, and achievement, the lack of studies on conscientiousness and cognitive-affective processes may be misplaced.

There are two possible reasons for the lack of investigation of conscientiousness and cognitive-affective processes. Firstly, there is sometimes an emphasis on the self-regulation and constraint components of conscientiousness, rather than the goal-driven and motivational aspects related to the achievement-striving aspects of conscientiousness. For instance, John et al. (2008, p. 138) describes conscientiousness as “*socially prescribed impulse control* [italics in original] that facilitates task- and goal-directed behaviour, such as thinking before acting, delaying gratification, following norms and rules, and planning, organizing, and prioritizing tasks”, while DeYoung (2010a, p. 1173) suggests that conscientiousness “reflects variation in the capacity for self-discipline and organization that is necessary [to constrain behaviour in order to pursue goals that may be achieved only in the distant future] for this form of top-down control”. Under these conceptions of conscientiousness, conscientiousness is formulated as the *ability* to achieve long term goals due to self-discipline and impulse control.

While impulse control, self-regulatory, and effort-regulation processes are undoubtedly related to conscientiousness, and important in achieving goals such as academic performance (Corker et al., 2012; McKenzie, Gow, & Schweitzer, 2004), a focus on these processes to the exclusion of motivational aspects neglects the fact that conscientiousness is strongly correlated with academic motivation (Komarraju & Karau, 2005; Komarraju, Karau, & Schmeck, 2009), and that goal- and motivational-constructs mediate the relationship between conscientiousness and academic performance, regardless of any self-regulation processes that are used to actually *achieve* these goals (Corker et al., 2012; Klein & Lee,

2006; Richardson & Abraham, 2009; Sorić et al., 2017). Indeed, research has indicated that at least part of the relationship between conscientiousness and effortful strategies in an academic context is due to the relationship between conscientiousness and academic goal-orientations (Corker et al., 2012). Put another way, while conscientiousness may be related to impulse control and self-discipline that facilitates the achievement of long term goals, the deployment of these goal-achievement strategies or abilities requires initially *setting* long term goals and the *motivation* to achieve these long-term goals.

A second reason why conscientiousness may have been neglected is that these personality processes have typically focused on emotional or affective processing (e.g., Robinson, 2007; Rusting, 1998; Rusting & Larsen, 1998) thus explaining the focus on extraversion and neuroticism, as conscientiousness is not typically thought to be an emotional trait. Indeed, in summarising the relationships between personality and emotions, Reisenzein and Weber (2009) detail the links between emotions and four of the five Big Five traits: extraversion, openness to experience, neuroticism, and agreeableness. Conscientiousness is notable for its absence. However, there are strong theoretical reasons to suggest that conscientiousness may be related to cognitive-affective processes such as chronic accessibility, attentional biases, and appraisals.

Chronic accessibility. As discussed, chronic accessibility is the basis of cognitive-affective perspectives on personality (Mischel & Shoda, 1995). For instance, according to Cervone's (2004) knowledge-and-appraisal personality architecture, knowledge structures influence the appraisal of situations and situational stimuli, which causes differences in personality. The chronic accessibility of these knowledge structures has been proposed as one of the main causes of cross-situational consistency (Cervone, 2004; Orom & Cervone, 2009). As an example of when chronic accessibility has been used to explain a trait, Baumert et al. (2011) suggest that a heightened chronic accessibility of justice and injustice concepts

in people high in trait justice sensitivity may cause directed attention to relevant stimuli, and be used in the appraisal of situations and others' actions (Baumert et al., 2011; Baumert et al., 2012).

A variety of tasks have been used to measure chronic accessibility of concepts, though these generally fall into one of two categories. The first category of accessibility tasks provide an ambiguous stimuli, and ask participants to define it. For instance, in the death word fragment task, which is commonly used to assess death thought accessibility (Greenberg, Pyszczynski, Solomon, Simon, & Breus, 1994), a number of word fragments are presented to the participants, who then have to fill in the blanks. For instance, the word fragment C O F F _ _ can be completed in a death-related way (coffin) or a neutral way (coffee). In these types of tasks, it is assumed that more highly accessible concepts will be activated and utilised in filling in the blanks. The second type of task uses reaction times to measure speed of recognition or categorisations of particular categories of stimuli (e.g., Borkeu et al., 2010). A quicker reaction time to one category of stimuli (e.g., pleasant words) compared to another (e.g., neutral words), would indicate a greater readiness of activation (i.e., chronic accessibility) of these concepts.

In an early study, Rusting and Larsen (1998) measured the chronic accessibility of positive and negative concepts for extraversion and neuroticism by two tasks. The first task was a word fragment task, such that the ambiguous stimuli could be completed as either a neutral word, or a valenced (positive or negative) word. For instance, the word fragment E _ A _ E D could be completed as either elated or erased. The second task was a reaction time task, where participants were instructed to categorise words presented on a screen as either positive, neutral, or negative. Results indicated that extraversion was not associated with positive word completion on the word fragment task, but was associated with quicker responding to words in the word categorisation task. In contrast, neuroticism was associated

with completion of negative words on the word fragment task, but was not associated with quicker responding on the word categorisation task.

In a subsequent study, Rusting (1999) again measured the chronic accessibility of positive and negative concepts for extraversion and neuroticism, this time using a homophone task and a story completion task. In the homophone task, participants were played a series of words, and were then instructed to write what they heard. However, contained in this list of words were homophones, which had either a valenced (positive or negative) or neutral meaning (e.g., die or dye, peace or piece). In the story completion task, participants were given an ambiguous sentence, and instructed to complete the story, which was then judged for both positive and negative emotional content. Results indicated that extraversion was positively correlated with positive meanings in the homophones task, and positively correlated with positive content and negatively correlated with negative content in the story completion task. Neuroticism was positively correlated with negative meanings and negatively correlated with positive meanings in the homophones task, and positively correlated with negative content, and negatively correlated with positive content in the story completion task.

Chan et al. (2007) used a categorisation task to measure chronic accessibility of positive and negative self-referent (participants were asked to imagine someone describing them this way) personality descriptors for neuroticism. Results indicated a relationship between neuroticism and chronic accessibility of concepts, such that people high in neuroticism were quicker to respond to negative compared to positive personality descriptors.

Borkenau et al. (2010) used a lexical decision task, where participants had to categorise stimuli as a word or a non-word, to measure the chronic accessibility of positive and negative concepts for extraversion and neuroticism, where faster responding to positive or negative compared to neutral stimuli would indicate a chronic accessibility of concepts.

Results indicated that extraversion was positively related to the chronic accessibility of positive concepts compared to both neutral and negative concepts, but there was no relationship between neuroticism and the accessibility of positive nor negative concepts.

Robinson et al. (2003), Tamir and Robinson (2004), Tamir et al. (2002), Meier and Robinson (2004) used a word categorisation task to measure chronic accessibility of positive, negative, and blame-related stimuli for extraversion, neuroticism, and agreeableness respectively. There were no significant direct relations between traits and the chronic accessibility of trait-congruent concepts in any of these studies, however Robinson and colleagues used the average for the entire block of trials (e.g., average reaction time for both positive words and negative words) as the dependent measure. This use of an average measure differs from the approach used in other studies, for example: Rusting and Larsen (1998), which separated reaction times for positive, negative, and neutral words; (Chan et al., 2007) looked at reaction times for negative *compared to* positive stimuli; and Borkenau et al. (2010) compared the target stimuli type (e.g., positive or negative) to neutral. Therefore, the dependent variables in Robinson and colleagues' studies are related to the recognition and categorisation of both trait-congruent (e.g., positive stimuli) and trait-irrelevant (e.g., neutral) stimuli, rather than comparing reaction times for trait-congruent to trait-irrelevant stimuli, and consequently, the results from their studies may not be directly comparable to the other studies reviewed previously.

Both social-cognitive, and integrated perspectives on personality suggest that traits and cognitive-affective processes interact with the environment. Though there are no studies specifically looking at the potential moderating effect of the situational context on the relationship between traits and chronic accessibility of concepts, there have been a number of studies that have looked at the interaction between personality traits and mood, which may be considered a potential outcome of the situation. Rusting (1999) found that there was a

significant interaction between neuroticism and mood in providing negative meanings in the homophones task in Study 2, however no other personality-mood interactions were found for extraversion, or on any of the other tasks. Tamir et al. (2002) and Tamir and Robinson (2004) found that extraversion and neuroticism interacted with positive and negative mood respectively, such that participants high in extraversion and positive mood, or neuroticism and negative mood, were quicker at categorising emotional stimuli. However, as noted above, these studies used a categorisation task where the dependent measure did not separate reaction times for trait-congruent and trait-irrelevant stimuli.

Thus far, there have been no studies investigating the relationship between chronic accessibility and conscientiousness. Despite this, there are theoretical reasons to believe that conscientiousness would be related to the chronic accessibility of particular categories of stimuli. For instance, chronic accessibility can be caused by repeated stimuli activation through environmental priming or goal activation. To the extent that conscientiousness is associated with greater involvement in particular contexts (e.g., university studies; Poropat, 2016), and the conscientiousness has been considered to be a motivational trait (Roberts, Jackson, Fayard, Edmonds, & Meints, 2009), it stands to reason that conscientiousness is likely related to the chronic accessibility of particular trait- and personally-relevant stimuli.

Attentional bias. Attentional bias is the term given to the preferential attention to one category of stimuli over another (e.g., bias for threatening words compared to neutral words), and may be comprised of the effects of both facilitated vigilance or orienting, and difficulty in disengaging from the stimuli (Cisler & Koster, 2010; Clarke, MacLeod, & Guastella, 2013). Research on attentional bias has expanded in recent years, primarily in the clinical domain, where researchers have investigated whether clinical traits (e.g., trait anxiety) or clinical populations have attentional biases for trait- or disorder-congruent stimuli (e.g., alcohol abuse with alcohol related stimuli). For instance, there have been meta-

analyses on attentional biases for: suicide-relevant information in suicide attempters (Richard-Devantoy, Ding, Turecki, & Jollant, 2016), threatening stimuli in anxiety or social anxiety (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007; Dudeney, Sharpe, & Hunt, 2015), pain related stimuli in chronic pain sufferers (Crombez, Van Ryckeghem, Eccleston, & Van Damme, 2013; Schoth, Nunes, & Lioffi, 2012), substance related stimuli in substance abusers (Coskunpinar & Cyders, 2013; Field, Munafò, & Franken, 2009; Rooke, Hine, & Thorsteinsson, 2008), food stimuli and disordered eating (Brooks, Prince, Stahl, Campbell, & Treasure, 2011), and negative stimuli and depression (Epp, Dobson, Dozois, & Frewen, 2012; Peckham, McHugh, & Otto, 2010).

Much of the research on attentional bias has been conducted for clinical traits or in clinical populations, and suggests that attentional bias may be related to the cause and/or the maintenance of symptoms (e.g., Bar-Haim et al., 2007). However, two accounts of attentional biases suggest that attentional bias may also be applicable outside the clinical domain: the relevance/significance framework (Broeren & Lester, 2013; Purkis, Lester, & Field, 2011), and the work on goals and attentional biases by Vogt, De Houwer, and colleagues (Vogt, De Houwer, & Crombez, 2011; Vogt, De Houwer, Crombez, & Van Damme, 2013; Vogt, De Houwer, & Moors, 2011; Vogt, De Houwer, Moors, Van Damme, & Crombez, 2010; Vogt, Lozo, Koster, & De Houwer, 2010). Firstly, under a relevance/significance framework the more relevant and/or significant a stimulus is to an individual, the more likely it is to gain preferential attention (Broeren & Lester, 2013; Purkis et al., 2011). For instance, Purkis et al. (2011) found that fans of *Doctor Who* (a British television show) had AB for *Doctor Who*-related stimuli, indicating that individual preferences or goals can influence attentional bias outside of the often studied clinical populations. Secondly, Vogt, De Houwer, and colleagues have found that laboratory induced goals (by rewarding “points” for correct identification of particular words) induce an

attentional bias to goal-relevant stimuli, though they did not find an attentional bias for semantically related but not goal-relevant stimuli (Vogt, De Houwer, & Crombez, 2011; Vogt et al., 2013; Vogt, De Houwer, & Moors, 2011; Vogt, De Houwer, et al., 2010; Vogt, Lozo, et al., 2010). This is consistent with other research which has suggested that participants exhibit an attentional bias to current (e.g., food-related stimuli for hungry participants) and chronic (e.g., attractive same- or opposite-gender faces for homosexual or heterosexual participants respectively) goals (Pool, Brosch, Delplanque, & Sander, 2016).

As with chronic accessibility, a variety of tasks can be used to measure attentional bias, three of which have typically been used to assess attentional bias for Big Five traits. The first task is the emotional Stroop task, which is based on the traditional Stroop task (Yiend, 2009). In the traditional Stroop (Stroop, 1935) task, a word (e.g., the word “red”) is printed in a colour (e.g., the colour yellow), and the participant has to respond to indicate the print colour. Stroop tasks typically produce an interference effect, indicated by the fact that participants are slower to respond if the word’s meaning is different to the colour the word is printed in. Similarly, in the emotional Stroop task, emotional words (e.g., failure) are presumed to cause greater interference in naming the print colour than do neutral words (e.g., chair; Yiend, 2009). Though the emotional Stroop task is often used to measure attentional bias (e.g., Paelecke et al., 2012), some authors have questioned whether it does in fact measure attentional bias, and instead have suggested that it may measure other processes, such as behavioural freezing (Clarke et al., 2013; Van Bockstaele et al., 2013).

Another type of task used to measure attentional bias is the spatial cueing task (e.g., Wilkowski et al., 2006). In this task, a cue (an emotional or neutral word) appears to either the left or the right of the screen, followed by a target that appears either in the same position as the cue, or in the opposite position. Attentional bias is inferred by quicker responding to the target when it is in the cued position (i.e., a shift in attention is not required), compared to

when it is opposite the cued position (when a shift in attention is required; Van Bockstaele et al., 2013; Yiend, 2009).

The most common method used to measure attentional bias (Yiend, 2009) are visual probe tasks, such as the dot-probe task (e.g., Chan et al., 2007). In the dot-probe task, two words (one the target word, one a matched-neutral word) appear simultaneously on the screen. Following a certain amount of time (stimulus onset asynchrony [SOA]; e.g., 100ms or 500ms), the words disappear and a probe appears in the position previously occupied by one of the words. Attentional bias is calculated as quicker responding to the probe when it is in the position previously occupied by the target word (indicating that attention is at that position at that point of time), compared to the neutral word (which would require an attentional shift if attention is on the target word; Van Bockstaele et al., 2013; Yiend, 2009).

Similar to chronic accessibility, much of the research on attentional biases in Big Five traits has focused on extraversion, neuroticism, and agreeableness, and again, the results have been mixed. In an early article, Reed and Derryberry (1995) used a visual probe task to assess the relationship between extraversion and neuroticism and attentional biases for positive and negative trait-descriptive adjectives (e.g., jealous, honest) which were made to be self-referent. In the visual probe task, two words (a trait-descriptive adjective and a neutral word) appeared on a computer screen (simultaneously in Study 1, sequentially in Study 2), and after a certain SOA (250ms, 500ms, or 750ms) a probe (in this instance, a letter of one of the words flashed) appeared, instructing the participant to respond indicating which word was probed. The results indicated that neuroticism was associated with an attentional bias towards negative trait-descriptive adjectives (only at 500ms SOA in Study 1, and 250ms and 500ms SOA in Study 2), but there was no relationship between extraversion and attentional biases for positive or negative trait-descriptive words. Using a similar visual probe task (but this time the probe was one or two stars which appeared in the position

previously occupied by one of the words, and only 500ms SOA) Chan et al. (2007) found no significant relationship between neuroticism and attentional bias for either socially threatening or positive words. Amin, Constable, and Canli (2004) used the dot-probe task to measure the relationship between extraversion and neuroticism and attentional bias for positive and negative stimuli at 1000ms SOA. The results indicated a strong negative relationship between extraversion and attentional bias for negative stimuli, though this data was based on only eight participants.

Paelecke et al. (2012) used an emotional Stroop task to assess attentional bias for positive and negative words for extraversion and neuroticism. The results indicated that extraversion was associated with an attentional bias for positive stimuli (when the samples for two studies were combined) compared to neutral stimuli, and neuroticism was associated with an attentional bias for negative stimuli, but only under conditions of high cognitive load.

Verhaak et al. (2004) also used the emotional Stroop task to assess attentional bias for general (e.g., blood, torture) and specific (e.g., miscarriage, childless) words for women in an in vitro fertilisation program. The results indicated an attentional bias for specific-, but not general-, threat words compared to neutral words. However, attentional bias was not correlated with neuroticism, though the sample size was relatively low (49 participants).

Finally, Wilkowski et al. (2006) used a spatial cueing task, whereby either prosocial (e.g., kind, smile) or antisocial (e.g., blackmail, terrify) words were sequentially presented to either the left or the right of a computer screen until the participant made a response indicating whether the word was positive or negative. The results indicated that when the word in the previous trial was prosocial, people high in agreeableness had a slower reaction time in categorising a word in the *opposite* side of the screen (indicating a difficulty shifting attention), and people low in agreeableness were slower to shift their attention when the cue

was an antisocial word. This indicates a relationship between agreeableness and attentional biases for social stimuli.

As with chronic accessibility, thus far there have been no studies investigating the relationship between conscientiousness and attentional bias. However, attentional bias is related to stimuli relevance/significance and current and chronic goals. To the extent that conscientiousness is related to goals and motivation (Barrick et al., 1993; Barrick et al., 2002; Corker et al., 2012; Klein & Lee, 2006) it could be argued that conscientiousness would be related to cognitive-affective processes related to goal-relevant/significant stimuli.

Appraisals. The discrepant results in the above-mentioned studies on Big Five traits and chronic accessibility and attentional biases may be due to several possible reasons. Firstly, there is a wide divergence in the tasks used, and there are methodological differences even in studies which use the same or similar tasks. If these cognitive-affective processes are particularly sensitive to methodological or situational factors, this may make results difficult to compare across studies.

One methodological (and theoretical) consideration that seems particularly pertinent is the type of stimuli used. For the most part, studies have used broad positively- or negatively-valenced stimuli to measure chronic accessibility and attentional biases, particularly in regards to neuroticism and extraversion. However, this selection of broad, valenced stimuli may be misguided. Chronic accessibility is caused by the repeated activation of concepts either through environmental priming or goal activation (Higgins & Scholer, 2008). Therefore, concepts that are not personally relevant to participants will not have the opportunity for repeated activation which causes chronic accessibility. Similarly, both the relevance/significance framework (Broeren & Lester, 2013; Purkis et al., 2011), and the work on goals and attentional biases by Vogt, De Houwer, and colleagues (Vogt, De Houwer, & Crombez, 2011; Vogt et al., 2013; Vogt, De Houwer, & Moors, 2011; Vogt, De

Houwer, et al., 2010; Vogt, Lozo, et al., 2010) suggest that attentional bias is facilitated by stimuli that has personal relevance or significance to the participants, either due to preferences, or current or chronic goals. This matches with theoretical perspectives on emotional processing more broadly (Moors et al., 2013; Reisenzein & Weber, 2009; Revelle & Scherer, 2009; Sander et al., 2005; Scherer, 2013). For instance, the appraisal of a stimulus's relevance is thought to be an early onset process in the Component Processes Model of emotion (Sander et al., 2005; Scherer, 2013), separate from appraisal of valence (Scherer, 2013). It is only after an early onset stimuli-relevance check that more attentional resources are deployed (Sander et al., 2005; Scherer, 2013).

There are two possible ways that stimuli relevance could affect the results of studies on personality and cognitive-affective processes. Firstly, a particular stimulus may be incorrectly thought to be trait-relevant for a specific trait. For instance, Robinson et al. (2003) gives "smile" and "flower" as their examples of positive words used in their categorisation task assessing chronic accessibility of positive concepts for extraversion. However, it is not clear why these words would be particularly relevant to the extraverted participants in their study. Instead, "flower" may have more specific relevance to people who are high in *openness to experience*, which is associated with finding beauty in nature (DeYoung, Quilty, & Peterson, 2007). Indeed, one item to measure openness to experience is "I love flowers" (Goldberg, 1999). Similarly, the word "smile" was categorised as a prosocial word by Wilkowski et al. (2006), and successfully used as a stimulus when measuring attentional bias for *agreeableness*.

A second way that stimuli relevance could affect results is if the words have no relevance/significance to the participants in the study more generally. For instance, Paelecke et al. (2012) and Borkenau et al. (2010) give "tumour" and "bombs" as their examples of negative stimuli. However, it is uncertain whether the student participants in these studies

would have had these stimuli repeatedly activated (either through goal activation or environmental priming), which would be necessary to develop their chronic accessibility (Higgins & Scholer, 2008). Similarly, it seems unlikely that these stimuli would be appraised as relevant/significant, or related to the current or chronic goals of the student participants, which would likely reduce or eliminate any attentional biases.

Apart from stimuli-appraisals relationship to chronic accessibility and attentional biases, appraisal is likely to be an important personality process by itself. For instance, whole trait theory (Fleeson, 2012; Fleeson & Jayawickreme, 2015) proposes interpretive processes (i.e., appraisal) as a set of processes which interact with environmental stimuli to lead to state expressions of traits. Similarly, the knowledge and appraisal personality architecture (Cervone, 2004) proposes that knowledge structures lead to the appraisal of environmental factors, which causes personality expression. More broadly, in appraisal theories of emotion, the relevance/significance appraisal of a stimuli is an antecedent of subsequent emotional, motivational, and behavioural reactions (Kuppens & Tong, 2010; Moors et al., 2013; Sander et al., 2005; Van Reekum & Scherer, 1997).

Despite the theoretical importance of appraisal processes to personality, as with the other cognitive-affective processes reviewed thus far, most research on appraisal processes in personality has focused on neuroticism and extraversion. A substantial proportion of the literature on personality and appraisal focuses on Lazarus and Folkman's (1984) transactional model of stress and coping, where two appraisal processes impact upon stress and coping outcomes: appraisal of the stressor and appraisal of coping resources. This body of research has typically found that neuroticism is associated with appraising events as more stressful/threatening and coping resources as low (e.g., Boyes & French, 2012; Gallagher, 1990; Hemenover & Dienstbier, 1996; Schneider et al., 2012; Shewchuk et al., 1999). The results for extraversion are more mixed, with some research suggesting a negative correlation

with stress/threat appraisals or a positive correlation with challenge appraisals (Gallagher, 1990) while other studies have not (Hemenover & Dienstbier, 1996; Schneider et al., 2012; Shewchuk et al., 1999). Some, but few, studies have moved beyond extraversion and neuroticism. For instance, Schneider et al. (2012) found that openness to experience was negatively correlated with appraisals of threat, and while Shewchuk et al. (1999) included all Big Five factors in a structural model predicting appraisal and coping, only neuroticism was associated with stimuli-appraisal. However, this body of research only focuses on appraisal of stimuli as stressful/threatening and of coping resources, and does not include other types of appraisals, such as relevance/significance.

In contrast, Tong et al. (2006) used experience sampling methodology, where police officers were asked to appraise what they were currently thinking about (in the appraisal categories of pleasantness, goal-conduciveness, effort, perceived control, certainty, agency-self, agency-others, agency-circumstances, unfairness, moral violation, and relationship-involvement) approximately every 30 minutes throughout a day. Neuroticism was negatively correlated with pleasantness, goal-conduciveness, perceived control, and certainty, and positively correlated with unfairness and moral violation appraisals. Extraversion was negatively correlated with unfairness and moral violation appraisals. Conscientiousness was negatively correlated with agency-others, unfairness, and moral violation, and positively correlated with pleasantness and perceived control appraisals. Openness to experience was positively correlated with agency-other appraisals, and agreeableness was not significantly correlated with any appraisal types. This study is important for three reasons. Firstly, it provides an ecologically valid investigation of appraisal processes. Secondly, it expands the research on Big Five traits and appraisals past stress/threat and coping appraisals. Thirdly, it found correlations between appraisals and traits other than neuroticism and extraversion. In

this instance, conscientiousness was a particularly consistent personality predictor of appraisals.

Similarly, Penley and Tomaka (2002) instructed participants to appraise an upcoming speech task using the appraisal categories of demand, coping ability, central ego-involvements, non-central ego-involvements, goal congruence, self-responsibility, self-control, other-responsibility, other-control, and fate-responsibility. Again, conscientiousness was one of the strongest personality predictors of appraisals, being negatively correlated with demand, and positively correlated with coping ability, self-responsibility, and self-control appraisals. Openness to experience was also negatively correlated with demand, and positively correlated with coping ability, self-responsibility, and self-control appraisals. Extraversion was positively correlated with coping ability, self-responsibility, and self-control appraisals. Neuroticism was negatively correlated with coping ability, and agreeableness was not significantly correlated with any of the appraisal categories.

However, while Tong et al.'s (2006) and Penley and Tomaka's (2002) studies were ecologically valid, they were not able to separate the appraisals for different *types* of events. This means that while they provided information on general appraisal tendencies in a specific context (work or before a speech task), they were not able to investigate the relationship between traits and the appraisal of different types of stimuli. An investigation of the relationships between traits and different types of appraisals for different stimuli types is likely to provide greater insight into the relationship between traits and cognitive-affective processes, particularly on how they interact with environmental stimuli to lead to trait-manifesting behaviour.

It is of note that the aforementioned studies typically investigated appraisal of imaginary scenarios (e.g., Shewchuk et al., 1999) or real life events (e.g., Tong et al., 2006). However, appraisals can also be studied by looking at specific isolated stimuli, such as

pictures or words (Scherer, 1988; Tempesta et al., 2010). For instance, some studies have used stimuli that may be of specific relevance to a particular trait. Czerwon, Lüttke, and Werheid (2011) used pictures of positive, neutral, and negative faces as stimuli, and found that agreeableness was positively correlated with the appraisal of positive faces as positive, and negatively correlated with the appraisal of negative faces as negative. This would be consistent with the view of agreeableness as a trait relating to altruism, empathy, and prosociality, as people high in agreeableness showed a general positivity bias for peoples' faces. Conscientiousness was also positively correlated with the appraisal of positive faces as positive, though there were no significant correlations between other Big Five traits and appraisals. However, again, this study did not examine relevance/significance appraisals.

The Current Thesis

The main aim of the current thesis was to determine whether conscientiousness was associated with cognitive-affective processes related to trait-congruent stimuli (Studies 1, 2, and 3). As conscientiousness is related to achievement and achievement striving in the academic domain, academic-related stimuli would be an appropriate choice for trait-congruent stimuli. The studies in this project used four different categories of academic-related stimuli to further establish which *types* of academic-related stimuli were associated with conscientiousness: academic-approach (e.g., success, brilliant), academic-avoidance (e.g., fail, idiot), performance-evaluative (e.g., assignment, grade), and academic-neutral words that do not fit in the above categories (e.g., university, textbook). By using different categories of stimuli, this thesis will further uncover the exact nature of the cognitive-affective processes related to conscientiousness, and how these may interact with environmental stimuli.

A secondary aim of this research project was to determine whether extraversion and neuroticism were associated with the cognitive-affective processing of academic-related

stimuli (Studies 1, 2, and 3). Previous research investigating the relationship between extraversion and neuroticism, with chronic accessibility and attentional bias of stimuli may have been hampered by using stimuli that were not specifically relevant to the participants in the studies, thus reducing or eliminating any potential effects. By using academic-related stimuli, which would be of specific relevance to the student participants in the studies, this concern should be reduced.

A third aim of this research was to determine whether the situational context moderates relationships between traits and cognitive-affective processing (Studies 1, 2, and 3). As cognitive-affective processing is thought to be a dynamic process that depends upon situational contexts, or current salient goals, the particular time of the semester in which studies are undertaken (week-of-semester) should affect the relationship between traits and the cognitive-affective processing of stimuli. For instance, later in the semester, more assessments are due, so there could be an increase in stress, greater temporal proximity to academic goals, greater concern about grades, and a greater focus on studying, which could cause differences in cognitive-affective processing compared to early in the semester.

A final aim of this research was to determine whether cognitive-affective processes were related to (the intention to commit) trait-manifesting behaviour (Studies 2 and 3). As cognitive-affective processes are presumed to be a dynamic process that interact with the environment to cause trait manifesting behaviour, a relationship between cognitive-affective processes and intention to commit trait-manifesting behaviour would provide support for this assertion.

outlines the constructs and their relationships in Studies 1, 2, and 3.

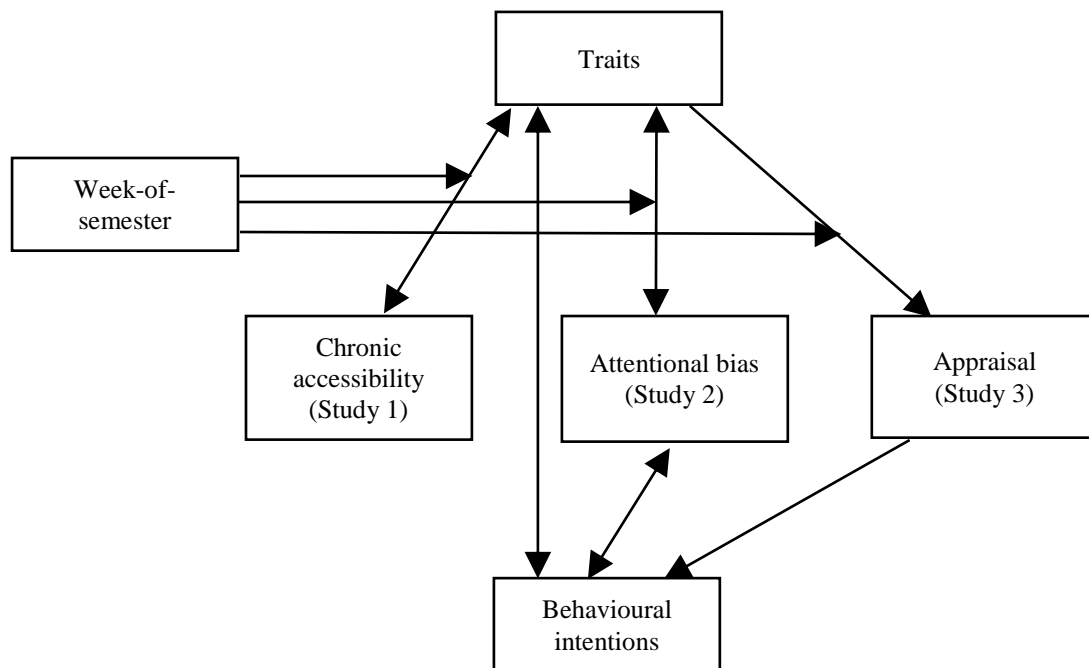


Figure 1. Outline of the current research project. Mediation was only tested in Study 3.

Study 1 investigated the relationship between conscientiousness, extraversion, and neuroticism and chronic accessibility of academic-related stimuli using a lexical decision task, which has been used in personality research (e.g., Borkenau et al., 2010). Other tasks used to measure chronic accessibility were deemed inappropriate for the current line of research, due to the word-stimuli used. For instance, the word fragment task (e.g., Greenberg et al., 1994) requires word-stimuli to be selected that can be completed in either a valenced, or neutral manner. The selection of words/word stems that can be completed in such a way unnecessarily constrains the selection of appropriate stimuli, which is inappropriate for a series of studies which all use the same stimuli. Other than the lexical decision task, the other major type of task used to measure chronic accessibility is a word categorisation task (e.g., Robinson et al., 2003). However, this type of task by necessity requires the participants to categorise words, typically on the dimension of valence. Due to the inclusion of word categories with no clear valence (i.e., performance-evaluative words, and academic-neutral

words), this task was not deemed appropriate. Furthermore, speed of categorising words on valence likely depends upon the individual's appraisal of the stimuli, and it was desired to investigate appraisal mechanisms in Study 3.

Study 2 investigated the relationship between conscientiousness, extraversion, and neuroticism and attentional bias for academic-related stimuli using the dot-probe task (e.g., Tapper, Pothos, & Lawrence, 2010). Study 2 also extended upon Study 1 with the inclusion of an additional measure to Study 1: Behavioural Indicators of Academic-Conscientiousness intentions (BIAC-intentions). As conscientiousness is related to both motivational and self-regulatory processes a measure of intention to commit academic-related conscientious behaviours should give a measure of conscientiousness distinct from whether these behaviours actually occurred, which is likely to be influenced by self-regulatory (e.g., self-discipline) processes. Study 2 used the dot-probe task for two main reasons. Firstly, it is the most commonly task used to investigate attentional biases (Yiend, 2009). Secondly, many other commonly used tasks to measure attentional biases are thought to contain other, non-attentional mechanisms. For instance, the emotional Stroop task may measure behavioural freezing as well as (or instead of) attentional biases (Clarke et al., 2013; Van Bockstaele et al., 2013).

Study 3 investigated the relationship between conscientiousness, extraversion, and neuroticism and both relevance/significance- and pleasantness-appraisals of academic-related stimuli, using a direct stimuli categorisation task. As a further extension of Study 1 and Study 2, Study 3 also sought to investigate whether stimuli-appraisals mediated the relationship between conscientiousness and BIAC-intentions, which would suggest that stimuli-appraisals are an important process between traits and (intention to commit) trait-manifesting behaviours.

In contrast to Studies 1 and 2, which used behavioural tasks to measure chronic accessibility and attentional biases, Study 3 used a self-report measure of stimuli-appraisals. This was for three main reasons. Firstly, most of the previous research on Big Five traits and appraisals have used self-report measures of appraisals. Secondly, behavioural measures of appraisal, such as the affect misattribution procedure (e.g., Imhoff, Schmidt, Bernhardt, Dierksmeier, & Banse, 2011) are typically quite time consuming for the participants. This is particularly a concern for Study 3, which sought to investigate four different types of stimuli, and two different types of appraisal. Finally, behavioural measures of appraisal are typically less reliable than their self-report counterparts (Bar-Anan & Nosek, 2013), and normally have value as an *addition* or comparison to self-report measures. As no research has investigated the relationship between self-reported relevance and significance appraisals and Big Five traits, a behavioural measure was deemed inappropriate.

Chapter 3: Introduction

Study 1 investigated the relationship between conscientiousness, extraversion, and neuroticism and chronic accessibility of academic-related stimuli.

This chapter includes a co-authored paper. The bibliographic of the co-authored paper, including all authors, are: Cummings, D. J., Poropat, A. E., & Loxton, N. J. (2017). Chronic accessibility of academic stimuli: Conscientiousness, extraversion, neuroticism. *Personality and Individual Differences, 115*(1), 114-147. doi:10.1016/j.paid.2016.03.020. This manuscript has been published and is included in its published form. Note, the Table and Figure numberings have been modified from the original publication to be consistent with the numberings in this thesis. Table 2 indicates the relevant input of others into the manuscript of Study 1.

Table 2

Statement of Contributions for Study 1

Contributor	Contribution
Cummings, D. J. (candidate)	Designed study (90%) Interpreted results (85%) Conducted study (100%) Wrote the paper (100%) Edited the paper (80%)
Poropat, A. E.	Designed study (10%) Edited the paper (10%) Interpreted results (5%)
Loxton, N. J.	Edited the paper (10%) Interpreted results (5%)
Sheeran, N.	Interpreted results (5%)

(Signed) _____

____ (Date) __22/12/2017__

Daniel Cummings

(Countersigned)

4 January 2018

Supervisor: Natalie Loxton

Chapter 3: Chronic Accessibility of Academic Stimuli: Conscientiousness, Extraversion, Neuroticism

Abstract

Previous research on relationships between Big Five traits and how readily a concept comes to mind (chronic accessibility; CA) has produced inconsistent findings, which may be partly due to the use of concepts that are not relevant to participants. As such, this study used academic-related stimuli that would be personally relevant to the 85 first-year university participants. A lexical decision task was used to investigate the relationship between conscientiousness, neuroticism, and extraversion for the CA of academic-approach, academic-avoidance, performance-evaluative, or academic-neutral words. Extraversion had a positive and neuroticism a negative correlation with CA of academic-approach words. Conscientiousness had a positive correlation with CA of academic-neutral words. There was no correlation between neuroticism and CA of academic-avoidance words, however week of the semester was a significant moderator, indicating that the relationship between neuroticism and CA of concepts may be sensitive to situational contexts.

KEYWORDS: chronic accessibility; academic; personality; Big Five; conscientiousness; extraversion; neuroticism; social-cognitive

Introduction

In social-cognitive perspectives on personality, the chronic accessibility (CA) of concepts is often suggested as one of the cognitive-affective processes that leads to individual differences in behaviour (Higgins & Scholer, 2008). The accessibility of a concept refers to how easily that concept is retrieved and activated. Temporary accessibility may come from situational primes or temporary goals. With regular activation, that concept may become *chronically* accessible to an individual, with the accessibility of these concepts existing beyond temporary goals or environmentally-primed concepts (Higgins & Scholer, 2008).

In contrast to the social-cognitive focus on within-person processes, trait-based personality researchers typically focus on differences *between* people, and use descriptions of traits like the Big Five to predict outcomes (Fleeson, 2012). Recently, researchers have recognised the utility of incorporating trait perspectives on personality with social-cognitive processes such as CA, in order to gain a better understanding of the mechanisms involved in traits and trait manifesting behaviour (Fleeson, 2012).

Several studies have compared Big Five traits with CA of trait-congruent stimuli. Robinson (2007) suggested that although multiple studies had been conducted with colleagues, no evidence was found for a correlation between the CA of positive concepts and extraversion, negative concepts and neuroticism, or hostile concepts and agreeableness. In contrast, Borkenau et al. (2010) found that extraversion *was* associated with the CA of positive concepts, though they still did not find an association between neuroticism and the CA of negative concepts.

Part of the reason for the different results found for extraversion may be due to the tasks used to measure CA. For instance, Borkenau et al. (2010) used a timed lexical decision task (where participants were instructed to respond if the word on the screen was a word or nonword). In contrast, Tamir et al. (2002) used a timed categorisation task (where words

were flashed on the screen, and the participants were instructed to classify the word as something they would or would not want). It is possible that the lack of direct relationship between extraversion and positive words in Tamir et al.'s (2002) study was due to the categorisation task being a less valid or reliable measure of CA than the lexical decision task. However, this still does not explain the consistent lack of results found for neuroticism.

One possible explanation for the nonsignificant results for neuroticism can be provided by considering the influence of concept relevance. CA of concepts is caused by either repeated contextual activation, or long term beliefs or goals (Higgins & Scholer, 2008). As such, for a concept to become chronically accessible to an individual, it has to be *relevant* enough for repeated activation, either through experience, or belief- or goal-activation. The negative stimuli used in Borkeanu et al.'s study (e.g., tumour, bomb; 2010) may have had little personal relevance to the student participants in their study. In other words, people high in neuroticism may have a greater CA of negative concepts, but only those that are personally-relevant enough for repeated activation. Some evidence for this is provided by Chan et al. (2007), who found that when instructed to think of positive and negative personality-trait stimuli as self-referent descriptors, neuroticism *was* associated with faster responding to negative compared to positive personality traits in a categorisation task.

Consequently, this study was designed to test whether CA of personally-relevant stimuli is associated with conscientiousness, extraversion, and neuroticism. For first year university students, university-related stimuli should be personally-relevant. To ensure comparability, this study used the lexical decision task from Borkeanu et al.'s (2010) study to assess four types of academic stimuli and neutral comparison stimuli: academic-approach words (e.g., success, brilliant), academic-avoidance words (e.g., fail, idiot), performance-evaluative words (e.g., assignment, grade), academic-neutral words (e.g., university, textbook), and matched neutral words. A faster reaction time to the recognition of one

category of stimuli compared to neutral words indicates a greater CA of concepts. As with previous studies, neuroticism was expected to be correlated with negative stimuli (academic-avoidance words), and extraversion with positive stimuli (academic-approach words).

Though conscientiousness is the strongest personality predictor of academic performance (Poropat, 2009), no studies have investigated the relationship between conscientiousness and CA. As such, although we expected that conscientiousness would be related to the CA of academic-related stimuli, no category-specific relationships were predicted. Week of semester was included as a moderator for the predicted relationships in order to assess potential trait by situation effects.

Method

Participants

Participants were 85 first year undergraduate psychology students, who gained partial course credit for participation. The age range was 16 to 40 ($M = 19.36$, $SD = 4.10$), and 67 were female. Informed consent was obtained from all participants.

Measures

Week of semester. Week of the semester in which the participants completed the experiment was recorded.

Personality. Neuroticism and extraversion were each measured by 10 items of the IPIP version of the NEO-FFI (Goldberg, 1999). As conscientiousness has a stronger relationship with academic performance (Poropat, 2009) and in order to investigate potential differences in conscientiousness facets (orderliness, self-efficacy, dutifulness, achievement striving, self-discipline, cautiousness), conscientiousness was measured by the 60 conscientiousness items of the IPIP NEO-PI-R (Goldberg, 1999). Internal consistency was .77 for neuroticism, .88 for extraversion, and .93 for conscientiousness. Internal consistency ranged from .71 (dutifulness) to .84 (self-discipline) for the six facets of conscientiousness.

Lexical decision task. Lists of words, descriptions of traits, and thesauruses were used to find candidate word stimuli. Candidate words were paired with neutral words matched on letter length and word frequency using the SUBTLEX-UK database (van Heuven, Mandera, Keuleers, & Brysbaert, 2013). Words were then sorted into the categories of academic-approach, academic-avoidance, performance-evaluative, academic-neutral, and neutral/nonacademic (for the matched neutral words) by 10 postgraduate psychology students. The 10 words with the highest agreement for each academic-word category were retained, along with their matched neutral word, giving a total of 80 word stimuli. As most measures of inter-rater agreement for nominal data have serious deficiencies when there is low variability in the ratings (Gwet, 2008; Heyman, Lorber, Eddy, & West, 2014), Gwet's AC_1 was used to estimate inter-rater agreement. Average reliability for final words was .78 for academic-approach words, .59 for academic-avoidance words, .69 for performance-evaluative words, .80 for academic-neutral words, and .89 for the nonacademic words, indicating fair to excellent reliability (Heyman et al., 2014). Each word stimulus was matched to a pseudo-word on word length and number of syllables using Wuggy, a pseudo-word generator (Keuleers & Brysbaert, 2010). This gave 160 stimuli in the critical trials.

The lexical decision task itself closely followed that described by Borkenau et al. (2010). Participants were instructed to respond as quickly and accurately as possible in identifying whether a stimulus was a word by pressing the spacebar, and do nothing if the stimulus was not a word. For each trial, a fixation cross appeared on the screen for 500ms, after which a stimulus appeared on the centre of the screen for 200ms. A question mark replaced the stimulus for 800ms or until the participant responded, and reaction time was recorded. If an incorrect response was recorded, a red X appeared on the screen for 500ms. This was followed by a 500ms intertrial interval. The task began with 20 practice trials with

stimuli not included in the critical trials. After the practice trials, there were two critical trial blocks where each stimulus was presented in a random order once in each block.

Procedure

The participants completed the lexical decision task individually in a quiet room. After they had completed this task, they completed the self-report measures on a computer. The University ethics committee granted study approval, and the study adhered to APA ethical guidelines.

Results

Lexical decision task scoring

Three participants responded with error rates over 3 *SD* above the mean (equalling > 29% of trials as errors), and were removed due to noncompliance concerns. Scoring on the lexical decision task followed Borkenau et al.'s (2010) method of individually trimmed means. Any trial with an error was removed (4.63% of word trials). Following this, participants' 10% fastest and 10% slowest reaction times for each stimulus category (e.g., academic-approach words, academic-approach matched neutral words) were removed. Indices were calculated by subtracting the average reaction time for the target word category (e.g., academic-approach words) from the average reaction time for the matched neutral word category (e.g., academic-approach matched neutral words). A positive CA index indicates faster responding to the target word category than the matched neutral words. Reliabilities were calculated using the Spearman-Brown split-half coefficient for each block. Reliabilities were .27 for academic-approach, .42 for academic-avoidance, .56 for performance-evaluative, and .40 for academic-neutral words, which are similar to that found in other studies (Borkenau et al., 2010).

Analysis

One sample t-tests were used to see whether overall, indices differed from zero. The results for academic-approach ($t(81) = 1.61, p = .11$) and academic-avoidance ($t(81) = -.40, p = .68$) were nonsignificant, though those for performance-evaluative ($t(81) = 9.19, p < .001$) and academic-neutral ($t(81) = 9.35, p < .001$) were significant.

As shown in Table 3, conscientiousness and the facets of order and achievement striving were positively correlated with CA of academic-neutral words. Both extraversion and the self-efficacy facet of conscientiousness were positively correlated with CA of academic-approach words, while neuroticism was negatively correlated with CA of academic-approach words.

Table 3

Correlations Between Study Variables and Chronic Accessibility to Academic Stimuli

Variable	Academic-approach	Academic-avoidance	Performance-evaluative	Academic-neutral
Conscientiousness	.15	-.08	.00	.26*
Self-efficacy	.32**	-.08	.02	.20
Order	-.04	.07	.04	.30**
Dutifulness	.16	-.02	.03	.08
Achievement striving	.10	-.14	-.01	.22*
Self-discipline	.02	-.10	-.11	.17
Cautiousness	.16	-.09	.06	.17
Neuroticism	-.31**	-.06	.07	.04
Extraversion	.25*	.01	-.03	.19
Week of the semester	-.03	.05	.07	.15

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

Analyses were conducted using multiple regression to test the moderating effect of week of semester upon predicted trait stimuli-category relationships. Week of semester was not a significant moderator for extraversion and academic-approach words ($\beta = -0.29, t(79) =$

-0.43, $p = .67$). It was a significant moderator for neuroticism and academic avoidance words ($\beta = 1.33$, $t(79) = 2.29$, $p = .03$). As can be seen in the interaction plot (Figure 2) during the beginning of the semester (-1 *SD*), people high in neuroticism had a reduced CA to academic-avoidance words, although the simple slope was not significant ($b = -1.07$, $t(79) = -1.83$, $p = .07$). This was reversed later in the semester, where people high in neuroticism had a greater CA of academic-avoidance words, though again, the simple slope was not significant ($b = 1.31$, $t(79) = 1.63$, $p = .11$).

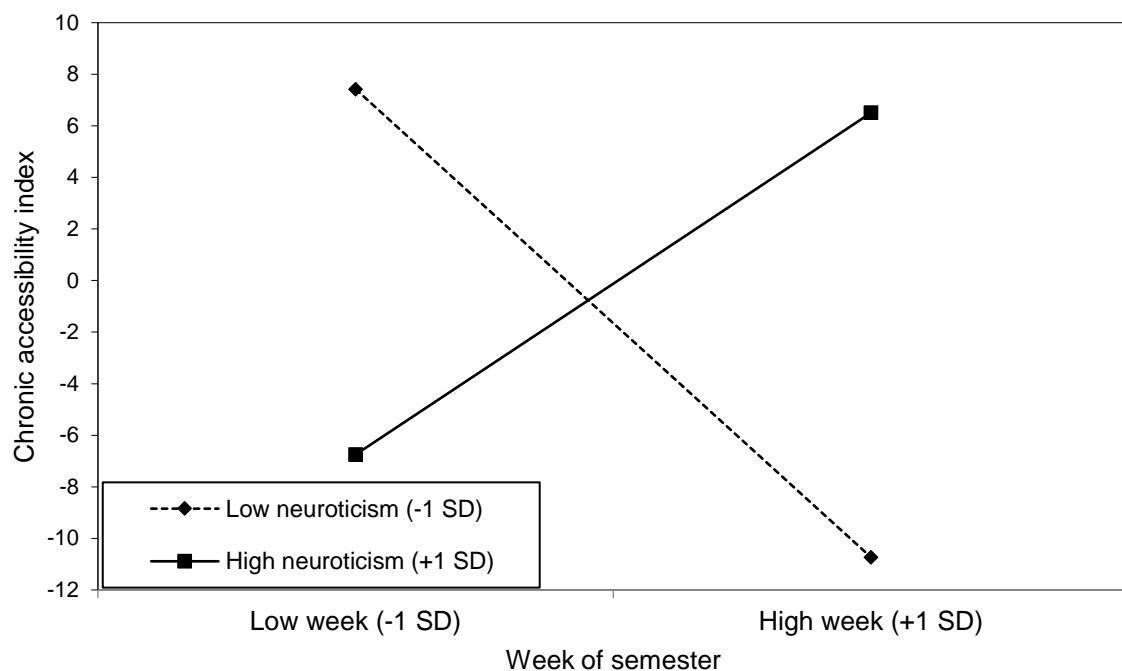


Figure 2. Chronic accessibility for academic-avoidance words as a function of neuroticism and week of semester.

Discussion

This study sought to investigate whether personality traits were related to CA of personally-relevant stimuli. As expected, extraversion was positively correlated with CA of academic-approach (positive) words, as with Borkeu et al. (2010). The conscientious facet of self-efficacy was also correlated with CA for academic-approach words. Self-efficacy is the belief that one can succeed, and is related to self-esteem (Costa, McCrae, & Dye, 1991),

which explains why self-efficacy is associated with the CA of concepts related to academic accomplishment (e.g., success) or positive academic characteristics (e.g., brilliant). In contrast, neuroticism was negatively correlated with CA of academic-approach words. This is consistent with the idea that people high in neuroticism have biases away from positive stimuli (Chan et al., 2007), not just towards negative stimuli.

Neuroticism was not correlated with CA of academic-avoidance words. However, the results of an interaction between neuroticism and week of the semester was significant, and the plot suggested that during the beginning of the semester, people high in neuroticism have a lower CA of academic-avoidance stimuli, but a higher CA for these stimuli later in the semester. Neuroticism is associated with disengagement coping strategies (Connor-Smith & Flachsbart, 2007), so it may be that these coping strategies serve to lower the accessibility of academic-avoidance stimuli at the start of semester, but become counter-productive as assessment pressures increase toward the end of semester. As such, the relationship between neuroticism and CA of academic-avoidance stimuli appears to be sensitive to situational factors. The observed interaction effect in this study may partly explain the lack of direct association between neuroticism and CA for negative stimuli obtained in other studies. If so, exploration of the relationships between neuroticism and CA will require more complex and subtler research designs.

Conscientiousness, and particularly the facets of order and achievement striving, were correlated with CA of academic-neutral words (e.g., university, textbook). If CA is due to sustained contextually-primed stimuli as well as goals (Higgins & Scholer, 2008), then those who are high in conscientiousness—which is associated with greater involvement and effort in university studies (Poropat, 2016)—will have had greater experience with contextually-primed academic-neutral stimuli. This may be particularly evident for those high on

orderliness, which is associated with planning (Roberts, Lejuez, Krueger, Richards, & Hill, 2014), and achievement striving.

The relationship between conscientiousness and academic-neutral words provides support for the suggestion that the relevance of stimuli are important for CA. Previous studies have largely focused on the relationship between traits and CA of valenced stimuli. However, the academic-neutral stimuli used in this study were categorically neither approach nor avoidance stimuli, indicating a lack of strong valence. Furthermore, these stimuli were of specific relevance to the student participants in this study—it seems unlikely that conscientious but nonstudent participants would exhibit CA for academic-neutral stimuli. As such, it is difficult to explain these results except by the increased relevance (causing repeated activation through experience or goal-activation) of these stimuli to conscientious students. This suggests that the relevance of stimuli is important in CA, though it still cannot explain the lack of direct relationship between neuroticism and negative stimuli.

However, this study did not directly assess stimuli relevance, nor did it include “nonrelevant” stimuli as a comparison. As such, support for the importance of stimuli relevance is indirect, and due to the nonsignificant direct relationship for neuroticism, incomplete. Future studies should directly investigate the impact of stimuli relevance, and actively explore the impact of situational influences on the relationships between traits and cognitive processes.

Chapter 4: Introduction

Study 1 investigated whether conscientiousness, neuroticism, and extraversion were associated with the chronic accessibility of academic-related stimuli in first year psychology students. The results indicated that conscientiousness was associated with the chronic accessibility of academic-neutral stimuli, and extraversion was associated with the chronic accessibility of academic-approach stimuli. Furthermore, week-of-semester moderated the relationship between neuroticism and chronic accessibility of academic-avoidance stimuli, suggesting that the relationship between personality traits and cognitive-affective processes may (at least in some cases) be situationally dependent.

Study 2 sought to further investigate how personality traits, and conscientiousness in particular, are related to cognitive-affective processes for relevant stimuli, by using an attentional bias task with the same academic-relevant stimuli used in Study 1.

This chapter includes a co-authored paper. The bibliographic details of the co-authored paper, including all authors, are: Cummings, D. J., Poropat, A. E., & Loxton, N. J. (2017). *An investigation of the cognitive-motivational processes of personality traits using attentional bias methodology*. Manuscript submitted for publication.

This manuscript has been submitted for publication, and is currently under review. It is included in its original form before revisions suggested by anonymous reviewers, though, the Table and Figure numberings have been modified from the submitted publication in order to be consistent with the numberings in this thesis. Table 4 indicates the relevant input of others into the manuscript of Study 2. During the preparation of the manuscript for publication, the results for the correlation analyses between conscientiousness facets and attentional bias indices were removed. These can be found in Appendix C.

Chapter 5: Cummings, D. J., Loxton, N. J., & Poropat, A. E. (2017). *The relevance/significance of stimuli appraisals for personality traits in an academic context.*

Manuscript submitted for publication.

Table 4
Statement of Contributions for Study 2

Contributor	Contribution
Cummings, D. J. (candidate)	Designed study (85%) Interpreted results (85%) Conducted study (100%) Wrote the paper (100%) Edited the paper (85%)
Poropat, A. E.	Designed study (15%) Edited the paper (5%) Interpreted results (5%)
Loxton, N. J.	Edited the paper (10%) Interpreted results (5%)
Sheeran, N.	Interpreted results (5%)

(Signed) _____

____ (Date) __22/12/2017__

Daniel Cummings

(Countersigned)

4 January 2018

Supervisor: Natalie Loxton

Chapter 4: An Investigation of the Cognitive-motivational Processes of Personality**Traits using Attentional Bias Methodology**

Abstract

As the underlying approach-avoidance motivational drive of conscientiousness is unclear, the main aim of the current study was to investigate the motivational underpinning of conscientiousness using attentional bias (AB) methodology and academic-related stimuli. This study used the dot-probe task across short (100ms, assessing initial automatic attentional processes) and longer (500ms, assessing more controlled attentional processes) stimulus durations to test the associations between AB for academic-stimuli (using the categories of academic-approach, academic-avoidance, performance-evaluative, and academic-neutral words) with conscientiousness, neuroticism and extraversion in 120 undergraduate students. Conscientiousness was correlated with AB to performance-evaluative words and neuroticism with AB to academic-avoidance words across both stimulus durations. Week-of-semester moderated the association between neuroticism and AB to academic-avoidance words at 100ms. Both stimulus relevance and situational context should be explored in future attentional bias research on trait-congruent effects.

KEYWORDS: Attentional bias; personality; academic; motivation; conscientiousness

Introduction

Conscientiousness is associated with a number of important outcomes, including being the strongest personality predictor of academic performance (Poropat, 2009). Researchers have found that this relationship is mediated through academic-goal orientations (Corker et al., 2012) or goal commitment (Klein & Lee, 2006). This link between conscientiousness and motivation has led some authors to suggest that conscientiousness is a motivational trait (Roberts et al., 2009), that conscientiousness subsumes achievement motivation (Richardson & Abraham, 2009), or that conscientiousness is related to motivation *regulation* (Corr, DeYoung, & McNaughton, 2013). However, the exact motivational processes underlying conscientiousness remain unclear (Corr et al., 2013).

While conscientiousness is related to approach-achievement goals (Corker et al., 2012), Beckmann, Wood, and Minbashian (2010) found that state conscientiousness is positively correlated with state neuroticism, and Fayard, Roberts, Robins, and Watson (2012) suggested that conscientious behaviours may be motivated by the desire to *avoid* guilt. Hence, conscientious behaviours may not reflect an approach towards positive goals or outcomes, but instead (or also) arise from a desire to *avoid* negative outcomes. As such, conscientiousness could be related to both approach and avoidance motivations (Corr et al., 2013).

Part of the reason for this indeterminacy may be that most personality research relies upon comparing results of trait questionnaires across people. Analysis at this level is unable to directly investigate the personality processes that lead to trait manifesting behaviour (e.g., Whole trait theory; Fleeson & Jayawickreme, 2015). As such, there has been recognition of the importance of investigating the social-cognitive-affective processes that are related to traits and trait-manifesting behaviour (Baumert & Schmitt, 2012). As attentional bias (AB) research allows direct comparison of cognitive (attentional) functioning with self-reported

personality, and as attention is related to goals and motivation, this methodology can be used to investigate proposed underlying motivational processes of conscientiousness.

Goals and Attention

AB refers to biased attentional processing of particular categories of stimuli (Tapper et al., 2010). There is now an extensive body of research investigating AB in psychopathology to disorder-relevant stimuli (Beard, Sawyer, & Hofmann, 2012; Yiend, 2009). However, the AB paradigm has also been used to explore the relationship between traits and associated social-cognitive-affective processes (Baumert & Schmitt, 2012). Of particular relevance to this study, AB research has been used to investigate attentional processing of goal-relevant stimuli (Vogt, De Houwer, et al., 2010).

Cognitive perspectives on goals recognise that goals and attention are often linked in automatic processes, with Dijksterhuis and Aarts (2010) noting that attention is a process in the service of goal achievement. Attention not only alerts an individual to goal-relevant stimuli, but also serves to select and preferentially bias the processing of goal-relevant stimuli in a mixed-stimuli environment (Dijksterhuis & Aarts, 2010). For instance, when someone is thirsty (their goal being to quench that thirst), their attention is likely to be captured by a glass of water. At the same time, attentional processing will be biased towards the goal-relevant glass of water over goal-irrelevant stimuli in the room.

In a laboratory study, Vogt, De Houwer, et al. (2010) found that inducing a goal towards particular word-stimuli (e.g., boat) creates an AB to that stimuli. Importantly, this AB was only found for stimuli that were induced to be goal-relevant, but not to stimuli that were semantically related, but not goal-relevant (e.g., ship). Similarly, a recent meta-analysis (Pool et al., 2016) found that AB for positive-stimuli was greater when stimuli had specific relevance to the participants' current (e.g., food stimuli for hungry participants) or chronic

(e.g., attractive same- or opposite-gender faces for heterosexual or homosexual participants) concerns.

This makes both intuitive and theoretical sense. For instance, the Component Process Model of emotion details an early-onset stimuli-relevance checking process—it is only after a stimulus is appraised as being relevant to an individual or their goals that further attentional resources are deployed (Sander et al., 2005; Scherer, 2013). This relevance-appraisal is subjective and can be influenced by individual differences, the context, and current concerns, so that goals that are less salient are less likely to direct attention (Sander et al., 2005; Scherer, 2013). This indicates that AB will be greatest for stimuli which are related to the participants' salient and specific goals or concerns. As such, to the extent that traits are related to chronic goals (Reisz, Boudreaux, & Ozer, 2013) or contain a motivational component (Elliot & Thrash, 2002), traits should be related to AB towards personally-relevant, trait-congruent and goal-relevant stimuli. For university students, this should be manifested as AB towards trait-congruent, academic-related words.

This Study

This study was primarily designed to investigate links between conscientiousness and AB to academic-stimuli, which will assist understanding the cognitive and motivational processes of conscientiousness. Multiple word-categories (academic-approach, academic-avoidance, performance-evaluative, academic-neutral) were used as stimuli in order to examine the relationship between traits and AB to specific stimulus types.

Consistent with a goal-relevant view of AB, *if* conscientiousness *is* associated with an approach motivation, then within academic contexts conscientiousness should be associated with AB for academic-approach (e.g., success, brilliant) words. Conversely, if conscientiousness is associated with an avoidance motivation, conscientiousness should be associated with AB for academic-avoidance (e.g., fail, idiot) words.

However, conscientiousness appears to be more strongly related to *intrinsic* motivation to accomplish (being motivated by accomplishment on the task itself) as opposed to external regulation (such as external rewards or punishments; Clark & Schroth, 2010). Therefore, conscientiousness should be associated with AB towards performance-evaluative words (e.g., assignment, grade) as they are specifically relevant to performance/achievement goals themselves, as opposed to academic-approach or academic-avoidance words, which are associated with *outcomes* of goal-relevant tasks. As such, we predicted that conscientiousness would correlate with an AB for performance-evaluative words.

A secondary purpose of this study was to extend previous research on the relationship between neuroticism and extraversion and ABs. As neuroticism is associated with avoidance motivation, and extraversion with approach motivation (Elliot & Thrash, 2002), previous studies have assumed that neuroticism and extraversion would be associated with AB for broad negatively- and positively-valenced stimuli respectively (e.g., Paelecke et al., 2012). However, it seems likely that some stimuli used in previous studies (e.g., tumour, bombs) may be of less specific relevance to the salient current or chronic goals of the student participants, thus reducing or eliminating AB effects. For example, it seems unlikely that most students high in neuroticism would have a salient current or chronic goal to avoid tumours and bombs, though it seems likely that they would wish to avoid failing and being thought of as stupid (i.e., academic-avoidance goal orientation; Corker et al., 2012). As such, based on the relationships of neuroticism with avoidance motivation (Elliot & Thrash, 2002), and avoidant academic-goal orientations (Corker et al., 2012), we predicted that neuroticism would correlate with AB towards academic-avoidance words. Similarly, based on the relationships of extraversion with approach motivation (Elliot & Thrash, 2002), we predicted that extraversion would correlate with AB towards academic-approach words.

Academic-related words not falling into the above categories may also induce AB, due to either individuals' experiences, the stimuli's relationships with goal-related activity, or goals not considered above. As such, this study also included academic-neutral words (e.g., university, textbook), though no specific predictions were made.

The third and final aim was to investigate the potential moderating effect of situational context. Both current concerns (Pool et al., 2016) and the situational context (Sander et al., 2005; Scherer, 2013) can affect ABs for goal-relevant stimuli. As authors have suggested that the situation and the person may interact through social-cognitive-affective processes (Fleeson & Jayawickreme, 2015), it seems likely that trait-AB relationships will be moderated by situational contexts. Indeed, Mogg, Bradley, and Hallowell (1994) found an interaction between trait-anxiety and a stress-condition in predicting AB for threatening words, such that AB was greatest in a real-life stress situation for those high on trait-anxiety. As assessment results are progressively released throughout the semester and final exams become closer, both stress and the salience of academic-related goals may increase, both of which may contribute to variations in relationships between traits and AB. As such, the week-of-semester in which participants completed the experiment was included as a moderating variable in a moderated multiple regression analysis, though only for predicted trait-AB relationships. Based on Mogg et al. (1994), we expected that the relationship between neuroticism and academic-avoidance words would become stronger later in the semester, as stress increases. However, there was no theoretical justification for the moderating effect of week-of-semester on the relationship between other traits and ABs, and therefore, no other specific predictions were made.

This study used a modified version of the dot-probe task which has been extensively used in research in psychopathology (Yiend, 2009) and successfully used in individual differences research (e.g., Tapper et al., 2010). The dot-probe task allows assessment of

attentional location at different time-spans using different stimulus onset asynchronies (SOAs). Though 500ms is the most commonly used SOA for the dot-probe task, 500ms allows for multiple shifts in attention, and may measure controlled attentional processes (Cooper & Langton, 2006). In contrast, a SOA of 100ms allows for only an initial shift of attention, and should measure initial and automatic attentional processes (Cooper & Langton, 2006). As such, following Tapper et al. (2010), this study used a SOAs of 100ms in addition to the common 500ms in order to investigate both automatic and controlled attentional processes.

Method

Participants

This study used 120 participants, slightly larger than Tapper et al.'s (2010) sample size. Participants were enrolled in a first year undergraduate psychology course in Australia, who gained partial course-credit for participation. The age range was 17–57 ($M = 23.47$, $SD = 8.58$), and 88 participants were female (73.33%). Informed consent was obtained from all participants included in the study.

Measures

Week-of-semester. The week-of-semester participants took the experiment was automatically recorded. Data collection started in week 4 (one week before initial minor pieces of assessment) and continued until week 13 (last teaching week of the semester, two weeks before final exam period).

Personality. As conscientiousness was the primary study focus, conscientiousness was measured with the 60 item IPIP NEO conscientiousness scale (Goldberg, 1999). Each item is rated from 1 = *Very inaccurate* to 5 = *Very accurate*. Internal consistency for the scale was .95. Extraversion and neuroticism were measured using the 10-item IPIP NEO-FFI

scales (Goldberg, 1999), using the same rating format. Internal consistency was .87 for neuroticism and .88 for extraversion.

Behavioural Indicators of Academic Conscientiousness. Conscientiousness reflects motivational (goal-striving) and self-control (impulse-control and effort management) processes (Corker et al., 2012). In order to separate motivational aspects from behavioural outcomes (influenced by self-control) participants reported *intentions* to perform academic-conscientious behaviours in the next week, using a modified version of the Behavioural Indicators of Conscientiousness (Jackson et al., 2010). Only items that could apply, or be modified to apply to academic-conscientiousness were included, providing a set of Behavioural Indicators of Academic-Conscientiousness intentions (BIAC-intentions), comprised of 32 items, rated from 1 = *Not at all* to 5 = *To a great extent*. Internal consistency of the BIAC-intentions scale was .90.

Dot-probe task. Descriptions of traits, trait adjectives, and thesauruses were used to find candidate word stimuli across four target categories: academic-approach, academic-avoidance, performance-evaluative, and academic-neutral. These candidate words were then matched to paired control-nonacademic words (e.g., century, table) on word length and frequency, using the SUBTLEX-UK word frequency database (van Heuven et al., 2013). Ten postgraduate psychology students categorised 158 candidate words into five categories: the four target categories, and an other/nonacademic category for paired control-nonacademic words. The 10 words with the highest category-assignment agreement for each target category were retained as target words, along with their paired control-nonacademic word, giving 40 word-pairs. Common interrater reliability statistics for nominal data are biased when rating data is skewed, what has been called the “kappa paradox” (Gwet, 2008; Heyman et al., 2014). As such, this study used Gwet’s (2008) AC_1 statistic, which is not subject to this bias. Interrater reliability for final word categories were .78 for academic-approach

words, .59 for academic-avoidance words, .69 for performance-evaluative words, .80 for academic-neutral words, and .89 for the control-nonacademic words, indicating fair to excellent reliability according to guidelines suggested by Heyman et al. (2014).

The dot-probe task was programmed and delivered through OpenSesame (Mathot, Schreij, & Theeuwes, 2012). Figure 3 shows an exemplar trial sequence in the modified dot-probe task. Each trial began with a fixation cue (“+++”), which was presented on-screen for 500ms. A blank screen was then presented for 500ms, following which a word-pair was presented, one word above and one word below the centre of the screen. The words remained on-screen for either 100ms or 500ms, after which a probe (either “<” or “>”) appeared in the previous location of one of the words. The probe remained on-screen until participants responded indicating which direction the probe was pointing (by pressing either “E” for left or “I” for right), and their response and time was recorded.

Participants had 20 practice trials with words not included in the critical trials. In total, there were 320 critical trials separated into two blocks of 160 trials. Word-pairs were presented in a random order, with each word-pair being presented four times at both 100ms and 500ms. Word and probe location were counterbalanced for each word pair. Congruent trials were when the probe appeared in the position previously located by the target word, while incongruent trials were when the probe appeared in the position previously located by the control-nonacademic word. A faster responding on congruent compared to incongruent trials indicates attention is located at the target words’ locations at that SOA, and thus AB.

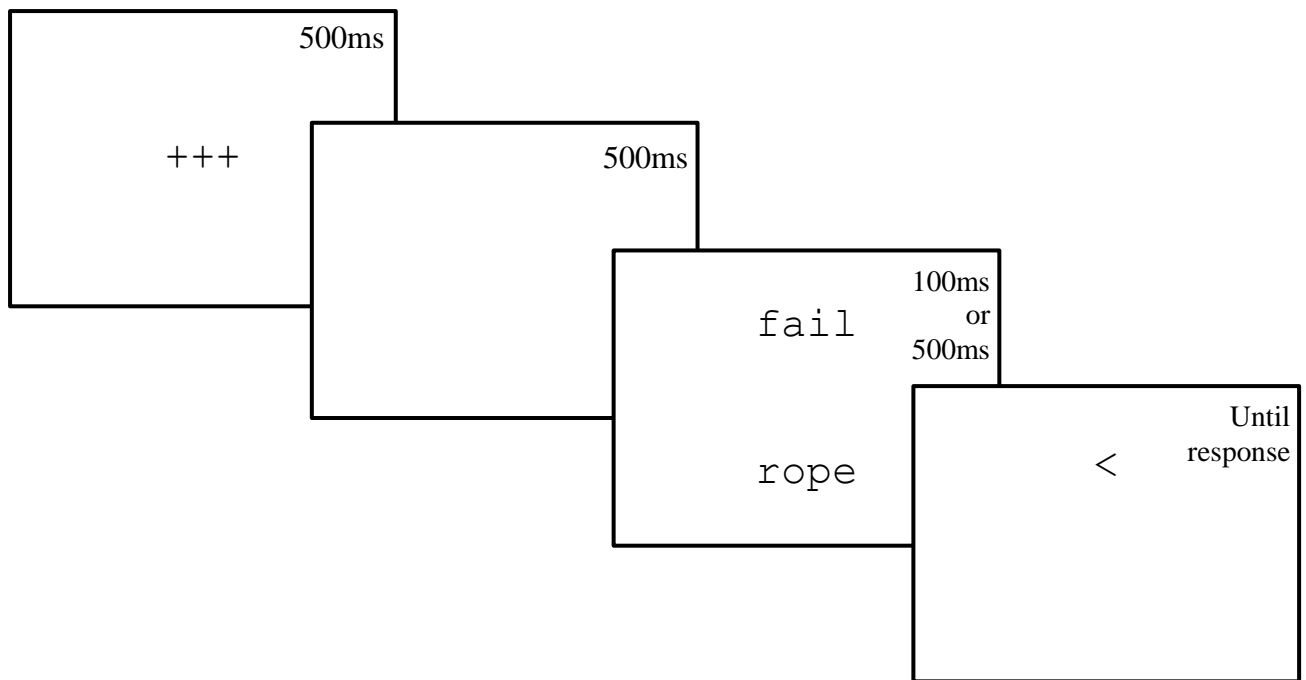


Figure 3. Exemplar trial sequence in the modified dot-probe task (not to scale).

Procedure

Participants completed the experiment individually in a quiet room. After completing the dot-probe task, participants completed the self-report measures. This study was granted University ethics approval, and was performed in accordance with the 1964 Declaration of Helsinki ethical standards.

Results

Attentional Bias Scoring

Results from four participants with a high number of incorrect responses ($> 25\%$, next highest = 17%) were removed due to noncompliance concerns, and results from another participant was removed due to a technical issue, leaving 115 participants. Elimination of outliers in the dot-probe task then followed Tapper et al.'s (2010) two-stage process.

Firstly, trial level data was analysed. All trials with incorrect responses (4.29% of trials), and responses less than 100ms (indicating anticipatory responses), or greater than 4000ms (indicating a failure to record information or participant temporarily stopping the task; Tapper et al., 2010) were eliminated (0.08% of trials). To remove the influence of

influential trial data on the AB indices, trials greater than 3.5 standard deviations outside of the participant's mean for the relevant trial type (stimulus category, congruent or incongruent, SOA) were deleted (0.48% of trials; Tapper et al., 2010). In total, 4.85% of trial data was removed. AB indices were then calculated for each target category by subtracting average reaction time for congruent trials from average reaction time for incongruent trials. A positive AB index indicates faster responding on congruent trials, compared with incongruent trials.

Secondly, individual-level outliers on the AB indices were removed. Though the data cleaning for trial-level data eliminates highly influential individual *trials* on the AB indices, influential person-level AB indices would still have high leverage, and distort any relationships with other person-level variables (Tapper et al., 2010). After inspection of histograms and z-scores, person-level outliers for each AB index greater than three standard deviations outside the sample mean for that target category and SOA were removed. Outliers identified had AB indices removed only from that target category and SOA. The following person-level outliers were removed: two for academic-approach at 100ms, one for academic-avoidance at 100ms, two for performance-evaluative at 100ms, three for academic-neutral at 100ms, two for academic-approach at 500ms, three for academic-avoidance at 500ms, three for performance-evaluative at 500ms, and one for academic-neutral at 500ms.

Analysis

Correlations between self-report variables and AB indices for trials at 100ms and 500ms SOA are presented in Table 5.

Table 5

Correlations Between Variables and Attentional Bias Indices

	100ms Stimulus Onset Asynchrony				500ms Stimulus Onset Asynchrony			
	Academic -approach	Academic - avoidance	Performance- evaluative	Academic -neutral	Academic- approach	Academic - avoidance	Performance- evaluative	Academic- neutral
Conscientiousness	.07	.00	.19*	-.12	-.13	-.04	.21*	.10
BIAC-intentions ^a	.06	-.01	.21*	-.03	-.15	.01	.16	.04
Neuroticism	-.02	.21*	-.02	.09	.00	.19*	-.11	-.21*
Extraversion	-.02	.00	.09	.04	.05	-.08	.09	.04
Week	.04	.10	.06	.06	.05	-.17	.01	-.03

Note. ^aBehavioural Indicators of Academic-Conscientiousness intentions. Predicted relationships indicated in bold.

* $p < .05$.

Predicted trait-stimuli relationships were tested for moderation by week-of-semester using moderated multiple regression (i.e., conscientiousness x week for AB for performance-evaluative words at 100ms and 500ms SOA, neuroticism x week for AB for academic-avoidance words at 100ms and 500ms SOA, extraversion x week for AB for academic-approach words at 100ms and 500ms SOA). One multivariate outlier (Mahalanobis' distance over critical value for $p < .001$) was identified for the interaction regression for neuroticism for academic-avoidance words at 100ms. After removing this outlier, the interaction of week-of-semester was significant ($\beta = 1.25$, $t(109) = 2.33$, $p = .022$). No other interactions were significant.

As can be seen in Figure 4, towards the beginning of the semester ($-1 SD$ for week-of-semester), the simple slope for neuroticism and AB for academic-avoidance stimuli at 100ms was not significant ($b = -0.13$, $t(109) = -0.27$, $p = .789$). Towards the end of the semester ($+1 SD$ for week-of-semester), the simple slope was significant ($b = 1.46$, $t(109) = 3.30$, $p = .001$).

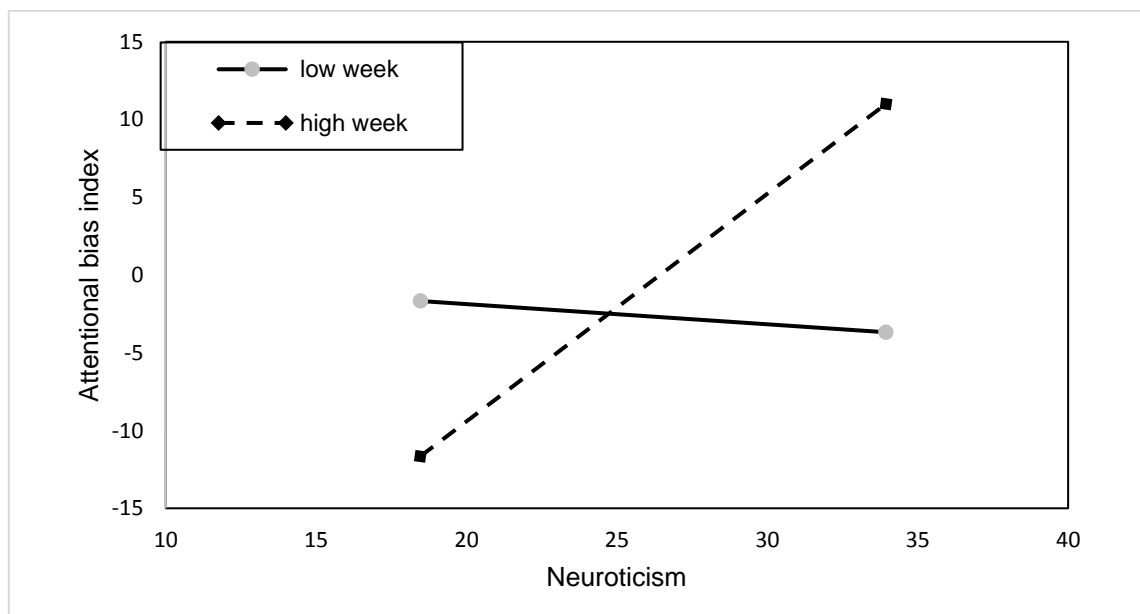


Figure 4. Attentional bias for academic-avoidance words at 100ms as a function of neuroticism and week-of-semester. Plus and minus 1 *SD* used as high and low values of variables.

Discussion

The primary purpose of this study was to investigate the relationship between conscientiousness and AB for academic-related stimuli. As predicted, conscientiousness was related to AB to performance-evaluative words, at both 100ms and 500ms SOA, indicating both automatic and more controlled attentional processing. Conscientiousness was not associated with an AB for academic-approach or academic-avoidance words. These results indicate that conscientiousness-related attentional processing reflects neither an underlying approach- nor avoidance-motivational drive in an academic setting. Instead, conscientiousness appears to be most strongly related to attention to the performance-tasks themselves. This is consistent with proposals that conscientiousness may be more related to intrinsic academic-motivation, rather than external regulation (Clark & Schroth, 2010), and to modulation of motivation, rather than motivational drives themselves (Corr et al., 2013).

The second purpose of this study was to investigate the relationship between neuroticism and extraversion and AB for academic-related stimuli. Extraversion was not associated with an AB to academic-approach stimuli in this study. Though extraversion is associated with approach motivation generally (Elliot & Thrash, 2002), and has been found to be related to AB to positive stimuli in some studies (Paelecke et al., 2012), extraversion is not associated with university-level academic performance (Poropat, 2009), nor with performance-approach academic-goal orientation, and only marginally with mastery-approach academic-goal orientation (Corker et al., 2012), which may explain the lack of direct relationship between extraversion and AB for academic-approach words in this study.

Previous investigations of neuroticism and AB to negative stimuli reported conflicting results (e.g., Paelecke et al., 2012; Reed & Derryberry, 1995). These earlier studies typically used broadly-valenced negative stimuli (e.g., tumor, bombs). However, from a goal-relevant perspective, these stimuli may have limited specific relevance to participants' salient current or chronic goals. The personally-relevant words used in this study resulted in significant associations between neuroticism and AB to academic-avoidance words at both 100ms and 500ms SOA.

Unexpectedly, neuroticism was negatively associated with AB to academic-neutral words at 500ms SOA, which indicates an attentional avoidance or decreased AB of academic-neutral words when considering more controlled attentional processes. As previously mentioned, neuroticism is linked with avoidance temperament (Elliot & Thrash, 2002) and academic-avoidance goal orientations (Corker et al., 2012), with some authors suggesting that neuroticism may be linked to overall avoidance or disengagement with university life (Komarraju & Karau, 2005). As such, these forms of behavioural avoidance may explain the attentional avoidance of academic-neutral words at longer SOA reported in this study.

The third purpose of this study was to investigate potential moderating effects of situational context; in this case, week-of-semester. Week-of-semester was found to moderate the relationship between neuroticism and AB for academic-avoidance stimuli at 100ms, whereby the simple slope was only significant later in the semester. This is likely due to the release of results throughout the semester, decreased distance to final results and exams, causing increased stress and/or salience of academic goals. It is not clear why this moderation only existed at 100ms SOA, though it may be that automatic attentional processes are more sensitive to situational contexts than more controlled attentional processes.

Limitations and future direction

Although this study noted stimuli relevance as an important factor in AB, it must be noted that stimuli relevance was not directly assessed in this research, and as such, any conclusions on the impact of stimuli relevance are indirect. As such, future research may benefit from directly investigating the relationship between traits (particularly conscientiousness) and stimuli-relevance appraisals. This stream of research would have two main benefits. Firstly, it would allow for the further investigation of the motivational underpinnings of conscientiousness using a different methodology. Secondly, and more broadly, if traits *are* related to stimuli appraisals, it would provide direct evidence suggesting that stimuli-relevance is important when considering the cognitive-affective processes of traits.

Conclusion

This study provided a mapping of associations of conscientiousness, neuroticism and extraversion with ABs within an academic context. The finding that conscientiousness and neuroticism were associated with academic-related stimuli indicates future research on AB may benefit from investigating personal- and goal-relevant stimuli. Furthermore, the interaction effect for neuroticism and week-of-semester showed that initial, automatic attention may be affected by the dynamic context of the situation. Future research on personality and cognitive-affective processes may benefit from exploring both stimuli relevance, and contextual moderating effects.

Chapter 5: Introduction

In order to investigate how personality traits, and conscientiousness in particular, are related to cognitive-affective processes for relevant stimuli, Study 1 used a task to measure chronic accessibility, while Study 2 used a task to measure attentional bias. Study 1 found that conscientiousness was associated with the chronic accessibility of academic-neutral stimuli, and extraversion was associated with the chronic accessibility of academic-approach stimuli. Though neuroticism did not have a bivariate relationship with academic-avoidance stimuli, there was a significant moderation effect by week-of-semester.

Study 2 found that conscientiousness associated with attentional bias for performance-evaluative stimuli, and neuroticism was associated with attentional bias for academic-avoidance stimuli. Furthermore, week-of-semester moderated the relationship between neuroticism and attentional bias for academic-avoidance stimuli, but only at 100ms SOA.

However, Study 1 and Study 2 did not directly access the relevance/significance of the stimuli. Indeed, it could be expected that people high in different traits may appraise stimuli differently. Consequently, appraisal processes may be an important cognitive-affective process related to personality traits. As such, Study 3 used a different sample to investigate the relationship between conscientiousness, extraversion, and neuroticism and both pleasantness and relevance/significance-appraisals of the academic-related stimuli used in Study 1 and Study 2.

This chapter includes a co-authored paper, included in a modified form of the original paper. Table 6 indicates the relevant input of others into the manuscript of Study 3. The bibliographic details of the co-authored paper, including all authors, are: Cummings, D. J., Loxton, N. J., & Poropat, A. E. (in press). The relevance/significance of stimuli appraisals for personality traits in an academic context. *Learning and Individual Differences*. doi: 10.1016/j.lindif.2018.04.008

Table 6

Statement of Contributions for Study 3

Contributor	Contribution
Cummings, D. J. (candidate)	Designed study (100%) Interpreted results (85%) Conducted study (100%) Wrote the paper (100%) Edited the paper (90%)
Poropat, A. E.	Interpreted results (5%)
Loxton, N. J.	Edited the paper (10%) Interpreted results (5%)
Sheeran, N.	Interpreted results (5%)

(Signed) _____

_____ (Date) 22/12/2017

Daniel Cummings

(Countersigned)

4 January 2018

Supervisor: Natalie Loxton

Chapter 5: The relevance/significance of stimuli appraisals for personality traits in an academic context

Abstract

Though appraisals are recognised as an important cognitive-affective process linking traits to emotions, motivations, and behaviours, previous research on the relationship between traits and appraisals has been limited by not considering relevance/significance-appraisals. This study used 120 university students to investigate the relationship between conscientiousness, extraversion, and neuroticism, and pleasantness- and relevance/significance appraisals of academic-related words (in the categories of academic-approach, academic-avoidance, performance-evaluative, and academic-neutral). The results suggested that pleasantness- and relevance/significance-appraisals were both important for explaining the relationship between traits and stimuli-appraisals. Overall, stimuli-appraisals accounted for 35% of the variance in conscientiousness, and 43% of the variance in achievement striving. Pleasantness-appraisals of academic-neutral stimuli mediated the relationship between conscientiousness and intentions to commit conscientious academic behaviours in the next week.

KEYWORDS: appraisal; academic; personality; Big Five; conscientiousness; extraversion; neuroticism

Introduction

In the current, dominant theory of emotions termed appraisal theories (Reisenzein & Weber, 2009), the appraisal of stimuli is thought to be an integral component in emotions (Kuppens & Tong, 2010; Moors et al., 2013). In these theories, individual differences in the subjective appraisal of stimuli is one of the causes of individual differences in emotional (including motivational) responses to particular events or stimuli (Kuppens & Tong, 2010; Moors et al., 2013; Sander et al., 2005). As personality has been described as the integration over time of emotional components (including appraisal and motivational tendencies; Revelle & Scherer, 2009), it stands to reason that appraisal processes would be an important personality process leading to individual differences in behaviour. For instance, Whole Trait Theory suggests that an interpretive (i.e., appraisal) process is one of the dynamic processes which leads to trait-manifesting behaviour (Fleeson & Jayawickreme, 2015).

While the exact appraisal processes differ across appraisal theories of emotion, of importance is the appraisal of the relevance/significance of the stimuli to the person (Moors et al., 2013). If a stimulus is appraised as being irrelevant to a person or their goals, a subsequent emotional or behavioural response is unlikely. For instance, the Component Processes Model of emotion proposes a series of stimuli evaluation checks that occur in stimuli-appraisal: relevance, implications/consequences, coping potential, and norm comparability (Sander et al., 2005; Scherer, 2013). Importantly, in the early-onset relevance appraisal check, the appraisal of pleasantness and goal/need relevance of stimuli are viewed as distinct (Scherer, 2013).

The distinction between pleasantness- and relevance/significance-appraisal of stimuli is important for personality researchers for two main reasons. Firstly, the relationship between personality traits and stimuli-appraisal is likely to be an important process when considering outcomes, such as emotional/motivational responses and trait-manifesting

behaviours. By not considering stimuli relevance-appraisals, we may be missing important components in the relationship between personality, appraisals, and outcomes. Secondly, personality researchers are increasingly using cognitive-affective tasks, such as attentional bias tasks (Paelecke et al., 2012) and chronic accessibility tasks (Borkenau et al., 2010) to investigate personality processes. Typically the stimuli used differ on the dimension of pleasantness, without an explicit consideration of stimuli-relevance/significance. However, researchers in other fields are beginning to recognise the importance of stimuli-relevance/significance in these cognitive-affective tasks (Purkis et al., 2011). As such, personality research may benefit from the investigation of the relationship between personality and relevance/significance-appraisals, in addition to pleasantness-appraisals.

Appraisals and Personality Traits

Despite the theoretical importance of stimuli-appraisals for personality and personality processes, relatively few studies have investigated the relationship between Big Five traits and appraisals, and only one (Tong et al., 2006) appears to explicitly investigate the relationship between traits and a type of relevance/significance-appraisal. Tong et al. (2006) investigated the relationship between Big Five traits and a variety of appraisals (pleasantness, goal-conduciveness, effort, perceived control, certainty, agency-self, agency-others, agency-circumstances, unfairness, moral violation, and relationship-involvement) of daily events using experience sampling methodology. Results indicated that neuroticism and conscientiousness were the strongest personality predictors of appraisals of events. However, while this study was comprehensive and ecologically valid, the events/stimuli that the participants experienced (and therefore appraised) were not controlled, and the appraisals were averaged over the day. Therefore, no information is provided on the relationship between appraisals and different *types* of events/stimuli, and it is possible that differences in

personality traits *caused* different events to be experienced, thus leading to different event-appraisals.

Most research on personality and appraisal has attempted to link Big Five traits (predominantly extraversion and neuroticism) to the appraisal of events, largely following Lazarus and Folkman's (1984) transactional model of stress and coping. This stream of research investigates relationships between traits and the appraisal of events as threatening, stressful, demanding, or unpleasant (primary appraisal), and coping resources (secondary appraisal). Results have typically found that neuroticism is associated with appraisal of events as more stressful, demanding, or unpleasant, and coping resources as lower (e.g., Gallagher, 1990; Hemenover & Dienstbier, 1996; Schneider et al., 2012; Shewchuk et al., 1999).

However, these studies have a number of limitations. Firstly, even when specifically considering academic events (e.g., Gallagher, 1990; Hemenover & Dienstbier, 1996) these studies have largely focused on neuroticism and extraversion, and have not included other Big Five traits, such as conscientiousness (c.f., Shewchuk et al., 1999). This is problematic, as conscientiousness is the strongest personality predictor of academic performance (Poropat, 2009). To the extent that stimuli appraisal is important in understanding the relationships between traits and trait-manifesting behaviour (Fleeson & Jayawickreme, 2015) and emotional responses (including motivation; Sander et al., 2005; Scherer, 2013), the lack of inclusion of conscientiousness when considering appraisal of academic-related stimuli seems like an oversight.

Secondly, most of the studies on relationships between personality and appraisal typically only focus on primary and secondary appraisal, following Lazarus and Folkman's (1984) transactional model of stress and coping, and only Tong et al. (2006) included a version of relevance/significance appraisal. As discussed, the relevance/significance of

stimuli is an important theoretical component of the appraisal process, and is often not directly assessed. It may be that relevance/significance-appraisals can add to explanations of the relationships between traits and appraisal processes. For instance, as neuroticism is associated with the appraisal of events as more negative (Tong, 2010) it may be that people high in neuroticism view possible negative academic outcomes as less pleasant, and thus to be avoided. However, neuroticism is also associated with avoidant academic-goal orientations (Corker et al., 2012). As such, people high in neuroticism may instead (or also) view possible negative academic outcomes as more relevant/significant, as they are associated with their avoidant academic-goals.

Finally, many previous studies do not analyse relationships between personality and appraisal of different *types* of stimuli. Using the above example, while neuroticism may be associated with the appraisal of *negative* academic outcomes, as neuroticism is not as strongly associated with approach academic-goal orientations, there may be no correlation between neuroticism and relevance/significance-appraisals of *positive* academic outcomes.

Consequently, previous research may have missed important subtleties in the relationships between traits and stimuli-appraisals due to a restriction on both appraisal types and stimuli types. This may have led to an incomplete understanding of the theoretical relationships between traits and appraisal of stimuli types, non-optimal stimuli (or the misinterpretation of results) in other cognitive-affective tasks, and a restricted investigation between the relationship between traits, stimuli-appraisal, and associated outcomes.

This Study

The first aim of this study was to investigate relationships between the pleasantness- and relevance/significance-appraisals of academic-related stimuli and the personality traits of neuroticism, extraversion, and particularly conscientiousness. In contrast to previous studies which have used scenarios or vignettes, this study used single-word stimuli. This was for

three reasons. Firstly, it enables stimuli to be easily sorted into distinct categories. Secondly, it enables the methodology and instructions to be consistent with those used to find valence, arousal, and dominance norms of word lists (e.g., Warriner, Kuperman, & Brysbaert, 2013), and is similar to other recent studies on differences in stimuli-appraisals (Gantiva, Delgado, & Romo-Gonzalez, 2015). Finally, single-word stimuli is consistent with other cognitive-affective tasks, such as chronic accessibility (e.g., Borkenau et al., 2010; Cummings, Poropat, & Loxton, 2016) and attentional bias (e.g., Paelecke et al., 2012). In order to examine differences in appraisal for different categories of stimuli, this study used four categories of academic-related words: academic-approach (e.g., success, brilliant), academic-avoidance (e.g., fail, idiot), performance-evaluative (e.g., exam, assignment), and academic-neutral words that do not fall into the above categories (e.g., student, class).

Conscientiousness is the strongest personality predictor of academic-performance (Poropat, 2009). However, to the authors' knowledge, no research has investigated the relationship between conscientiousness and the appraisal of specific academic stimuli, and there is limited theoretical links between conscientiousness and the emotional processing of stimuli (Reisenzein & Weber, 2009). As such, while we predicted that conscientiousness would be associated with both pleasantness- and relevance/significance-appraisals of academic-related stimuli, no category specific predictions were made.

Extraversion is often associated with the processing of positive information, and neuroticism associated with the processing of negative information (Rusting & Larsen, 1998). Consequently, as neuroticism is associated with the appraisal of events as more negative (Tong, 2010), we predicted that neuroticism would be negatively correlated with the pleasantness-appraisal of academic-avoidance stimuli. Additionally, as neuroticism is associated with avoidant academic-goal orientations (Corker et al., 2012), we predicted that neuroticism would be positively correlated with the relevance/significance-appraisal of

academic-avoidance stimuli. As extraversion is associated with the appraisal of pleasant events as more positive (Lucas & Diener, 2001) we expected that extraversion would be correlated with pleasantness-appraisals of academic-approach stimuli. However, research has suggested that extraversion is not correlated with performance-approach academic-goal orientation, and only marginally associated with mastery-approach academic-goal orientation (Corker et al., 2012). As such, we made no predictions on the relationship between extraversion and relevance/significance-appraisals of academic-approach stimuli.

A second purpose of this study was to investigate the potential role of the specific situational context in moderating trait-appraisal relationships. The component processes model of emotion recognises that appraisal is a dynamic process which depends upon salient needs/goals and the situational context (Scherer, 2013). It may be that as the semester proceeds, and major assessments and grades are closer, salient goals change or are strengthened, causing a change in the relationship between traits and stimuli-appraisals. As such, we included week-of-semester as a moderating variable in trait and appraisal relationships, though no specific predictions were made.

A final aim of this study was to investigate the relationship between conscientiousness, appraisals, and behavioural intentions. As an interpretive (i.e., appraisal) process is thought to be one process that is important in explaining the relationship between traits and trait-manifesting behaviour (Fleeson & Jayawickreme, 2015), and appraisal of stimuli is an important component of emotional reactions (including motivation; Scherer, 2013), it could be assumed that if traits are related to appraisals, stimuli-appraisals may mediate the relationship between traits and intention to commit stimuli-related behaviour. For instance, a person who views water as pleasant, is likely to have an increased intention to swim, compared to a person who views water as unpleasant. To examine this, we conducted

mediation analyses for conscientiousness, stimuli-appraisals, and intention to commit academic-conscientious behaviours in the next week.

Method

Participants

Participants were 120 first year undergraduate psychology students, who gained partial course credit for participation. The age range was 17 to 61 ($M = 22.75$, $SD = 8.19$), 89 were female, 30 were male, and one indicated other. Informed consent was obtained from all participants.

Measures

Week-of-Semester. The date which participants completed the experiment was automatically recorded, and converted to week-of-semester.

Personality. As conscientiousness was the focus of this study, it was measured by the 60 conscientiousness items of the IPIP NEO-PI-R, while neuroticism and extraversion were each measured by 10 items of the IPIP version of the NEO-FFI (Goldberg, 1999). Internal consistency was .90 for neuroticism, .87 for extraversion, and .94 for conscientiousness. Internal consistency ranged from .74 (dutifulness) to .88 (self-discipline) for the six facets of conscientiousness.

Behavioural Indicators of Academic Conscientiousness. Participants reported intentions to perform academic-conscientious behaviours in the next week, using a modified version of the Behavioural Indicators of Conscientiousness (Jackson et al., 2010), providing a set of Behavioural Indicators of Academic-Conscientiousness intentions (BIAC-intentions). Only items that applied, or could be modified to apply to, an academic context were included. BIAC-intentions was comprised of 32 items, rated from 1 = *Not at all* to 5 = *To a great extent*, and had internal consistency of .91.

2.2.4. Ratings of Stimuli. We used 80 words which were previously used by Cummings, Poropat, et al. (2016) as our academic word-stimuli. Of these 80 words, there were 10 words each in the categories of academic-approach, academic-avoidance, performance-evaluative, and academic-neutral. Additionally, there were 40 non-academic/neutral words which were used as filler words, and not included in subsequent analyses. Words were presented in a fixed random order, with one word for each word-category at the beginning of the list to serve as a calibration.

Participants were instructed to rate the words' pleasantness and relevance/significance on a scale from 1 to 9. Instructions for the pleasantness ratings followed that of Warriner et al. (2013). Instructions for ratings of relevance/significance used a modified version of the pleasantness instructions. Ratings for each word category were summed for pleasantness and relevance/significance to form individual scales. All appraisal scales had high internal consistency, ranging from .91 (performance-evaluative) to .93 (academic-approach and academic-neutral) for relevance/significance-appraisals, and .91 (academic-avoidance) to .93 (academic-neutral, performance-evaluative, and academic-approach) for pleasantness-appraisals.

Procedure

Participants completed the online survey individually in a quiet room. The University ethics committee granted study approval, and the study adhered to APA ethical guidelines.

Results

Relationships Between Traits and Appraisals

To test the relationship between traits and appraisals, correlation analyses were conducted. Results for intercorrelations between the appraisal categories are presented in Table 7, while results for correlations between traits and appraisals are presented in Table 8. There were high correlations between appraisals of academic-neutral and performance-

evaluative stimuli for both appraisal types. However, as we consider these stimuli categories as theoretically distinct, and they had been categorised by raters into distinct categories a priori (see Cummings, Poropat, et al., 2016), they were kept separate in subsequent analyses.

Due to the large correlations between stimuli-appraisals and conscientiousness, and as the achievement striving facet of conscientiousness is likely to be of particular relevance to an academic context, additional regression analyses were conducted to investigate the overall variance of conscientiousness and achievement-striving explained by appraisals. A secondary purpose of these analyses was to see whether relevance/significance-appraisals explained additional variance to pleasantness-appraisals when predicting conscientiousness and achievement striving. Results for the stepwise regression for conscientiousness is reported in Table 9, and for achievement striving in Table 10. Though regression coefficients are reported, we would caution against their over-interpretation due to high collinearity (see Table 7 and Table 8) between the variables (which does not affect R^2). The results indicated that appraisal of stimuli explained a large portion of the variance for conscientiousness ($F(8,111) = 7.43, p < .001, R^2 = .35, R^2_{\text{Adjusted}} = .30$) and achievement striving ($F(8,111) = 10.33, p < .001, R^2 = .43, R^2_{\text{Adjusted}} = .39$).

Table 7

Intercorrelations Between Appraisal of Academic Stimuli

	1.	2.	3.	4.	5.	6.	7.
Pleasantness appraisal							
1. Academic-approach	-						
2. Academic-Avoidance	-.44 ^{***}	-					
3. Performance-evaluative	.54 ^{***}	-.14	-				
4. Academic-neutral	.54 ^{***}	-.28 ^{**}	.77 ^{***}	-			
Relevance/significance appraisal							
5. Academic-approach	.62 ^{***}	-.34 ^{***}	.35 ^{***}	.49 ^{***}	-		
6. Academic-Avoidance	-.34 ^{***}	.12	-.40 ^{***}	-.26 ^{**}	-.14	-	
7. Performance-evaluative	.50 ^{***}	-.45 ^{***}	.21 [*]	.42 ^{***}	.73 ^{***}	.09	-
8. Academic-neutral	.43 ^{***}	-.27 ^{**}	.22 [*]	.40 ^{***}	.60 ^{***}	-.09	.82 ^{***}

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

Table 8

Correlations Between Personality Traits and Appraisal of Academic-stimuli

	Pleasantness				Relevance/significance			
	Academic-approach	Academic-Avoidance	Performance-evaluative	Academic-neutral	Academic-approach	Academic-Avoidance	Performance-evaluative	Academic-neutral
Conscientiousness	.36***	-.13	.49***	.43***	.42***	-.34***	.30***	.32***
Self-efficacy	.48***	-.15	.56***	.39***	.46***	-.42***	.22*	.26**
Order	.22*	.04	.21*	.15	.23*	-.15	.19*	.24**
Dutifulness	.14	-.06	.29**	.28**	.16	-.16	.22*	.23*
Achievement striving	.47***	-.24**	.50***	.53***	.49***	-.37***	.37***	.40***
Self-discipline	.30***	-.18*	.46***	.49***	.44***	-.29**	.31***	.30***
Cautiousness	.02	.02	.20*	.06	.06	-.11	.04	.02
BIAC-intentions	.21*	-.21*	.38***	.43***	.31***	-.27**	.28**	.30***
Neuroticism	-.18*	-.02	-.35***	-.26**	-.17	.32***	-.04	-.10
Extraversion	.30***	-.10	.27**	.16	.17	-.26**	.06	.14

Note. BIAC = Behavioural Indicators of Academic Conscientiousness. Predicted relationships are in bold.

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

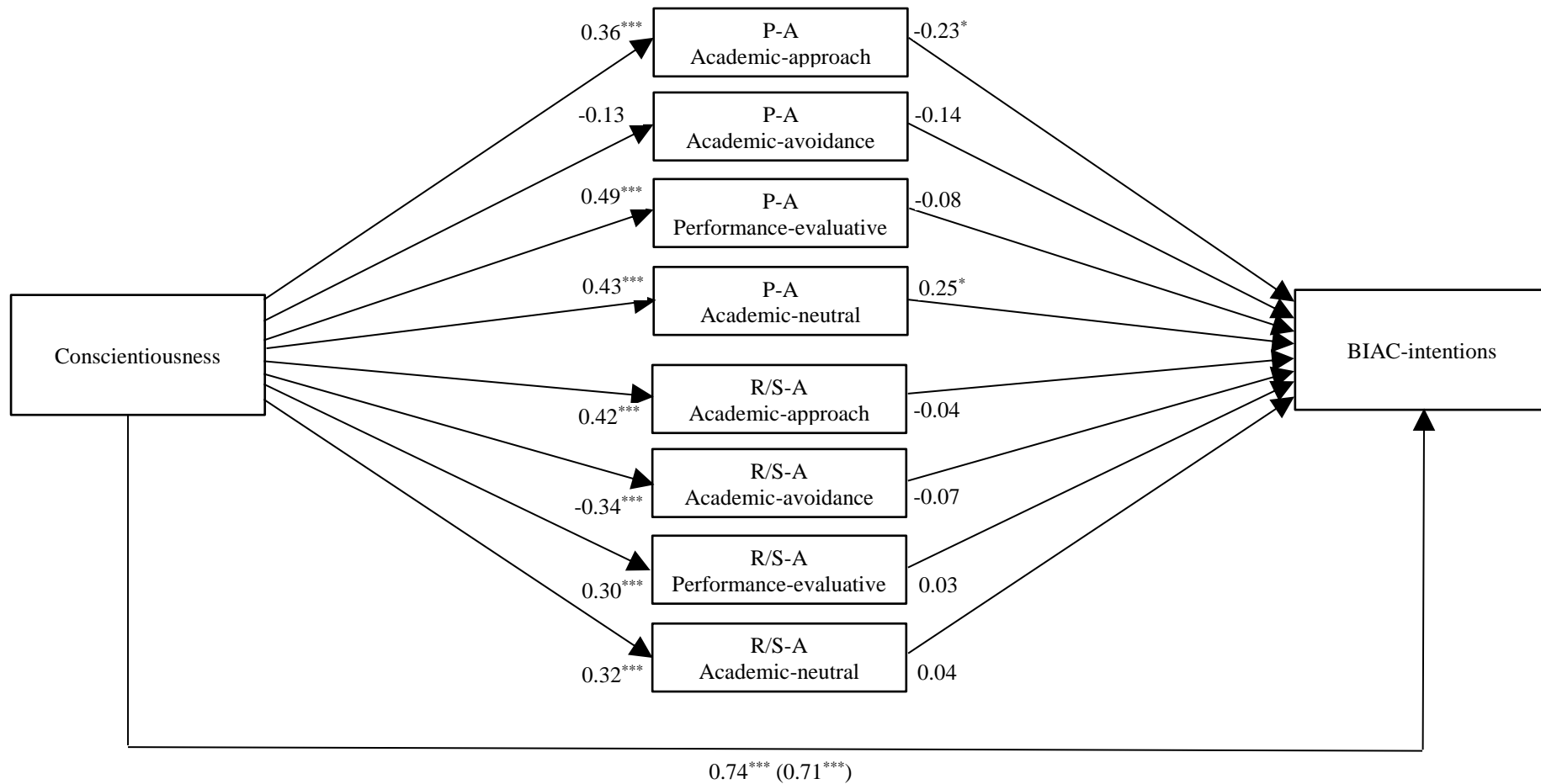


Figure 5. Standardised regression coefficients for the relationship between conscientiousness and Behavioural Indicators of Academic Conscientiousness Intentions (BIAC-Intentions), as mediated by pleasantness-appraisal (P-A) and relevance/significance appraisal (R/S-A) of

academic-related words. Standardised regression coefficient between conscientiousness and BIAC-Intentions while controlling for the mediators in parentheses. * $p < .05$, *** $p < .001$.

Table 9

Stepwise Regression for Appraisals in Predicting Conscientiousness

	<i>B</i>	<i>SE B</i>	β	ΔR^2
Step 1				0.26***
Pleasantness appraisals				
Academic-approach	2.46	2.28	0.12	
Academic-avoidance	-0.16	2.35	-0.01	
Performance-evaluative	6.81	2.45	0.37**	
Academic-neutral	1.59	2.68	0.08	
Step 2				0.09**
Pleasantness appraisals				
Academic-approach	-2.31	2.51	-0.11	
Academic-avoidance	0.59	2.44	0.02	
Performance-evaluative	7.25	2.49	0.39**	
Academic-neutral	-0.95	2.73	-0.05	
Relevance/significance appraisals				
Academic-approach	4.25	2.16	0.25	
Academic-avoidance	-2.73	1.37	-0.19*	
Performance-evaluative	1.29	3.88	0.06	
Academic-neutral	1.73	2.88	0.09	

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

Table 10

Stepwise Regression for Appraisals in Predicting Achievement Striving

	<i>B</i>	<i>SE B</i>	β	ΔR^2
Step 1				0.34***
Pleasantness appraisals				
Academic-approach	1.02	0.51	0.20*	
Academic-Avoidance	-0.28	0.53	-0.05	
Performance-evaluative	0.79	0.55	0.18	
Academic-neutral	1.31	0.60	0.27*	
Step 2				0.09**
Pleasantness appraisals				
Academic-approach	-0.03	0.56	-0.01	
Academic-Avoidance	-0.20	0.54	-0.03	
Performance-evaluative	0.80	0.56	0.18	
Academic-neutral	0.80	0.61	0.17	
Relevance/significance appraisals				
Academic-approach	0.95	0.48	0.24	
Academic-Avoidance	-0.70	0.31	-0.21*	
Performance-evaluative	-0.06	0.87	-0.01	
Academic-neutral	0.62	0.64	0.13	

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

Moderation of the Relationship Between Traits and Appraisals by Week-of-semester

To test whether week-of-semester moderated the relationship between traits and stimuli-appraisals, moderation analyses were conducted in multiple regression. We expected that week-of-semester would moderate the relationship between traits and stimuli-appraisals due to the change of context as stress increased, and assessments and final exams drew closer. However the interaction term was not significant in any analysis ($p > .05$).

Mediation of the Relationship Between Traits and Behavioural Intentions by Stimuli-Appraisals

To test whether stimuli-appraisals mediated the relationship between traits and BIAC-intentions, a mediation analysis was conducted using bootstrapping (with 10,000 samples) with Hayes's (2013) PROCESS macro in SPSS (Hayes, 2009). As the confidence intervals for the completely standardised indirect effect for pleasantness-appraisal of academic-neutral words (0.11, 95% CI [0.02, 0.22]) and pleasantness-appraisal of academic-approach words (-0.08, 95% CI [-0.18, -0.01]) did not include zero, the results indicated a significant indirect effect through these appraisal types (see Figure 5).

Discussion

The first purpose of this study was to investigate the relationship between traits and pleasantness- and relevance/significance-appraisals of different categories of academic stimuli. Contrary to our prediction, neuroticism was not associated with pleasantness-appraisals of academic-avoidance stimuli. However, neuroticism *was* associated with relevance-significance appraisals of academic-avoidance stimuli. As such, it may be that the association between neuroticism and academic avoidant-goal orientations (Corker et al., 2012) is reflected in the appraisal of academic-avoidance stimuli as more relevant/significant, not as more unpleasant. However it is of note that neuroticism *was* negatively correlated with the pleasantness-appraisal of academic-approach, performance-evaluative, and academic-neutral stimuli. This suggests that while neuroticism may be associated with the appraisal of events in general as more negative, the relationship between neuroticism and appraisal of specifically related negative-stimuli may be more correctly captured by relevance/significance appraisals.

As we predicted, extraversion was positively correlated with the pleasantness-appraisal of academic-approach stimuli, but not with relevance/significance appraisal. As

extraversion has not been strongly associated with academic approach-goal orientations in previous studies (Corker et al., 2012) it may be that while people high in extraversion view academic-approach stimuli as more positive, they do not consider them to be of personal relevance/significance. Extraversion was negatively correlated with relevance/significance-appraisals of academic-avoidance stimuli, which is consistent with some research that has found that extraversion has a stronger (negative) relationship with performance-avoidance academic-goal orientation than performance-approach academic-goal orientation (Zweig & Webster, 2004). Consequently, the results of this study may provide a partial, appraisal-based explanation of the relationship between extraversion and academic-goal orientations.

Conscientiousness was positively correlated with all appraisal types, with the exception of pleasantness-appraisals of academic-avoidance stimuli. It is of note that stimuli-appraisals accounted for 35% of the variance in conscientiousness, and 43% of the variance in achievement striving. This was surprisingly large, particularly considering that conscientiousness is not normally associated with the appraisal of emotional stimuli (Reisenzein & Weber, 2009). As such, it appears as though stimuli-appraisals may be an important cognitive-affective process in personality traits, beyond those traits traditionally associated with the processing of emotional information (i.e., extraversion and neuroticism).

The inclusion of relevance/significance appraisals explained an additional 9% of the variance of conscientiousness and achievement striving, indicating that relevance/significance appraisals have statistical importance in addition to pleasantness appraisals, for at least some personality traits. Furthermore, analysis of both pleasantness- and relevance/significance-appraisals enabled a more detailed theoretical analysis of the relationship between neuroticism and extraversion, and stimuli-appraisals. As such, this study found that the inclusion of relevance/significance appraisals in addition to pleasantness-appraisals was important both statistically and theoretically.

The relationship between traits and stimuli appraisals was not moderated by week-of-semester, indicating that the relationship between traits and stimuli-appraisals may be relatively consistent across circumstances. However, this study used direct, self-reported rating of stimuli. Under dual process models, direct measures are thought to tap deliberative and controlled cognitions, while indirect or implicit measures are thought to tap automatic and spontaneous cognitions (Nosek, Hawkins, & Frazier, 2011). It may be the specific situational context is not a strong enough moderator of trait-appraisal relationships when direct measures of appraisal are used, and indirect measures may be better suited to uncovering the dynamic relationship between traits, the situational context, and the appraisal of stimuli.

We found that pleasantness-appraisal of academic-neutral and academic-approach words were significant mediators of the relationship between conscientiousness and BIAC-intentions. The results for academic-neutral words are unsurprising, as it seems probable that as people view stimuli as more positive (or less negative), this leads to increased intention to commit stimuli-related behaviour—in this instance, general academic-related words, and BIAC-intentions. The negative indirect effect through academic-approach words is more difficult to explain, and due to the reversal of sign compared to the bivariate relationships, it is likely due to the inclusion of other appraisal-types in the mediation model. It is possible that the negative indirect effect is due to academic-approach words being outcome focused, rather than task-focused, thus having a negative effect when controlling for other stimuli-appraisal types, however this would need to be explored in future research.

We did not differentiate between different types of BIAC-intentions (e.g., studying versus getting to class on time). A more detailed analysis of *specific* stimuli-related behaviours may reveal stronger mediation effects for related, specific stimuli-categories (e.g., performance-evaluative stimuli and studying, or academic-neutral stimuli and attendance).

Limitations and future directions

There are two main limitations to this study. Firstly, some appraisal categories were highly correlated with each other. As there are theoretical reasons to consider these categories distinct (e.g., someone may view assessment as unpleasant, but not view class as unpleasant), and as they were sorted into distinct categories a priori, we kept them as distinct stimuli categories in these analyses. However, caution must be made in the interpretation of the results, particularly for the mediation model and regressions.

Secondly, this study chose to focus on pleasantness- and relevance/significance-appraisals. Some models of emotional evaluations include arousal and dominance in addition to pleasantness (e.g., Warriner et al., 2013) while different appraisal theories of emotion include different appraisal processes beyond that used in this study (Moors et al., 2013). We chose to focus on pleasantness- and relevance/significance-appraisals as we thought they were of most utility to the current research, particularly as we were using context-specific stimuli. Furthermore, we did not wish to overburden participants with more appraisal types. However, future research may benefit from expanding the appraisal domain past pleasantness and relevance/significance.

Conclusion

This study investigated the relationship between the traits of conscientiousness, neuroticism, and extraversion, and the pleasantness- and relevance/significance-appraisal of academic-related stimuli. The results indicated that relevance/significance-appraisals may be an important addition when understanding the relationship between traits and appraisal of stimuli. Furthermore, some stimuli-appraisals mediated the relationship between traits and trait-related behaviour intentions, suggesting that stimuli-appraisal may be an important cognitive-affective process when considering the relationship between traits and trait-manifesting behaviour. Future research may benefit from investigating the relationship

between traits, different appraisal types, different stimuli types, and trait-manifesting behaviour.

Chapter 6: General Discussion

The three studies in this thesis were undertaken to investigate cognitive-affective processes related to the personality traits of conscientiousness, neuroticism, and extraversion. This was done by using four types of academic-relevant word-stimuli (academic-approach, academic-avoidance, performance-evaluative, and academic-neutral, see Appendix A), a lexical decision task to assess chronic accessibility (Study 1), a modified dot-probe task to assess attentional bias (Study 2), and explicit relevance/significance- and pleasantness-appraisals (Study 3).

The primary aim of the current research project was to investigate whether conscientiousness was associated with cognitive-affective processes related to trait-congruent stimuli (Studies 1, 2, and 3). A secondary aim of this research project was to investigate whether extraversion and neuroticism were associated with the cognitive-affective processing of academic-related stimuli (Studies 1, 2, and 3). A tertiary aim of this research project was to investigate whether the situational context moderates any relationships between traits and cognitive-affective processing (Studies 1, 2, and 3). A final aim was to investigate whether cognitive-affective processes were related to intention to commit trait-manifesting behaviour (Studies 2 and 3).

Summary of Major Findings

Study 1. Study 1 sought to investigate the relationship between conscientiousness, extraversion, and neuroticism, and the chronic accessibility of academic-related stimuli. The results indicated that conscientiousness was related to the chronic accessibility of academic neutral stimuli. Furthermore, extraversion was positively, and neuroticism was negatively, related to the chronic accessibility of academic-approach stimuli. Contrary to predictions, there was no direct relationship between neuroticism and chronic accessibility of academic-avoidance stimuli, however, the week-of-semester in which the study was undertaken was

found to be a moderator of this relationship. The results from this study suggest that personality traits (conscientiousness and extraversion) may be associated with chronic accessibility of trait-congruent stimuli, and that the situational context may moderate the relationship between some trait (neuroticism) and chronic accessibility relationships.

Study 2. Study 2 sought to investigate the relationship between conscientiousness, extraversion, and neuroticism, and the attentional bias of academic-related stimuli. Conscientiousness was positively correlated with attentional bias for performance-evaluative stimuli at both 100ms and 500ms SOA. However BIAC-intentions was only positively correlated with attentional bias for performance-evaluative stimuli at 100ms SOA. Neuroticism was positively correlated with attentional bias for academic-avoidance stimuli at both 100ms and 500ms SOA. Neuroticism was also negatively correlated with attentional bias for academic-neutral stimuli at 500ms, though this relationship was not predicted. Week of semester in which the study was conducted moderated the relationship between neuroticism and attentional bias for academic-avoidance stimuli at 100ms SOA. The simple slope for early in the semester ($-1SD$) was not significant, but the simple slope for later in the semester ($+1SD$) was significant, indicating that the relationship between neuroticism and attentional bias for academic-avoidance stimuli may only be significant in certain situational contexts (e.g., higher stress, greater pressure). The results of this study suggest that personality traits (conscientiousness and neuroticism) were associated with attentional bias for trait-congruent stimuli, and that the situational context may moderate the relationship between traits (neuroticism) and attentional bias. Further, attentional bias for specific stimuli (performance-evaluative) was related to intention to commit conscientious academic behaviours in the commit week.

Study 3. Study 3 sought to investigate the relationship between conscientiousness, extraversion, and neuroticism, and both the relevance/significance- and pleasantness-

appraisals of academic-related stimuli. Results indicated that conscientiousness was related to relevance/significance- and pleasantness-appraisals of all stimuli categories, except pleasantness-appraisals of academic-avoidance stimuli. BIAC-intentions was related to both appraisal types for all stimuli categories. The relationship between conscientiousness and stimuli-appraisals explained 35% of the variance in conscientiousness, and 43% of the variance in achievement striving. Neuroticism was negatively correlated with pleasantness appraisals of academic-approach, performance-evaluative, and academic-neutral stimuli, but was not associated with the pleasantness appraisal of academic-avoidance stimuli. However, neuroticism was positively correlated with the *relevance/significance*-appraisals of academic-avoidance stimuli. In contrast, extraversion was positively correlated with the pleasantness-appraisal of academic-approach and performance-evaluative stimuli, and negatively correlated with the relevance-significance appraisal of academic-avoidance stimuli. Week-of-semester in which the study was conducted did not moderate any of the trait-appraisal relationships. Pleasantness-appraisals of academic-neutral stimuli was a positive mediator, and pleasantness-appraisals of academic-approach stimuli was a negative mediator, of the relationship between conscientiousness and BIAC-intentions, indicating that appraisal of academic-related stimuli mediates the relationship between traits and intention to commit trait-related behaviour. This study found that personality traits (conscientiousness, extraversion, and neuroticism) were associated with appraisals of trait-relevant stimuli. Further, the appraisal of certain stimuli mediated the relationship between a trait (conscientiousness) and intention to commit trait-related behaviour.

Integration of Findings

Interaction effects. Figure 6 outlines the significant relationships between traits (in general) cognitive-affective processes, and behavioural intentions found in this series of studies. The moderating influence of the current environment (i.e., week-of-semester) on

trait and cognitive-affective processes is also included: the dotted lines for this relationship indicate it did not have a consistent effect across traits. It is not clear why week-of-semester was only a significant moderator for neuroticism, and only for chronic accessibility and attentional bias (i.e., not for stimuli-appraisals). The lack of significant moderating influence of week-of-semester on trait-appraisal relationships may be due to Study 3 using a self-report measure of stimuli-appraisals, while chronic accessibility and attentional bias were measured using behavioural tasks. Self-report measures are thought to measure relatively deliberative processes (i.e., the participant has opportunity to reflect and decide in self-report measures; Banse & Greenwald, 2007; Bing, LeBreton, Davison, Migetz, & James, 2007; De Houwer, 2006). In contrast, behavioural tasks sometimes aim to measure the cognitive-affective processes more directly (e.g., the dot-probe task aims to measure attentional processing), and often (but not always) measure relatively automatic and nonconscious processes. For instance, the lexical decision task in Study 1, and the dot-probe task at 100ms SOA in Study 2 likely measure relatively automatic processing. Consequently, as Study 2 found that week-of-semester moderated the relationship between neuroticism and attentional bias and academic-avoidance stimuli at 100ms (reflecting automatic attentional processes) and not 500ms (reflecting more controlled attentional processes), and Study 3 did not find a moderating effect of the situational context on self-reported appraisal (which likely measures more deliberative processing), it may be that relatively automatic processing is more sensitive to the moderating effect of the situational context than more deliberative processing.

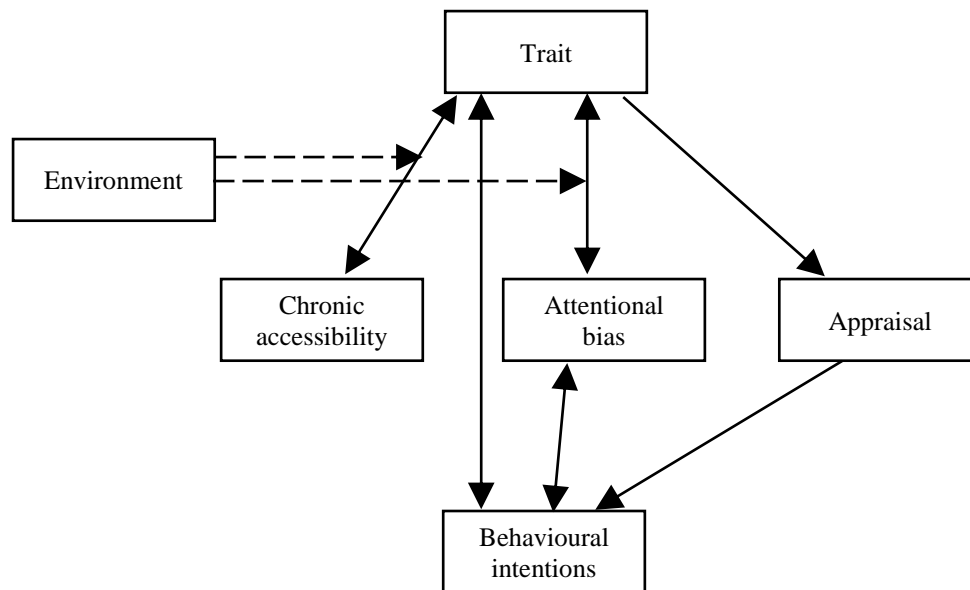


Figure 6. Significant relationships between constructs found in the current series of studies. Not all relationships detailed were significant for all traits. Moderating effect of environment in italics due to it not being consistent across all traits. The only indirect effect that was tested was from traits through appraisal of stimuli to behavioural intentions.

Self-report measures of stimuli-appraisals were used in Study 3 for several reasons. Firstly, self-report measures are normally more reliable than behavioural measures (e.g., Gawronski, Morrison, Phillips, & Galdi, 2017). Secondly, behavioural measures can often be time consuming, particularly when considering that Study 3 used four different categories of stimuli, and two different types of appraisals. Finally, behavioural measures are often *contrasted* with self-report measures, to investigate whether they differentially predict outcomes (e.g., Vianello, Robusto, & Anselmi, 2010). As no previous research has investigated self-reported appraisals of traits and these categories of stimuli (particularly of relevance/significance appraisals) the use of a behavioural measure was not deemed appropriate.

Week-of-semester only moderated the relationship between neuroticism and cognitive-affective processes, which may be due to a variety of reasons. In any situational context, it is difficult to understand the salient features, particularly because what is salient in any given situation may be different for different people. It is possible that as the week-of-semester increased, the salient contextual feature was increased stress, rather than other contextual factors, such as increased temporal proximity to goals. If so, it would make sense that week-of-semester only moderated the relationship between neuroticism and cognitive-affective processes, as neuroticism is related to general stress-reactivity (Suls & Martin, 2005). This heightened emotionality as the semester progresses may make the trait-relevant academic-avoidance stimuli more pertinent (i.e., people high in neuroticism may have had an increased concern about failing as stress increases, leading to increased chronic accessibility and attentional bias). Suls and Martin (2005) found that agreeableness was related to stress-reactivity for situations that involved interpersonal conflict, indicating that different aspects of the situation may affect people with different traits in different ways. For situational contexts to moderate relationships between cognitive-affective processes, it is likely that the salient situational characteristics need to be trait-relevant. For instance, as conscientiousness is thought to be associated with goal- and motivation-regulation (Corr et al., 2013; DeYoung, 2010a), situations where there is goal-conflict may moderate the relationship between conscientiousness and cognitive-affective processes of goal-relevant stimuli. Consequently, future research may benefit from further investigating what specific aspects of the situational context are relevant to people high in different personality traits. Determining how the situational context moderates the relationship between personality traits and cognitive-affective processes will add considerable depth to knowledge about the expression of personality traits in educational and other settings.

Direct relationships between traits and cognitive-affective processes. Overall, there were varied findings across the studies for the relationships between traits and cognitive-affective processes for different stimulus categories. For instance, conscientiousness was related to the chronic-accessibility of academic-neutral stimuli, was not related to attentional bias of academic-neutral stimuli, instead being related to attentional bias of performance-evaluative stimuli, and was related to the relevance/significance- and pleasantness-appraisals of all stimuli-types except pleasantness-appraisals of academic-avoidance stimuli. There was no direct relationship between neuroticism and the chronic-accessibility or pleasantness-appraisals of academic-avoidance stimuli (though there was a moderating effect by week of semester), however there was a significant direct relationship between neuroticism and attentional bias for academic-avoidance stimuli, and a positive relationship between neuroticism and the relevance/significance-appraisal of academic-avoidance stimuli. Extraversion was associated with the chronic accessibility and pleasantness-appraisals of academic-approach stimuli, but not attentional bias or relevance/significance appraisals of academic-approach stimuli.

There are various possible explanations for this. Firstly, there may not be a direct one-to-one correspondence between a trait and cognitive-affective processes for different stimuli types. There are a two main theoretical reasons why this may be the case. Firstly, chronic accessibility may be caused by repeated activation of a concept through environmental stimuli, as well as goal activation (Higgins & Scholer, 2008). For instance, a medical student may have an elevated chronic accessibility of health related-stimuli, without that elevated accessibility being related to the student's health-goals (Touré-Tillery & Fishbach, 2014). Indeed, such a familiarity or experience-based effect has been found previously in the literature, where nurses were quicker at responding to nursing words, and engineers to engineering words (Gardner, Rothkopf, Lapan, & Lafferty, 1987). If experience

is more important than goals in the relationship between traits and chronic accessibility of concepts, than stimuli-relevance/significance may not be a strong requirement for this relationship.

In contrast, there is no theoretical expectation for a relationship between experience and attentional bias, except as how experience relates to personally- or goal-relevant/significant stimuli. Instead of experience, under the relevance/significance framework and goal-relevant perspective of attentional bias, the relevance/significance of the stimuli is thought to be important. The correspondence between traits and relevance/significance appraisals in Study 3 was, somewhat, reflected in the relationships between traits and attentional bias in Study 2. For instance, the relationship between neuroticism and attentional bias for academic-avoidance stimuli and for conscientiousness and performance-evaluative stimuli, was reflected in a significant, positive relationships between those traits and relevance/significance-appraisals for that stimuli type. However, relevance/significance appraisals cannot fully explain the relationship between traits and attentional bias for stimuli types, as conscientiousness was correlated with relevance/significance appraisals of all stimuli types, though only correlated with attentional bias for performance-evaluative stimuli. As such, relevance/significance appraisals may be a requirement, but not sufficient, for attentional biases.

An alternative possibility is that stimuli also need to have *specific* goal-relevance in order to induce an attentional bias. If this is the case, stimuli that are goal-related, but not goal-relevant (e.g., academic-neutral stimuli for people high on conscientiousness) would not induce an attentional bias. This would be consistent with research from Vogt and colleagues who have found that an experimentally induced goal, directed attention to goal-relevant stimuli, but not goal-related (i.e., stimuli that is semantically related but not goal-relevant) stimuli (Vogt, De Houwer, & Moors, 2011). Consequently, a combination of experience-

effects and the requirement for specific goal-relevance may cause the different relationships between the personality traits and the cognitive-affective processes for specific stimuli categories in the current research.

Further integration. Together, these findings indicate a more complex relationship between traits and cognitive-affective processes than previously thought, particularly when potential moderating effects are considered. Figure 7 outlines potential theoretical relationships between some trait-relevant constructs and the cognitive-affective processes explored in this study, and as such is not intended to be authoritative. Many of these relationships are inferred, and have not been directly assessed. Furthermore, Figure 7 only includes those cognitive-affective processes which were included in the current study, and there are likely to be others that are important for explaining personality processes. Finally, Figure 7 provides a broad, abstract overview of the different processes, and does not detail the complex relationships between specific traits, stimuli-types, and cognitive-affective processes. Even so, Figure 7 highlights the complex relationships between the measured constructs, delineating how they may be differentially affected so as not to have the same relationships with the same stimuli types. Additionally, Figure 7 draws attention to the potential moderating influence of situational context, which is an important consideration when considering cognitive-affective processes, and one that is rarely explicitly addressed.

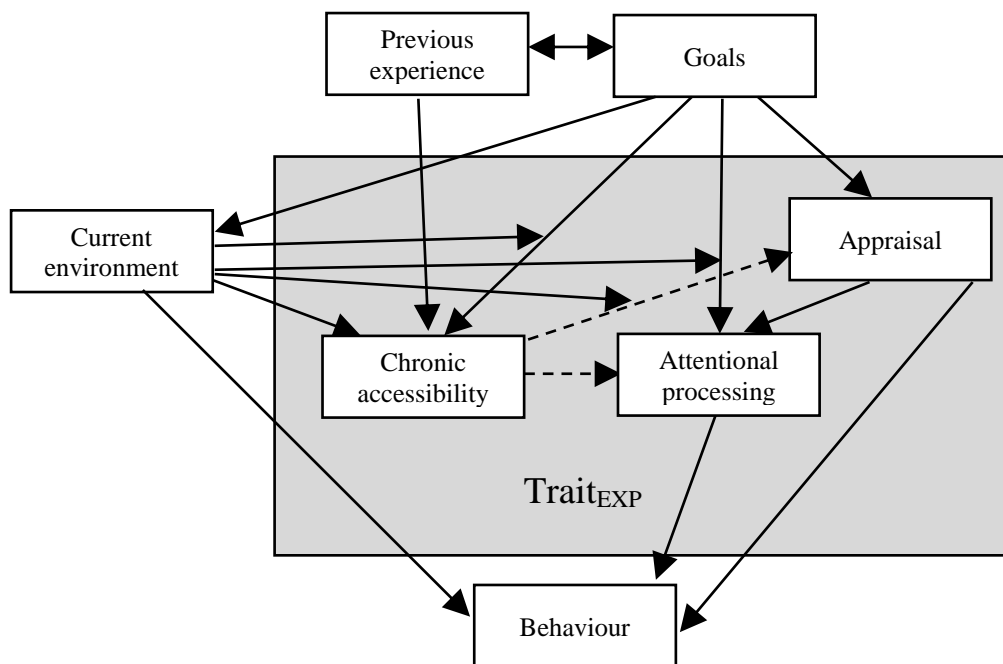


Figure 7. Theoretical relationships between constructs. Relationship between chronic accessibility and attentional bias in italics to indicate there may not be a one-to-one correspondence of stimuli-type.

In Figure 7, the exogenous variables of experience and goals likely influence each other. For instance, goals may directly influence what experiences individuals have (i.e., the goal to get a university degree affects whether a person has gone to university). Similarly, chronic goals likely have some influence on the current situation that an individual is in (i.e., the goal to get a university degree would affect whether a student is currently at university). As previously discussed, both experiences and goals are thought to influence chronic accessibility, while goals and appraisals likely influence attentional biases.

Chronic accessibility is theoretically linked to attentional bias and appraisal. Despite this, there was not a direct one-to-one correspondence between traits and the chronic accessibility, attentional biases, and appraisal of particular stimuli types in this series of studies, suggesting that the relationships between chronic accessibility and other cognitive-affective processes may not be *not* one-to-one. Unfortunately, both previous research and the

current thesis provide limited guidance regarding how or under which circumstances these cognitive-affective processes may be related to each other. One possibility is that these cognitive-affective processes are in fact distinct, and any observed similarities between these processes may be caused by a common antecedent. For instance, goals are theoretically linked to both chronic accessibility and attentional processing, however these two processes may not be directly related. A second possibility is that the relationship between cognitive-affective processes is moderated by the current environment. For instance, it may be that it is only in ambiguous situations that chronic accessibility leads to differences in appraisals, which would be consistent with previous proposals (e.g., Baumert et al., 2011; Baumert et al., 2012). A related possibility is that cognitive-affective processes are dynamic and volatile both between- and within-people. This would make it difficult to find consistent relationships at a global, trait level. Instead, it may be necessary to investigate relationships between cognitive-affective processes concurrently, and using a process theoretically similar to experience-sampling methodology, whereby data is collected at various points across time. As such, though there is a prior theoretical link between chronic accessibility and attentional bias and appraisal, the lines from chronic accessibility to appraisal and attentional biases are dashed in Figure 7, to indicate that there may not be a one-to-one correspondence.

The current environment is likely an important moderating factor in relationships between several constructs outlined in Figure 7. Study 1 and Study 2 found that the situational context could moderate the relationship between traits (which are related to trait-congruent goals such as academic avoidance-goal orientations) and cognitive-affective processes. To the extent that chronic accessibility and attentional bias are related to goals, one could similarly expect the current environment to moderate the relationship between goals and concept accessibility, and goals and attentional processing. That is, it may be that the relationship between goals and cognitive-affective processes is greater when the

environmental situation makes the goals salient. The situational context was not found to moderate the relationship between traits and appraisals in Study 3, and as such, Figure 7 does not indicate that the current environment moderates the relationship between previous experience and goals to appraisal.

Implications

Conscientiousness. Previous research on cognitive-affective processes and personality traits has been limited to the traits of extraversion, neuroticism, and agreeableness, while no previous research has investigated the relationship between conscientiousness and cognitive-affective processes of chronic accessibility, attentional biases, and appraisal of different categories of trait-relevant stimuli. This may be due to the focus on conscientiousness as a trait related to control and self-regulation, and the fact that conscientiousness is rarely considered a trait relating to emotions or affective processing. The results from this series of studies show that conscientiousness *is* related to the cognitive-affective processing of trait-relevant stimuli, which expands the theoretical basis for this important trait.

Firstly, it appears that conscientiousness is related to the relatively automatic processing of stimuli, such as chronic accessibility of academic-neutral words, and attentional bias of performance-evaluative stimuli at 100ms. These types of automatic processing are somewhat at odds to the depiction of conscientious as a trait largely reflecting control, planning, and deliberation (e.g., John et al., 2008). However the findings are consistent with previously observed correlations between conscientiousness and achievement goals (Corker et al., 2012; Sorić et al., 2017) and motivation (Komarraju & Karau, 2005; Komarraju et al., 2009; Richardson & Abraham, 2009). Both goals and motivation are thought to cause automatic processes such as attentional processing of goal-relevant material (Dijksterhuis & Aarts, 2010; Vogt, De Houwer, & Moors, 2011), which implies that conscientiousness should

be related to the automatic processing of trait-congruent, personally relevant stimuli, as reported in this thesis.

These results also help to explain some of the links between conscientiousness and effort- and motivation-regulation, at least in an academic context. For instance, in a mixed stimuli environment, people high in conscientiousness have their attention automatically directed to academic performance-relevant stimuli, thus readying a behavioural response, and reducing the influence of distracting stimuli (Dijksterhuis & Aarts, 2010). Consequently, the control and regulation displayed by people high in conscientiousness may be partially attributed to attentional processes.

Furthermore, people high in conscientiousness may be more likely to engage in study-related tasks because they appraise them as more relevant/significant, and more pleasant than people low in conscientiousness. This is consistent with the results of the mediation model in Study 3, which found that the relationship between conscientiousness and BIAC-intentions was mediated by pleasantness appraisals of academic-neutral stimuli. These results would also be consistent with findings that conscientiousness is negatively correlated with procrastination due to the aversiveness of the task (Watson, 2001), which means that people high in conscientiousness are less likely to procrastinate on an academic task because it is unpleasant. The results from the research presented in this thesis imply that the negative correlation between conscientiousness and procrastination in an academic context may not be because people high in conscientiousness have an ability to force themselves to do unpleasant tasks, but instead is due to people high in conscientiousness viewing these tasks as less unpleasant, therefore less aversive.

Secondly, these studies have raised the possibility that conscientiousness is more related to emotions and affective-processing than previously considered. Study 3 found that conscientiousness was more strongly related to the pleasantness- and relevance/significance

appraisals of the contextual stimuli than extraversion and neuroticism, which are the two traits most commonly associated with both emotions and affective processing (Reisenzein & Weber, 2009). Just as agreeableness is associated with emotional responses and processing of particular types of affective-stimuli, such as those relating to interpersonal and prosocial interactions (Reisenzein & Weber, 2009; Wilkowski et al., 2006), conscientiousness appears to be related to emotional responses and processing of affective-stimuli in an *achievement* context. Conscientiousness is related to achievement goals (Corker et al., 2012; Sorić et al., 2017) and motivation (Komarraju & Karau, 2005; Komarraju et al., 2009; Richardson & Abraham, 2009). As goals and motivated behaviour are functionally-related to emotions (Moors et al., 2013; Reisenzein & Weber, 2009; Revelle & Scherer, 2009; Sander et al., 2005), emotions may regulate and motivate goal pursuit (Carver & Scheier, 2013), and achievement goals are antecedents of achievement emotions specifically (Pekrun, Elliot, & Maier, 2009), it makes sense that conscientiousness would be related to achievement emotions. Indeed, initial research from a study not included in this thesis (Cummings, Poropat, Loxton, & Sheeran, 2017) has indicated that conscientiousness may be strongly related to at least some types of achievement emotions (see Appendix D). However, thus far, no report of the relationship between conscientiousness and achievement emotions has been identified.

Extraversion and neuroticism. This series of studies has also extended previous knowledge of the relationship between the personality traits of neuroticism and extraversion with cognitive-affective processes, by limiting the stimuli to those that should be of personal, contextual relevance to the student participants. By having stimuli that were contextually-relevant, this research reduced concerns that the lack of consistent findings in previous research investigating these traits and cognitive-affective processes may be due to the chosen stimuli not having specific relevance/significance to the study participants. Additionally,

Study 3 included relevance/significance appraisals of the research stimuli, in addition to the commonly considered dimension of pleasantness. These results do not provide a complete explanation for the mixed results found in previous studies, as neuroticism was not associated with chronic accessibility of academic-avoidance stimuli, and extraversion was not associated with the attentional bias of academic-approach stimuli. It may be that additional, unmeasured factors, such as the environmental context, or goals or goal salience, impact these relationships (see Figure 7).

Relevance/significance of appraisals and stimuli. The relevance/significance of stimuli appears to be important, and the appraisal of stimuli as relevant/significant has differential relationships with different traits. For example, Study 3 found that neuroticism was not associated with pleasantness-, but was associated with relevance/significance-appraisals of academic-avoidance stimuli. In contrast, extraversion was associated with the pleasantness- but not the relevance/significance-appraisals of academic-approach stimuli. It is notable that this pattern of results for relevance/significance appraisals reflects the relationship between these traits and academic-goal orientations. That is, neuroticism is associated with academic-avoidance goal orientations (i.e., academic-avoidance stimuli are relevant/significant) but extraversion is not associated with academic-approach goal orientations (i.e., academic-approach stimuli are not relevant/significant). Furthermore, relevance/significance appraisals added a significant amount of variance to pleasantness-appraisals in the prediction of conscientiousness.

As such, it may be that relevance/significance appraisals and personally relevant-stimuli are of equal importance to valence appraisals when considering the relationship between traits and the cognitive-affective processing of stimuli. This has important implications for two reasons. Firstly, it goes to the core of trait-congruent stimuli and processes. While extraversion and neuroticism are commonly thought to reflect the

processing of positive and negative stimuli respectively, valence appraisals may only be one component of the relationship between these traits, the processing of affective stimuli, and emotional outcomes. Drawing on the component processes model of emotion (Sander et al., 2005; Scherer, 2013), both valence and stimuli-relevance appraisals are important for subsequent emotional reactions. People may view some stimulus as unpleasant, however if it is not deemed to be of personal relevance/significance, they are unlikely to have a strong emotional reaction to that stimulus. As such, including relevance/significance appraisals adds an extra dimension when considering the relationship between extraversion and neuroticism and the processing of different categories of affective information.

Furthermore, relevance/significance appraisals can assist in uncovering the core affective domain of each trait. As previously mentioned, there are theoretical reasons to suggest that conscientiousness would be related to achievement emotions, despite conscientiousness largely being neglected when considering the relation between traits and emotions. As seen in Study 3, this achievement-oriented affective component is likely reflected by people high in conscientiousness viewing academic-related stimuli as more personally relevant/significant. A similar approach could be used to investigate the relationship between other traits and different categories of stimuli (e.g., for agreeableness: interpersonal conflict, interpersonal cooperation, empathy, affection.). Such an approach is likely to provide further insight into the exact nature of the affective core of other personality traits.

Secondly, the relevance/significance of stimuli has important implications for how traits and cognitive affective processes are investigated. While some research on cognitive-affective processes have implicitly recognised the importance of choosing stimuli that is of personal relevance/significance to the participants (e.g., alcohol stimuli for problematic drinkers, rather than rewarding stimuli more generally), with the exception of agreeableness

(Wilkowski et al., 2006), this has not been explicitly done with research on personality traits. To the extent that trait-congruent relevance/significance of stimuli is likely to increase the relationship between traits and cognitive-affective processes, and even subsequent emotional and behavioural outcomes, this seems like an oversight. Future research should explicitly consider stimulus relevance when investigating the relationships between personality traits and cognitive-affective processes.

Moderation by Situational Context. Studies 1 and 2 found that the situational context (week-of-semester) moderated the relationship between traits (at least neuroticism) and cognitive-affective processes. Some previous studies have investigated the interaction between the personality traits of neuroticism, extraversion, and current mood in predicting chronic accessibility (Rusting, 1999; Tamir & Robinson, 2004; Tamir et al., 2002). However, this research is the first to investigate the moderating effect of naturally occurring situational context on the relationship between Big Five personality traits and cognitive-affective processes. The finding that the situational context can moderate the relationship between traits and cognitive-affective processes has two main implications.

Firstly, it provides preliminary evidence supporting the relationship between personality traits and the dynamic interplay of naturally occurring situations and personality processes, such as chronic accessibility and attentional bias. This dynamic interplay between the situation and personality processes is central to many social-cognitive perspectives on personality (Mischel, 1999; Mischel & Shoda, 1995), and an integral part of whole trait theory (Fleeson, 2012; Fleeson & Jayawickreme, 2015).

Secondly, these results have practical implications for how future studies on personality traits and cognitive-affective processes are conducted. The finding that the situation can modify the relationship between traits and cognitive-affective processes (Study 1), or that the relationship between traits and cognitive-affective processes may only exist in

certain situational contexts (Study 2), suggests that future research may benefit from explicitly considering how the situational context may impact upon any relationships investigated. By not considering these moderating influences, any direct relationships may be hidden or misunderstood.

Applied implications. Most personality assessment for selection and development purposes in organisations uses a self-report format, using either normative, ipsative, or quasi-ipsative response formats (Salgado & Táuriz, 2014). However, there is an increase in the interest in using alternative approaches, such as gamified or more interactive personality assessments (Chamorro-Premuzic, Winsborough, Sherman, & Hogan, 2016). For instance *VisualDNA* (Imagini Europe Ltd., 2017), has users respond to questions using pictures, instead of the traditional Likert-type anchors. These responses are the able to infer a user's personality Big Five personality traits. *VisualDNA* is essentially measuring stimuli appraisals in a forced choice format in order to assess their personality. As Study 3 found strong relationships between conscientiousness and stimuli-appraisals, with further and more applied research, these results could form the basis of a personality assessment based on stimuli-appraisals.

Other gamified personality assessments are more complete overhauls of the process of assessment. For instance, Arctic Shores (Arctic Shores, 2017) have a number of games which candidates can play which assess their cognitive abilities and their personality. One of the games, *Skyrise city* (Arctic Shores, 2017), is claimed to assess people's emotions, derailers, aptitude, cognition, thinking style, interpersonal style, and a person's ability to deliver results. These assessments collect over 3000 data points to provide a candidate's report. Arctic Shores state:

Unlike self-report personality inventories, the traits under examination are not completely obvious to the candidate. For instance, asking candidates whether they

tend to speak up in groups hints that their degree of Extraversion is being measurement. In contrast, our assessments use a cognitive neuroscience model to subtly measure Extraversion more objectively via subtle shifts in attention. (Arctic Shores, 2017).

This quote, specifically the section which discusses subtle shifts in attention, appears conceptually similar to the investigation of personality and attentional bias, which was conducted in Study 2 of the current thesis. Further, this suggests a potential move away from assessing self-reported personality, and instead directly assessing personality processes or personality related cognitions.

Apart from the lack of peer-reviewed, published articles assessing the validity of these new types of personality assessments, one of the criticisms of this new generation of game-based assessments is that they are not grounded in theory, and instead are driven by data analytics (Chamorro-Premuzic et al., 2016). For instance, the relationship between data points and personality traits or performance outcomes may have been discovered through data mining, instead of being theoretically based. In contrast, the links between personality traits and cognitive-affective processes presented in this thesis are theoretically grounded.

As such, the research presented in the current thesis contributes towards a knowledge base of how personality traits are related to cognitive-affective processes. If properly extended and further researched, this theoretical grounding could be applied in the development of these new types of personality assessments.

Limitations

The use of behavioural tasks. The first, and major limitation of this thesis is the use of behavioural, and particularly reaction time based tasks. While the use of behavioural tasks has benefits (such as likely tapping automatic as opposed to more deliberative processing, which may be necessary to uncover the moderating effects of the situation found in Study 1

and Study 2) behavioural reaction time tasks usually have low reliability (e.g., Gawronski et al., 2017; LeBel & Paunonen, 2011; Van Bockstaele et al., 2013). The lexical decision task used in Study 1 had split-half reliability ranging from .27 to .56, which is typical for these types of tasks. However, though there were the same number of trials used to calculate the indices in the dot-probe task and the lexical decision task—20 target word and 20 matched neutral word trials per category in the lexical decision task, and 20 congruent and 20 incongruent trials in the dot-probe task per category and SOA, the way the dot-probe was implemented in this study meant that there was more method variance than in the lexical decision task. Consequently, the split-half reliability for the dot-probe task was not calculated for the following reasons.

Firstly, while the dot-probe task had the same number of critical trials per target-category and SOA as the lexical decision task, the dot-probe could also vary on the positioning of the words (i.e., whether the target-word was in the position above or below the centre of the screen). To the extent that word-position may affect reaction time, this would need to be balanced across both of the halves used in the split-half reliability estimates.

Secondly, the trials in the lexical decision task were presented in a random order, so that each word and matched-neutral word was presented once in each block. Similarly, in the dot-probe task, in each block each word pair was presented four times: one congruent trial and one incongruent trial when the target-word was above the centre of the screen, and one congruent and one incongruent trial when the target-word was below the screen. However, each of these four presentations of the word-pair was randomly chosen to be at either 100ms SOA or 500ms SOA. Consequently, the trials that make up each attentional bias index (e.g., target-category and SOA) were not necessarily equally distributed across the trial blocks, and were likely in different blocks for different participants, meaning that each trial could be in any position, across both of the blocks. In retrospect, this design choice was not ideal, and

both the lexical decision task and the dot-probe task should have had stimuli presented in a fixed random order, like the stimuli in Study 3, which minimizes procedural variance that can be confounded with interindividual variance (Schnabel, Asendorpf, & Greenwald, 2008).

There are two options for calculating split-half reliabilities in the dot-probe task. Splitting based on order of presentation (e.g., the first 10 congruent trials and the first 10 incongruent trials within a target-category and SOA), raises the concern that there are likely to be different words-pairs in the different halves for each person. This is even more problematic as in each order-based split-half, each congruent trial will not always be in the same block as its' corresponding incongruent trial. That is, in block one there could be a trial where the probe was behind the target-word in the word pair, but due to the order of presentation, the corresponding incongruent trial is in the second split-half. Therefore, calculating reliability in this way operates against the initial efforts that matched target- and neutral-words based on word-length and frequency of use to try to minimize the effects the lexical properties of these words may have on speed of attentional processing.

A second option in calculating split-half reliabilities is to split the halves based on word-pair. It would be possible to have each half contain the word-pair presented twice, one congruent trial, and one incongruent trial, but this creates other problems. Comparing the trials when the target-word was presented above the screen to the trials when the target-word was presented below the screen means the split-halves are not methodologically balanced. Another problem arising from splitting on the basis word-pair is that it ignores the order in which the word pairs are presented. As an extreme example, in each split-half, it would be possible for one participant to have all the component trials sourced from the beginning of the dot-probe task, while the component trials for another participant was sourced at the end of the dot-probe task. To the extent that there are method factors impacting reaction time of trials at different stages of the task (e.g., practice and/or fatigue effects), any variance arising

from these could be confounded with individual variance thereby affecting reliability estimates.

A final difference between the lexical decision task and the dot-probe task in calculating reliability is that the lexical-decision task had no individual-level outliers, while the dot-probe had individual-level outliers for most indices. This indicates greater individual variability in the dot-probe task, which is problematic for two reasons. Firstly, greater individual variability is likely exacerbated by the relatively small number of trials used in this implementation of the dot-probe task. This increased individual variability is likely to be *further* exacerbated by splitting the trials in half to calculate split-half reliability. Secondly, the presence of this individual level variability raises the question of how individual-level outliers should be treated if split-halves are calculated. If individual-level outliers were removed for each split-half, the calculated statistics may not correspond to the final indices used. However, failure to remove individual-level outliers from each split half is likely to bias results.

Previous researchers have noted that using 10 congruent and 10 incongruent trials to calculate each half required for split-half reliability (the same that would be used to calculate split-half reliability in Study 2) is insufficient to calculate split-half reliability in the dot-probe task (Zvielli, Bernstein, & Koster, 2014). Consequently, the reliability of the dot-probe task was not calculated, as it was believed any method was likely to be insufficient and misleading due to the specific nature of the implementation of the task in this study.

However, the reliability of the dot-probe task in this study is not likely to be large, as dot-probe measures have been found to have small reliability in other studies (e.g., Ataya et al., 2012; Dear, Sharpe, Nicholas, & Refshauge, 2011; Zvielli et al., 2014) (cf., Bar-Haim et al., 2010). There have been some attempts to improve the scoring of the dot-probe task to improve its reliability. One method is to measure how much attentional bias changes in a

testing session, in what has been called attentional bias variability, which may have greater validity (Iacoviello et al., 2014) and reliability (Price et al., 2014) than the traditional attentional-bias index. As another more comprehensive measure of within-person attentional bias variability, Zvielli et al. (2014) proposed a trial-level attentional bias score, which accounts for attentional bias variability within the task. Their trial-level bias score has been found to have greater reliability and greater validity than traditional attentional bias indices (Zvielli et al., 2014). However, these attentional bias variability scores may be caused by poor executive control (Iacoviello et al., 2014), have mostly been used in clinical samples and with threatening stimuli, and likely measures a different concept than the traditional attentional bias index. Therefore these methods of scoring may not be applicable to other populations and stimuli-categories.

Problems around reliability and/or validity exist for most, if not all behavioural, indirect, or reaction time measures currently used to investigate cognitive-affective processes, and lack of reliability is a well-recognised problem (Ataya et al., 2012; Bar-Anan & Nosek, 2013; Gawronski et al., 2017; LeBel & Paunonen, 2011; Van Bockstaele et al., 2013; Williams & Kaufmann, 2012), though research is seeking to find more reliable and valid measures. For instance, there has recently been evidence to suggest that measures of emotion-induced blindness (e.g., the rapid serial visual presentation task) may have greater reliability (Onie & Most, 2017) (cf., Tibboel, De Houwer, & Field, 2010) and stronger relationship with outcome measures (Pool et al., 2016) than other measures of attentional bias, such as the dot-probe task, though the evidence is mixed (Van Bockstaele et al., 2013). Regardless, these measures do not currently have the same theoretical or empirical background linking them to goal-related attentional processing. In fact, they appear to measure different attentional mechanisms than tasks such as the dot-probe task (Onie &

Most, 2017), so may not be appropriate in investigating goal-relevant attentional processing before further research is conducted.

The results of the chronic accessibility task should also not be over-interpreted. Firstly, the effect size is relatively small, though of a similar magnitude to effect sizes found in other research on chronic accessibility (e.g., Rusting, 1999). Secondly, the sample size was also somewhat small, which may affect the reliability and replicability of the results found. Finally, there are likely to be further moderating variables affecting the relationship between traits and chronic accessibility. For instance, the sample used in Study 1 was comprised of first year undergraduate psychology students. To the extent that experience with stimuli is thought to influence chronic accessibility, it seems possible that participants who have greater exposure to the target stimuli (e.g., those in a later year of their study) may have a greater chronic accessibility of the constructs, potentially moderating the relationship between traits and chronic accessibility. This greater experience with academic-related constructs for all students is likely to reduce the specific correlation between conscientiousness and chronic accessibility of academic-neutral stimuli. Consequently, and consistent with the emphasis in this thesis on the situational context, any effects found for the relationships between traits and cognitive-affective processes are likely to be moderated by both situational and sample characteristics.

Relationships between the cognitive-affective processes. In this research, the different cognitive-affective processes have been linked through rational/theoretical arguments, and the relationship between personality traits, cognitive-affective processes, and stimuli categories. However, these relationships have not been specifically tested. As such, the broader integration of these cognitive-affective processes, such as outlined in Figure 7, remains somewhat tentative.

This is consistent with previous research, as despite the fact that the same authors often research the relationships between traits and chronic accessibility (Borkenau et al., 2010; Meier & Robinson, 2004; Robinson et al., 2003; Tamir & Robinson, 2004; Tamir et al., 2002) and traits and attentional bias (Paelecke et al., 2012; Wilkowski et al., 2006), these authors have not studied these concepts and their relationships concurrently. The lack of research studying chronic accessibility and attentional bias concurrently is likely due to the low reliability of many of the tasks used to measure cognitive-affective processes (with the exception of the explicit ratings used in Study 3), which makes the investigation of the relationships between traits and these processes difficult, and would make the investigation between these processes even more difficult. This may be why only one study was found that explicitly compared attentional bias and chronic accessibility, and this study used a non-behavioural/non-reaction time (i.e., self-report like), measure of chronic accessibility (Bargh & Pratto, 1986). As such, an investigation of the relationships between these cognitive-affective processes using behavioural/reaction time tasks may be premature, until strong and consistent bivariate relationships between cognitive-affective processes, traits, and stimuli-types are uncovered, and more reliable tasks are developed.

Relationships to other constructs. In this research, inferences have been drawn between traits, cognitive-affective processes, and other traits, such as goals, motivation, and previous experience. As with relationships between cognitive-affective processes, much of this has been based on previous research, theory, or logical inferences. For instance, it was suggested that the relationship between conscientiousness and attentional bias for performance-evaluative stimuli is due to the relationship between conscientiousness and intrinsic motivation to accomplish. Similarly, it was suggested that the relationship between neuroticism and extraversion, and relevance/significance appraisals of academic-avoidance and academic-approach stimuli reflected their association with academic goal-orientations.

However, as the focus of this research was on the relationships between cognitive-affective processes and traits, these potential explanatory mechanisms were not explicitly tested in this research.

Measure of behavioural intentions. The measure of conscientious behavioural intentions was a measure of *intentions*, rather than reported or observed behaviour. Using a measure of behavioural intentions has the simultaneous benefit and limitation that it is separate and distinct from whether the behaviour occurred. Behavioural intentions likely measure motivation to commit corresponding behaviours, while a measurement of whether the behaviour occurred likely includes both motivation to commit the behaviour, and the self-regulatory and self-discipline processes which would be involved in the actual occurrence of these behaviours, as well as transient situational influences. This means that behavioural intentions may be a good measure when conducting initial analyses regarding cognitive-affective processes, particularly when the focus is on motivation (such as in this research) as it is not contaminated by self-control, and therefore finding a significant relationship is likely to be more straight-forward. However, this does mean that these results cannot necessarily be transferred to behavioural outcomes themselves, and so the current results would need to be interpreted with caution if attempting to apply them more broadly.

Multiple comparisons. Finally, the studies presented in this thesis included a large number of analyses. For instance, Study 3 included a correlation matrix for the relationships between the different appraisal types, and a correlation table for the relationships between the personality-traits and appraisals. Due to the large number of analyses included, there is a concern that the number of analyses conducted would increase the false positive result, and any significant results that occurred capitalised on chance. Indeed, a Bonferroni correction to the alpha level for Table 8 would suggest using $p < .0006$ as a criteria for statistical significance.

However, this is unlikely to be as severe a limitation as it initially appears. Firstly, Bonferroni corrections have been found to be overly conservative when measures are correlated (Bland & Altman, 1995). As shown in Table 7, the measures of stimuli-appraisals were highly correlated. Furthermore, the conscientiousness facets presented in Table 8 would also be highly correlated, as they are subordinate facets of a higher factor. Consequently, such an adjustment is likely to overestimate the effect of multiple comparisons on false positives, and severely reduce power to find true effects.

Secondly, not all of the analyses which were included were predicted, or were of central importance to the research, and instead are provided to give extra context, for the sake of completeness, and for the benefit of future researchers who may be interested in these relationships. The relationships presented in Table 7, and many of the correlations in Table 8 were tangential to the research and have been included for completeness and not for testing theories. Only a small number of the relationships presented in Table 8 were the focus of the research, and these were hypothesised based upon clear theoretical justifications. Nonetheless, as with any empirical research, caution is recommended in the interpretation of the results of this thesis until the results can be further replicated.

Future Directions

Goals or motivation and cognitive-affective processes. This thesis found significant relationships between traits and cognitive-affective processes for trait relevant stimuli. However, as mentioned in the limitations section, although this research utilised goal-related concepts in the justification of hypotheses and the explanations of results, this study did not directly examine the relationships between goals and cognitive-affective processes. This should be a fruitful avenue of future, careful research.

One option in investigating these types of relationships would be to conduct a mediation analysis, to see whether goals or motivation mediated the relationship between

traits and cognitive-affective processes. This could be done by using self-report measures of broad goal orientations (e.g., Elliot & McGregor, 2001), or major life goals (Roberts & Robins, 2000). However, the relationships between traits and goal-related constructs are often modest, which increases the sample size requirements. For instance, based off Fritz and Mackinnon's (2007) analysis, assuming a correlation of about .14 for the relationship between a goal-orientation and a cognitive-affective process when controlling for a trait, a researcher would need 462 participants (using bias-corrected bootstrapping) with .80 power to find a significant mediated effect if the relationship between trait and goal-orientation was .14, and 368 for a .26 trait-goal relationship. As Corker et al. (2012) found a correlation of .20 between neuroticism and performance-avoidance and mastery-avoidance goal-orientations, this indicates there would be a large sample size requirement, which becomes more difficult when participants need to be tested on-site, and often individually. Instead, future research may be better served by initially investigating the relationships between goals and/or motivation and cognitive-affective processes (e.g., chronic accessibility, attentional bias, and appraisals), separate from traits.

Appraisals and cognitive-affective processes. This research suggests that appraisal of particular stimuli-categories have an important relationship with traits. Additionally, previous theorizing suggests that stimuli appraisals may be an important or necessary precursor to attentional processing. Consequently, it may be beneficial to investigate whether appraisals mediate the relationship between personality traits and other cognitive-affective processes. However, as with investigating the relationships between goals or motivation and cognitive-affective processes a similar, there is a similar, but less severe, problem when attempting to investigate the potential mediating effect of appraisal on the trait-cognitive affective processes. As Study 3 found medium to high correlations between traits and appraisals (e.g., $r = .32$ between neuroticism and relevance/significance appraisal of

academic-avoidance words, and $r = .49$ between conscientiousness and pleasantness-appraisal of performance-evaluative words), assuming an average correlation of .39 between traits and appraisals, there would need to be 391 participants to achieve .80 power if the relationship between appraisals and other cognitive-affective processes is .14 when controlling for traits, or 116 if the relationship was .26 (Fritz & Mackinnon, 2007). Again, it seems likely that an initial investigation of the bivariate relationship between appraisals and other cognitive-affective processes would be a wiser use of resources, before a mediation model is attempted.

There are two ways the effect of appraisal on cognitive-affective processes could be investigated. Firstly, it would be possible to choose different types of stimuli and correlate participants' stimuli-appraisals (like as measured in Study 3), with their results on the cognitive-affective processes. A second way would be to use different categories of stimuli that are presumed to have higher, and lower relevance to the participants. For instance, the words *celebrate* and *party* are positive stimuli that would likely have universal relevance (particularly among student participants), while the words *hero* and *newlywed* have a similar valence, but are likely to have less universal relevance. A finding that there are differences in the cognitive-affective processing (e.g., chronic accessibility or attentional bias) of these different categories of these stimuli would indicate that stimuli-relevance is an important characteristic which leads to cognitive-affective processing. A preliminary investigation (Cummings, Donsky, & Loxton, 2016) of this has been conducted in a study not included in this thesis (using the lexical decision task outlined in Study 1), and the results indicated that only positive relevant-stimuli was associated with quicker responding to words on the lexical decision task (see Appendix E for results), however future research may benefit from extending this finding in published research, and with other stimuli types.

Moderation of context. This research found that the situational context (specifically, the week-of-semester in which the study was conducted) moderated the relationship between neuroticism and automatic cognitive-affective processes, which is consistent with social-cognitive and integrated perspectives on personality, such as whole trait theory (see the Integration of Findings section for a discussion for potential reasons why a moderating effect was not found for other trait- cognitive-affective processes relationships). The investigation of the moderating effect of the context may be difficult, and may require some care and creativity in research design.

For instance, as previously mentioned, conscientiousness is thought to be associated with goal- and motivation-regulation (Corr et al., 2013; DeYoung, 2010a). Consequently, there may be a stronger relationship between conscientiousness and attentional bias for goal-relevant stimuli in situations where there is goal conflict. One possibility would be to investigate these relationships using something similar to experience sampling methodology, where cognitive-affective processes are measured repeatedly, along with a state-based measure of personality and a measure which records the salient features of the situation.

Another, less resource intensive method would be to experimentally manipulate chronic goals in a laboratory setting. McCabe and Fleeson (2016) assigned participants the task of “getting things done” to successfully measure increases in state based conscientiousness. It would be possible to assign a conflicting goal, or create a context with conflicting motivations (e.g., other people are in the room with the goal to “have fun”) in order to measure the differences in the relationship between conscientiousness and cognitive-affective processes with and without conflicting motivations.

Specificity of stimuli. This research found that particular traits may be associated with the cognitive-affective processing of particular stimuli-categories. However, due to the lack of previous research with which to form grounded hypotheses, this line of research did

not statistically examine whether particular traits are *only* associated with specific stimuli-categories. Such analyses would provide further insight into the relationship between specific traits and related cognitive-affective processing.

For instance, it would be possible to conduct an ANCOVA, with reaction time or appraisal as the dependent variable, stimuli-type as the independent variable, and a trait as a covariate. By investigating the interaction between the covariate and the independent variable, it would be possible to see whether the relationship between a trait and the cognitive-affective processing differs for different stimuli types. Another approach would be to use Fisher's z transformation to examine whether correlation coefficients were significantly different from each other (Meng, Rosenthal, & Rubin, 1992). A final approach would be to use equivalence testing to investigate whether specific correlation coefficients were statistically different from zero (Lakens, 2013). Each of these approaches has limitations. Both ANCOVA and Fisher's z transformation would require a greater sample size to achieve adequate power to detect significant differences, while equivalence testing would require a strong theoretical justification for predicting an absence of an effect. It is likely that this will be most easily accomplished in reliable experimental paradigms where it is possible to observe strong effects, such as with the self-reported appraisal task used in Study 3. Such an effort may lead to further insight into the affective core of specific personality traits.

Conscientiousness and achievement emotions. The results presented in this thesis show that conscientiousness is more strongly related to cognitive-affective processing of contextualised, trait-congruent stimuli, than previously thought. As motivation and goal-regulation are considered functional purposes of emotions (Carver & Scheier, 2013), the relationship between conscientiousness, effort- and self-regulation strategies might be partly explained by the relationship between and the cognitive-affective processing of trait-

congruent stimuli. For instance, Study 2 found that people high in conscientiousness appraise academic-neutral stimuli as more positive/less aversive, thus leading to an increase in intention to commit conscientiousness behaviours. It may be that appraisals (and other cognitive-processes) of trait-relevant stimuli lead to trait-related behaviours, such as effort and motivation regulation. Future research could investigate this by conducting a mediation model, similar to Study 3 presented in this thesis, but measuring effort and motivation regulation and outcome variables.

Conclusion

The current research had four main aims. The first aim was to investigate whether conscientiousness was associated with cognitive-affective processes related to trait-congruent stimuli. Study 1 found that conscientiousness was related to the chronic-accessibility of academic-neutral stimuli, Study 2 found that conscientiousness was related to the attentional bias of performance-evaluative stimuli, and Study 3 found that conscientiousness was related to the pleasantness and relevance/significance-appraisal of multiple types of academic-related stimuli. This indicates that conscientiousness is more related to the affective processing of stimuli than previously thought, which has implications for the conception of conscientiousness.

A secondary purpose of this research was to investigate whether extraversion and neuroticism were associated with the cognitive-affective processing of academic-related stimuli. Study 1 found that extraversion was significantly correlated with the chronic accessibility of academic-approach stimuli, Study 2 found that neuroticism was significantly correlated with attentional bias of academic-avoidance stimuli, and Study 3 found that both neuroticism and extraversion were correlated with stimuli-appraisals, which appear to reflect the traits' relationships with academic-goal orientations.

A third purpose of this research was to investigate whether the situational context moderates the relationships between traits and cognitive affective processes. Study 1 and Study 2 found that the week-of-semester in which the study was conducted moderated the relationship between neuroticism and chronic accessibility (Study 1) and attentional bias (Study 2) of academic-avoidance stimuli. Future research may benefit from explicitly considering the potential impact of the situational context on the relationship between traits and cognitive-affective processes, though this is likely to require a degree of creativity and subtlety in research design.

A final purpose of this research was to investigate whether cognitive-affective processes were related to intention to commit trait-manifesting behaviour. Study 2 found that attentional bias for performance-evaluative stimuli was significantly related to BIAC-intentions, and Study 3 found that pleasantness-appraisals of academic-neutral stimuli mediated the relationship between conscientiousness and BIAC-intentions. However, this research only measured behavioural intentions, and did not measure behavioural outcomes themselves, and therefore these results need to be interpreted with caution if applying them to more broad behavioural outcomes.

Future research should investigate the relationships between goals or motivation and cognitive-affective processes, which should help to explain the relationship between traits and cognitive-affective processes of particular categories of stimuli. If mediation studies are pursued this will require large sample sizes for adequate power, so it is likely to be more useful to firstly conduct bivariate studies of the relationships between goals/motivation and cognitive affective processes before a mediation analysis is attempted.

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Appendix A

List of Word-stimuli used in this Research

Table 11

List of Word-stimuli used in this Research

Academic-approach		Academic-avoidance		Performance-evaluative		Academic-neutral	
Target	Matched-neutral	Target	Matched-neutral	Target	Matched-neutral	Target	Matched-neutral
capable	quarter	dropout	spatter	test	wall	campus	liquid
expert	object	flunk	canoe	mark	code	semester	terminal
intelligent	description	idiot	reach	grade	plate	university	commercial
smart	table	unqualified	fluorescent	exam	port	class	piece
competence	immaterial	quit	area	assignment	particular	textbook	offshore
proficient	incidental	defeat	script	essay	notch	tutor	delta
excellent	newspaper	dumb	pack	assessment	transition	lecture	curtain
success	section	loser	stone	evaluation	indication	chapter	luggage
accomplish	industrial	stupid	street	report	public	student	century
brilliant	temporary	fail	rope	performance	coincidence	lesson	borrow

Appendix B

List of the Items used to Measure Behavioural Indicators of Academic-Conscientiousness

Intentions

Get to appointments on time

Be the first person to show up for a class

Complete assignments on time

Turn in assignments late

Leave for university at the exact time you had planned

Show up for a class more than 5 minutes early

Get to class on time

Return phone calls and emails in timely fashion

Keep up with required study or university work

Put off study or work on an assignment until the last minute

Sit and do nothing

Give up on a problem

Watch TV or go on the internet instead of taking care of responsibilities

Bypass a difficult task

Study or work on an assignment long hours

Study or work on an assignment until you are physically exhausted

Study or work on an assignment on a Friday or Saturday evening

Finish a set amount of study or work on an assignment before relaxing

Persist at tasks after meeting setbacks or failures

Work extra hard on a project to make sure that it is done right

Complete the projects you start

Use a planner to schedule the day's events

Cross off items from your to do list

Make an itinerary

Make lists

Use a calendar or date book to plan your activities

Keep your desk or work area clean

Write in a date book

Set a timeline for getting a project done

Play sick to avoid doing something

Oversleep for class

Blow off class

Appendix C

Correlations Between Variables and Attentional Bias Indices in Study 2, Including Conscientiousness Facets

Table 12

Correlations Between Variables and Attentional Bias Indices in Study 2

	100ms Stimulus Onset Asynchrony				500ms Stimulus Onset Asynchrony			
	Academic- approach	Academic- avoidance	Performance- evaluative	Academic- neutral	Academic- approach	Academic- avoidance	Performance- evaluative	Academic- neutral
Conscientiousness	.07	.00	.19*	-.12	-.13	-.04	.21*	.10
Achievement- striving	.10	-.01	.16	-.08	-.09	.00	.13	.10
Self-efficacy	-.01	-.09	.14	-.03	-.06	-.13	.19*	.09
Self-discipline	-.02	.01	.21*	-.07	-.15	-.01	.13	.03
Order	.14	.10	.20*	-.01	-.09	-.07	.20*	.08
Dutifulness	.04	-.06	.04	-.11	-.10	.06	.22*	.04
Cautiousness	.07	-.01	.10	-.17	-.12	-.05	.12	.11
BIAC-intentions ^a	.06	-.01	.21*	-.03	-.15	.01	.16	.04
Neuroticism	-.02	.21*	-.02	.09	.00	.19*	-.11	-.21*
Extraversion	-.02	.00	.09	.04	.05	-.08	.09	.04
Week	.04	.10	.06	.06	.05	-.17	.01	-.03

Note. ^aBehavioural Indicators of Academic-Conscientiousness intentions

* $p < .05$.

Appendix D

Correlations Between Personality Traits and Learning-oriented Achievement Emotions

Personality traits were measured by the 120 item version of the IPIP NEO (Goldberg, 1999), and achievement emotions were measured by the Achievement Emotions Questionnaire (Pekrun, Goetz, & Perry, 2005). Participants were 425 university students recruited through a first year psychology research pool, and an invitation to participate in research email which is distributed to the student population at the researcher's university. Results of bivariate correlations are presented in Table 13.

Table 13

Correlations Between Personality and Learning-oriented Achievement Emotions

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Extraversion	(.89)										
2. Agreeableness	.06	(.84)									
3. Openness to experience	.13**	.28***	(.81)								
4. Conscientiousness	.26***	.30***	.11*	(.88)							
5. Neuroticism	-.42***	-.03	-.04	-.50***	(.90)						
6. Enjoyment	.28***	.11*	.24***	.49***	-.24***	(.86)					
7. Hope	.32***	.04	.10*	.53***	-.39***	.75***	(.87)				
8. Anger	-.11*	-.18***	-.21***	-.49***	.41***	-.37***	-.41***	(.90)			
9. Anxiety	-.19***	.01	.04	-.36***	.56***	-.08	-.37***	.61***	(.91)		
10. Hopelessness	-.21***	-.09	-.09	-.54***	.53***	-.35***	-.57***	.7***	.79***	(.94)	
11. Boredom	-.13*	-.16**	-.12*	-.54***	.33***	-.47***	-.46***	.75***	.46***	.59***	(.92)

Note. Alpha coefficients presented on the diagonal.

$N = 425$

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

Appendix E

Analysis of Difference in Reaction Times to Relevant Versus Irrelevant Positive

Words in a Lexical Decision Task

Descriptive statistics for reaction time to the word categories are presented in Table 14. A one-way repeated measures ANOVA was conducted to assess whether there were differences in reaction times to the word categories, and was found to be significant ($F(3,106) = 64.37, p < .001$). Post-hoc pairwise analyses found that the reaction time for positive-relevant words was significantly different from all other word categories ($p < .001$), however no other pairwise comparisons were significant ($p > .05$).

Table 14

Descriptive Statistics for Reaction Time to Word Categories

	<i>M</i>	<i>SD</i>
Positive-relevant	274.77	50.21
Positive-relevant matched neutral-control	302.01	51.93
Positive-irrelevant	299.28	52.13
Positive-irrelevant matched neutral-control	301.28	56.11