Working Title

The Chernyshenko Conscientiousness Scales: A New Facet Measure of Conscientiousness

Abstract

Background: The Chernyshenko Conscientiousness Scales (CCS) are a new series of measures designed to assess six lower-order facets of conscientiousness; industriousness, order, self-control, traditionalism, virtue and responsibility. Research has shown that predictive validity can be improved by taking a facet-based approach to personality; however existing inventories fail to capture the entire breadth of the domain.

Aim: To validate the CCS using standard psychometric analyses to confirm that it is suitable for use in US and UK populations.

Method: Data from US (n = 7900) UK (n = 649) participants who completed the CCS was assessed for internal reliability and the underlying structure explored using factor analysis. A separate UK sample completed the CCS twice, two weeks apart, to evaluate test-retest reliability in addition to convergent, discriminant and criterion-related validity.

Results: Factor analysis revealed items designed to measure industriousness, order, self-control, traditionalism and virtue were best represented by a factor structure broadly consistent with the five facet scales. However though internally consistent, the responsibility scale did not hold up under factor analysis. Taken together, the CCS demonstrated good test-retest, construct and criterion-related validity with variation across the facet scales highlighting the heterogeneity of the conscientiousness domain.

Conclusions: The results confirmed that: i) the CCS are a reliable and valid measure of the lower order structure of conscientiousness, ii) the facets of Industriousness, Order, Virtue, Traditionalism and Self-control are robust and distinct, whereas, the content of the Responsibility facet requires further investigation, and iii) the scales are suitable for use in the US and the UK.

INTRODUCTION

Conscientiousness, along with Extraversion, Agreeableness, Neuroticism and Openness to experience, is one of five broad personality domains outlined in the Big Five Taxonomy of Traits (McCrae & Costa, 1987). Despite being a relatively new taxonomy, research has already demonstrated how individual differences in conscientiousness can predict a range of important outcomes including occupational performance (Dudley, Orvis, Lebiecki, & Cortina, 2006; Judge, Higgins, Thoresen, & Barrick, 1999) marital stability (Roberts & Bogg, 2004; Tucker, Kressin, Spiro, & Ruscio, 1998) health-related behaviours (Bogg & Roberts, 2004; Hagger-Johnson et al., 2012; O'Connor, Conner, Jones, McMillan & Ferguson, 2009; Walton & Roberts, 2004) physical and mental wellbeing (Goodwin & Friedman, 2006; Kendler & Myers, 2010) and longevity (Friedman et al., 1993). Furthermore, it has been shown that the personality trait of conscientiousness is comparable to well-established determinants such as socioeconomic status and education attainment in predicting health and mortality (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007).

Conscientiousness is not a unitary construct, but rather a broad domain best conceptualized as a family of related, but distinct stable tendencies and characteristics. An individual high in conscientiousness is more likely to adhere to socially prescribed norms and rules, and has the propensity to be goal-directed, organised, and is able to delay gratification and control one’s impulses (John & Srivastava, 1999). A number of studies have begun to identify the lower-order structure of conscientiousness (see Roberts, Lejuez, Krueger, Richards, & Hill, 2014 for an overview) but research is inconclusive as to what traits are at the core. As articulated by Roberts et al. (2014) our understanding of how conscientiousness may influence important behavioural and health outcomes is only as good as our understanding of the construct itself. Therefore basic research which clarifies the hierarchical structure and lower-order facets of conscientiousness is necessary if we are to advance and push forward our knowledge of this important personality domain.

Bogg and Roberts (2004) conducted a comprehensive meta-analysis of 194 studies which investigated the relationship between conscientiousness-related traits and the leading health behaviours which contribute to mortality. In addition to being one of the largest studies to synthesize the evidence that conscientiousness exerts its effect on health through promoting health-beneficial behaviours, the meta-analysis demonstrated the importance of shifting our attention to the specific facets rather than the higher-order domain. Predictive validity was greatly improved when lower-order traits were analysed compared to an overall measure of conscientiousness, with responsibility, self-control and traditionalism being found to be the strongest predictors of behavioural outcomes (Bogg & Roberts, 2004). In addition, when virtue was assessed, a facet often absent from conscientiousness scales or subsumed by responsibility, it was found to consistently account for individual differences in various health behaviours, demonstrating how inventories which overlook this facet are failing to capture an important predictor of criterion-related variability.

Driven by the lack of a comprehensive taxonomy, Roberts, Chernyshenko, Stark and Goldberg (2005) aimed to empirically derive an acceptable structure of conscientiousness by factor analyzing data from thirty-six scales relating to the domain, taken from seven widely used personality inventories. A six factor solution which converged to form a single higher-order domain of conscientiousness was found to best represent the data; industriousness, order, self-control, responsibility, traditionalism and virtue. In addition to demonstrating good convergent and discriminant validity, tests of criterion related validity revealed these six facets to differentially relate to relevant outcomes (drug use, work dedication, preventive health behaviours, traffic risk), providing further evidence that the lower-order facets offer greater incremental validity than a single global factor of conscientiousness.

The existing inventories analysed by Roberts and colleagues (2005) included scales that either loaded onto only a subset of the lower order facets (a maximum of three) or used one facet as a proxy for conscientiousness. In order to improve predictive validity a comprehensive scale that captures the entire domain and discriminates between lower-order facets is required to further investigation into the relationship between conscientiousness and important criterion variables.

The Chernyshenko Conscientiousness Scales (CCS; Chernyshenko, 2002; Hill & Roberts, 2012) were developed for this purpose. The 60-item inventory has six fairly heterogeneous scales allowing measurement of the different ways in which one can be conscientiousness, with individuals being able to score high on some facets (e.g. virtue) yet low on others (e.g., order). The CCS was developed as part of a doctoral dissertation (Chernyshenko, 2002), and the six facets have demonstrated reliabilities of at least α=.87 (Hill & Roberts, 2012) and good construct validity, predicting outcomes such as student study behaviours, work behaviours and health behaviours (e.g., Gartland, O’Connor, Lawton, & Ferguson E., 20143; Hill & Roberts, 2012). Validation of the order scale was reported by Chernyshenko, Stark, Drasgow and Roberts (2007), however the psychometric properties of the other five scales have not been published. Until the scale is fully validated those wanting to assess conscientiousness will continue to rely on general domain measures, or subscales from personality inventories which do not assess the entire breadth of the domain. In addition, to the best of our knowledge, the scale has only been used in US populations; therefore, we were also interested in exploring its reliability and validity in the UK.

To summarize, the objective of the current research was to examine the reliability and validity of the Chernyshenko Conscientiousness Scales. In order to meet this objective two studies were conducted. In Study 1 we assessed the internal reliability of the six facet scales, and examined whether the 60-items loaded onto a 6-factor structure reflecting the proposed six facets. In order to examine whether the scale was appropriate for use outside of the US and to examine consistency across populations, the above analyses were carried out using a large US sample and then replicated using a UK sample. In Study 2 we aimed to further investigate the psychometric properties of the CCS by exploring test-retest reliability, construct validity and predictive validity in an additional, smaller sample of UK based participants.

STUDY 1

METHOD

*Participants*

*US sample.* The participants who completed the CCS were not actively recruited; they were individuals who visited websites related to R Chris Fraley’s and Brent W. Roberts’ assessment-related web sites (<http://www.yourpersonality.net/>;<http://www.psychology.illinois.edu/people/bwrobrts>). Links on these websites indicated that individuals could answer for themselves “How Conscientious are You?” by completing the survey. Once the CCS was put up on the web, it passively collected responses from interested participants.

In total, data were available for 9285 participants who had completed the CCS online. Participants were asked to indicate whether they had previously completed the questionnaire, and those who reported yes were excluded from the analysis (n=827). Participants who reported being less than 16 years of age or over 80 years of age were also excluded. Therefore 7900 participants made up the US sample; 5524 females (69.9%), 2339 males (29.6%) and 37 who did not report their gender (0.5%). Participants were aged 16 to 77 years, with a mean age of 29.66 ± 12.32 years.

*UK sample.* This data set was collated from four studies carried out in the UK which administered the CCS as part of their design. All studies recruited participants using an opportunity sampling method where participants responded to public advertisements and volunteered to take part. Data was available for 696 participants, with the respective sample sizes of the four studies being 100, 103, 231, and 262. However 47 participants were excluded from the current analysis due to insufficient data for the CCS. Therefore, the final UK population sample included 649 participants; 486 females (74.9%), 159 males (24.5%), and 4 participants who did not report their gender (0.6%). Participants were aged 18 to 78 years, with a mean age of 26.53 ± 10.65 years.

*Design and Measures*

For each sample conscientiousness was assessed cross-sectionally using the Chernyshenko Conscientiousness Scales (Chernyshenko, 2002; Hill & Roberts, 2012); a 60-item questionnaire made up of six scales, each designed to measure one of the six facets of conscientiousness described by Roberts et al. (2005). The full scale is reproduced in Appendix 1. Industriousness reflects the degree one is ambitious and hard working (example item: ‘I try to be the best at anything I do’). Order refers to the tendency to plan ahead, be organised and neat (example item: ‘organisation is a key component of everything I do’). Self-control is the propensity to be cautious and able to delay gratification, rather than being impulsive and careless (example item: ‘I rarely jump into something without first thinking about it’). Responsibility is concerned with being dependable, cooperative and a service to others (example item: ‘I go out of my way to keep my promises’). Virtue reflects being honest, moral and a Good Samaritan (example item: ‘The people who know me best would say that I am honest’), and traditionalism reflects adherence to societal rules and norms, and the tendency to respect authority (example item: ‘I support long-established rules and traditions’). Each facet scale consists of 10-items. The US studies scored items on 4-point Likert scale, ranging from 1 (disagree strongly) to 4 (agree strongly), whereas the UK participants rated items on a 5-point scale ranging from 1 (very inaccurate) to 5 (very accurate). High scores on any scale indicated that an individual was high in that lower-order facet; however there was no cut-off score which distinguishes people as high or low in conscientiousness (Hill & Roberts, 2012).

*Statistical Analysis*

The individual facet scales were examined in turn for internal reliability using Cronbach’s alpha. The factor structure of the questionnaire was then investigated using factor analysis, where principal axis factoring (PAF) was selected as the extraction method in SPSS version 19.0. PAF was performed with an oblique (direct oblimin) rotation; the preferred method of rotation when factors are hypothesised to be related (Field, 2009, p. 664). Whilst the facet subscales should capture different aspects of conscientiousness that are to some degree heterogeneous, the facets have previously been found to converge into one single higher-order domain of Conscientiousness (Roberts et al., 2005), and therefore an oblique rotation was more appropriate than an orthogonal rotation for this dataset.

For preliminary factor analysis it is recommended to extract all factors with Eigenvalues >1 (Kaiser, 1960). However in large samples this criterion can often lead to an overestimation of the number of appropriate factors (Field, 2009, p.641). Therefore in order to investigate how well the 60 items load onto the proposed six-factor lower order structure of conscientiousness, a forced six-factor solution was extracted. As an exploratory measure five and seven factor extractions were also carried out on both data sets to examine how these compare to the six factor solutions. Factor loadings with an absolute value greater than .3 are typically taken to be important (Field, 2009, p.644) and therefore values <.3 were suppressed in the output.

RESULTS

*Descriptive Statistics*

Participants’ scores on the CCS for both the US and UK samples are presented in Table 1. Whilst it appears that the US sample scored lower on all facets, this is due to the different Likert scales used in the two samples.

In both samples participants scored highest on industriousness and responsibility and lowest in traditionalism. It is also noteworthy that for both samples, all facet scales were significantly correlated and the majority of these correlations were moderate in magnitude. This suggests that whilst the lower-order facets are related, they are also measuring different aspects of conscientiousness. Across both samples, the highest correlation was between responsibility and industriousness, indicating that these domains may be overlapping whereas the relationship between order and virtue was consistently low.

*Scale Reliability*

Internal consistency of the subscales was assessed using Cronbach’s alpha, and Table 2 displays the alpha value for each lower-order facet in the US and UK samples separately. For the US sample, all facet scales demonstrated good internal reliability (α ≥ 0.80), with the exception of the responsibility subscale which showed lower (α ≥ 0.70) but acceptable reliability (Cortina, 1993). Likewise, in the UK sample order, self-control and industriousness also demonstrated good internal reliability (α ≥ 0.80), whereas responsibility again demonstrated lower but acceptable reliability (α ≥ 0.70). Reliabilities for traditionalism and virtue were lower in the UK sample compared to the US sample, but still within the acceptable range.

*Factor Analysis*

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy established values of .95 for the US and .91 for the UK sample, indicating that these databases were appropriate for factor analysis (Hutcheson & Sofroniou, 1999). Likewise KMO values for individual items were >.90 for the US sample, and >.70 for the UK sample, both well above the acceptable limit of .50 (Field, 2009, p.647). This indicated that the patterns of correlations are compact and factor analysis should yield distinct and reliable factors for both data sets (Kaiser, 1974). Moreover Bartlett’s test of sphericity was found to be significant for both the US (χ2 (1770) = 160211.85; P < 0.001) and UK samples (χ2 (1770) = 13930.337; P < 0.001), indicating that correlations between items were sufficiently large, further confirming that both data sets were appropriate for factor analysis.

*US sample.* Table 3 shows the factor loadings for the US sample after an oblique rotation (direct oblimin) with a six factor extraction. Scale items designed to measure industriousness, order, virtue and self-control reflected the facets accurately, with all the individual scale items loading together as expected on separate components.

For the two facets of traditionalism and responsibility the factor loadings were less definitive. The majority of the traditionalism items also held up on a single factor (component 3); however those items relating to rule abiding (T3, T7 and T10) had low factor loadings. Moreover item T3 (‘Even if I knew how to get around the rules without breaking them, I would not do it’) demonstrated a factor loading of -.40 on the component best representing virtue, and item T10 (‘When I was in school, I used to break rules quite regularly’) loaded onto the component representing self-control at .33, indicating that these items were blends of more than one of the conscientiousness facets.

In comparison, the responsibility scale was more problematic and did not hold up well when subjected to factor analysis with a six-factor extraction. Only item R4 loaded onto a sixth component with a weak factor loading of .30. Items R1-R3 loaded with the industrious items onto component 1 whereas R5 loaded weakly onto the component representing virtue. No other items demonstrated factor loadings >.3 on any component. A 7-factor extraction only resulted in minor changes from the 6-factor solution, with item R3 (‘I got out of my way to keep my promises’) loading on component 7 and no items loading on component 6. This suggests that the responsibility facet does not break out as a coherent factor using the items from the CCS.

*UK sample.* In order to confirm that this solution was the most appropriate, an oblique rotation (direct oblimin) with a six factor extraction (Table 4) was performed in the UK sample and the pattern of factor loadings largely replicated the US sample. Item I9 (‘Setting goals and achieving them is not very important to me’) and SC9 (‘I dislike being around impulsive people’) did not demonstrate factor loadings ≥.3; however as a whole those items measuring industriousness, order and self-control clustered together on components 1-3. Likewise, the traditionalism items associated with following rules (T3, T7 and T10) again were problematic with item T3 loading on the component representing virtue, confirming that this item is complex. The virtue items also generally loaded onto the same component, however not as strongly or consistently as when virtue was measured in a US sample, with items V6 and V7 having factor loadings <.3. A similar pattern emerged regarding the responsibility items, with items loading onto the components representing industrious (R1 and R2) and virtue (R5 and R9) and no items loading onto a sixth factor. Therefore, it was concluded that across both samples, the items from all of the facets but responsibility successfully cohere into reasonably clear factors.

STUDY 2

METHOD

*Participants and Design*

Study 2 was carried out in order to: (1) assess the test-retest reliability of the CCS by asking participants to complete the instrument twice, two weeks apart, (2) assess convergent validity by analysing whether the CCS correlates well with another validated measure of conscientiousness (convergent validity) and less so with a validated measure of other personality domains (discriminant validity), and to (3) examine the criterion-related validity of the CCS by exploring whether it is associated with important health behaviours in the expected direction.

Participants were recruited via advertisements inviting them to participate in a two-part online questionnaire, and were compensated with the chance to win £25 ($40) of shopping vouchers. Part one included a series of online questions and assessments designed to assess personality and recent health behaviours (described below). Those participants who completed part one were sent an email invitation two weeks later asking them to take part in the second part of the study, which involved completing the CCS a second time to assess test-retest reliability.

A total of 118 participants completed part one of the online validation study; 101 (85.6%) females and 17 (14.4%) males. Due to a technical error, information regarding participants’ age was not collected at the time of testing; 69 (58.5%) participants later gave their age online when requested via email invitation. The mean age of the 69 participants who retrospectively reported their age was 26.25 years (8.82 SD), with a range of 19-54 years.

Eighty participants completed part two of the study, on average 14.76 (SD 1.29) days after part one (range 14-19 days), giving a follow up rate of 67.8%. Comparing those participants lost at follow-up to those who completed all parts of the study, no significant differences were found for gender (χ2 (1) = 2.01, p = .157) or whether participants were students or in employment (χ2 (2) = 2.69, p = .261). Additionally, the two groups did not differ in terms of conscientiousness when measured using the CCS (d = .24, p = .19), or the IPIP conscientiousness scale (d = .21, p = .26). Those participants who reported their age retrospectively were significantly more likely to have completed all parts of the study (χ2 (1) = 42.06, p <.001); age data was available for 91.3% of the test-retest sample compared to only 58.5% of the whole sample. Therefore, we could not analyse whether the two groups differed on age.

*Measures and Assessments*

Participants responded to a range of questions assessing various health behaviours, and completed a series of assessment tools designed to measure personality traits.

*Personality*

*Chernyshenko Conscientiousness Scales.* The CCS, as described in Study 1, were administered to assess conscientiousness.

*‘Big 5’ Personality Traits.* The five broad personality domains (Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness to Experiences) were assessed using a 50-item International Personality Item Pool measure (IPIP; <http://ipip.ori.org/newNEODomainsKey.htm>). This public domain inventory consists of five 10-item scales, each measuring constructs similar to those in the NEO-PI-R (Costa & McCrae, 1992), with five positive and five negatively worded items per scale. Each scale has been to shown to correlate highly with the corresponding NEO-PI-R scale (r = .77), and has demonstrated good internal reliability with coefficient alpha’s ranging from .77 to .86 (<http://ipip.ori.org/newNEO_DomainsTable.htm>).

*Health Behaviours*

The following health behaviours (risk taking behaviour, alcohol intake, tobacco consumption and drug use) were assessed cross-sectionally as outlined below. For each question participants were asked to think about their health behaviours on average over the past week.

*Risk-Taking Behaviour* was measured using four items taken from the Health Behaviour Checklist (HBCL; Vickers et al., 1990). Two items related to risky driving behaviour; “I speed while driving” (item 33) and “I carefully obey traffic rules so I won’t have accidents” (item 12). The other items related to taking risks in daily life; “I take chances when crossing the street” (item 5) and “I engage in activities and hobbies where accidents are possible” (item 40). Participants rated all four items on a 5-point scale ranging from 1 (very uncharacteristic of me) to 5 (very characteristic of me), with item 12 being reverse scored.

*Alcoholic beverage consumption* was assessed using a number of questions adapted from the NHS choices: alcohol self-assessment questions (NHS, 2013). This included an open response question where participants were asked how many units of alcohol they had drank over the past week. NHS guidelines on the unit equivalent of alcoholic drinks were provided so participants could calculate approximately how much alcohol they had consumed. To assess binge drinking participants were asked to indicate how often they consume six or more units on one occasion (ranging from never to daily/almost daily), and on how many days in the past week have they consumed six or more units (ranging from never to 4 or more days).

*Cigarette use* was measured by asking participants to indicate whether they currently smoke tobacco and participants could indicate yes, no or that they smoked in the past. Participants were also asked to indicate how many cigarettes they had smoked in the last 7 days with a free response format.

*Drug use* was measured by asking participants to indicate how often they use drugs other than those required for medical reasons (ranging from never to often). To clarify what was meant by drug use, the following definition taken from the Drug Abuse Screening Test (Gavin, Ross, & Skinner, 1989) was provided; “this may include but is not limited to: cannabis (e.g., marijuana, hash), solvents (e.g., gas, paints), tranquilizers (e.g., Valium), barbiturates, cocaine and stimulants (e.g., speed), hallucinogens (e.g., LSD) or narcotics (e.g., Heroin). This does not include alcohol or tobacco.”

*Statistical analysis*

Convergent and discriminant validity of the CCS was assessed by asking participants to complete a measure of the ‘Big 5’ personality domains, with the expectation that the CCS would correlate highly with the conscientiousness scale and less strongly with measures of the other four personality domains (openness, agreeableness, extraversion and neuroticism). Finally to ascertain predictive validity, the six facet scores and the overall conscientiousness composite score were correlated with health behaviours. Pearson’s Product Moment Correlations were also used to assess test-rest reliability of the CCS.

RESULTS

*Descriptive Statistics*

CCS scores and zero order correlations between the facet scales are shown in Table 5. Replicating study 1, participants scored highest on Industriousness and Responsibility and lowest on Traditionalism. With the exception of the virtue scale the majority of the correlation coefficients show a small to moderate association between facets demonstrating that whilst related the scales are measuring heterogeneous traits. The absence of a significant correlation between virtue and three of the scales (industriousness, order and self-control) indicates that in the UK validation sample being virtuous may differ markedly from other aspects of conscientiousness. Descriptive statistics for the IPIP measure of the Big Five are given in Table 6. Participants’ health behaviour scores are also shown in Table 7, and a wide range of scores were reported. As a whole the sample was found to be relatively healthy, reporting low alcohol unit consumption and tobacco usage over the past week. Additionally, only a small number of participants were found to use drugs regularly or consume six or more units for the majority of the week.

*Convergent Validity*

Table 8 presents the correlation coefficients between participants’ scores on the CCS and their scores on the IPIP Big Five scales. The total CCS scale was found to correlate strongly with the IPIP measure of conscientiousness (r=.63, p < .001, 95% CI: 0.51, 0.73), indicating that the scale has good convergent validity as a whole. Examining the facet scales individually, the Order, Responsibility and Industriousness scales showed good convergent validity with correlation coefficients of .52 (p < .001, 95% CI: 0.37, 0.64), .61 (p < .001, 95% CI: 0.48, 0.71) and .55 (p < .001, 95% CI: 0.41, 0.67), respectively. The Traditionalism (r=.22, p = .22, 95% CI: 0.04, 0.39) and Self control (r =.29, p = .29, 95% CI: 0.12, 0.45) facet scales also demonstrated significant, albeit lower correlation coefficients. Virtue was the only facet scale which did not evidence convergent validity, showing an almost complete absence of relationship with the IPIP measure of conscientiousness (r =.06, p = .52, 95% CI: -0.12, 0.24).

*Discriminant Validity*

When the CCS were combined into a total score they demonstrated a good pattern of discriminant validity. No significant correlation was found between the CCS total score and the IPIP measures of extraversion and openness, and whilst the total CCS score had a significant association with neuroticism (r = -.21, p = .02, 95% CI: - 0.38, - 0.03) and agreeableness (r=.22, p = .02, 95% CI: 0.04, 0.39), these correlation coefficients were modest in magnitude. The Order, Responsibility and Industrious scales, which correlated strongly with the IPIP conscientiousness measure, also indicated good discriminant validity as they did not correlate with any other domain measure >.28.

Examining the remaining three facet scales, Traditionalism was found to correlate most strongly with openness to experience (r = -.36, p < .001, 95% CI: -0.51, - 0.19), self control negatively correlated with extraversion (r = -.32, p < .001, 95% CI: -0.47, -0.15), and virtue demonstrated a significant correlation with agreeableness (r = .23, p = .01, 95% CI: 0.05, 0.39). These correlation coefficients are greater in magnitude compared to than when each facet scale was correlated with the IPIP measure of conscientiousness, which suggests that these scales are tapping into other personality domains in addition to conscientiousness.

*Criterion-Related Validity*

Table 9 shows the relationship between each of the six conscientiousness facets, the total conscientiousness score and important health behaviour criterion measures. In addition, the correlation coefficients between the IPIP measure of conscientiousness and the same health behaviours are also provided to compare the criterion-related validity of both measures.

The overall CCS score was found to significantly correlate with all health behaviour variables, aside from risky activities (r = -.16, p =.09, 95% CI: -0.34, 0.03), indicating that the scale as a whole has good criterion-related validity. Moreover, risky activities significantly correlated with the lower-order self-control scale (r = -.27, p < .001, 95% CI: -0.43, -0.09), demonstrating how predictive validity can be improved when a facet based approach to conscientiousness is adopted.

Examining the lower-order traits individually, each facet was associated with at least one important area of health behaviour. Self control emerged as the most important facet, often demonstrating equal or greater levels of validity than the overall conscientiousness score. Order also emerged as an important facet demonstrating a negative association with a total score for risk behaviour (r = -.21, p = .02, 95% CI: -0.38, -0.03), recent binge drinking behaviour (r = -.21, p = .02, 95% CI: -0.38, -0.03) and tobacco use (r = -.31, p <.001, 95% CI: -0.47, -0.14). The Industriousness facet scale showed weaker criterion-related validity, however a negative association was found with recent binge drinking (r = -.18, p = .05, 95% CI: -0.35, 0.00).

The correlation coefficients between the total CCS score and health behaviours were also found to be greater in magnitude when compared to the IPIP measure; binge drinking being the exception where the coefficients were almost equivalent (-.21 and -.22). Whereas the CCS significantly related to behaviours such as alcohol unit consumption (r = -.25, p = .01, 95% CI: -0.41, -0.07) and drug use (r = -.21, p = .02, 95% CI: -0.38, -0.03), no association was found when these behaviours were correlated with the IPIP conscientiousness measure. This indicates that for the health behaviours measured in the current study, the CCS demonstrates equivalent or greater predictive validity than an existing measure of conscientiousness.

*Test-retest Reliability*

Test-retest reliability for the CCS was evaluated using data from the 80 participants who completed the CCS approximately two weeks apart. The correlation coefficients between scores at time 1 and time 2 were high for all facet scales indicating good test-retest reliability; Order (r = .90, 95% CI: 0.85, 0.94), Virtue (r=.80, 95% CI: 0.70, 0.87 ), Traditionalism (r=.86, 95% CI: 0.79, 0.91), Self control (r=.85, 95% CI:0.78, 0.90 ), Responsibility (r=.81, 95% CI: 0.72, 0.87), Industriousness (r=.86, 95% CI: 0.79, 0.91), and the total CCS score (r = .87, 95% CI: 0.80, 0.92).

DISCUSSION

The Chernyshenko Conscientiousness Scales are six 10-item measures of the lower order facets of conscientiousness identified by Roberts et al. (2005). Previous research has highlighted the need for a facet based approach to personality (Moon, 2001; Roberts & Bogg, 2004), and therefore the CCS were designed to assess the most frequently replicated facets which are overlooked in many of the major personality inventories. The current research aimed to evaluate the CCS to confirm that they are appropriate for use in the UK and US, and two studies were carried out in order to meet this objective. In Study 1 internal reliability and factor analysis were performed on two large data sets. In Study 2 a separate sample was recruited to explore the scale in relation to: (i) test-retest reliability; (ii) convergent and discriminant validity and (iii) criterion-related validity.

Principal axis factoring carried out on US and UK datasets revealed two comparable factor structures, both broadly consistent with the facet scales. For the most part items intended to measure industriousness, order, self-control, traditionalism and virtue loaded as expected on five distinct factors. Each facet scale also demonstrated good internal validity, indicating items within each subscale were measuring a related construct. However across both US and UK samples, the responsibility scale did not hold up well when subjected to factor analysis. Several of these items loaded with items designed to measure industriousness and virtue, whereas others did not meaningfully load onto any factor. When a six-factor solution was forced, across both data sets few items meaningfully loaded onto a sixth component. Therefore despite the CCS being designed to capture six related yet discrete traits, it appears that 5 scales conform to the hypothesized structure, while responsibility did not.

Examining the content of the responsibility items reveals that they capture a range of qualities including punctuality, trustworthiness and having the desire to give back to the community. Therefore the scale may be tapping into multiple facets rather than capturing a discrete lower-order trait, which is reflected in the strong associations found between scores on the responsibility scale and the industriousness and virtue facets. It is also worth noting that the scale was shown to have acceptable reliability, and in study 2 good convergent and discriminant validity. Nonetheless, it is clear that the current set of items is in need of revision in order to achieve a distinct factor structure and facet tapping responsibility.

The CCS also demonstrated good reliability and validity in a separate sample of UK-based participants. The scales produced consistent results when administered twice over a two week period, confirming its test-retest reliability. In addition, the instrument as a whole and the scales measuring industriousness, order and responsibility evidenced strong patterns of convergent and discriminant validity; correlating highly with an alternative measure of conscientiousness and only moderately with the remaining Big Five. The traditionalism and self-control scales also demonstrated convergent validity, yet discriminant validity was more problematic. This is in line with previous research which found conscientiousness to positively relate to agreeableness, emotional stability and openness to experience (Digman, 1997; Roberts et al., 2005), supporting the view that certain facets may be “interstitial” and lie somewhere between conscientiousness and other measures of the Big Five (Hofstee, de Raad, & Goldberg, 1992; Roberts et al., 2005). Virtue was the only facet found to not relate to the IPIP measure of conscientiousness. However, it has been acknowledged that virtue is often overlooked in the major existing personality inventories (Bogg & Roberts, 2004). Therefore the weak convergent validity may be the result of the alternative measure failing to capture virtuous qualities.

The scales also demonstrated criterion-related validity, although, there was variation across the facets which is likely to reflect the proactive and inhibitive aspects of conscientiousness. Self-control was related to each of the outcome measures whereas industriousness only demonstrated a significant relationship with recent binge drinking. This is likely to be a result of the chosen outcomes; industriousness reflects the degree to which one is hard working and ambitious and therefore is more likely to predict job performance or work dedication rather than health behaviours. Moreover, it would be interesting to explore the extent to which these conscientiousness scales relate to approach health behaviours such as exercise and healthy eating as well as to avoidance, risky behaviours as observed in the current study (Conner & Abraham, 2001; O’Connor, Conner, Jones, McMillan, & Ferguson, 2009)

A number of limitations of the current study require some additional comment. First, we recognise that the main design was cross-sectional and as a result we are unable to draw any conclusions about the ability of the CCS to predict changes in behaviour overtime. In addition, we acknowledge that the sample size recruited in Study 2 was relatively small, and consequently, the study may have been under powered to detect relationships between some of the lower order facets and the health behaviours. However, it is important to note that many of the predicted relationships were observed, therefore, the absence of effects is likely to indicate a real finding and that the lower order facets of conscientiousness have differential effects on health behaviours (Bogg & Roberts, 2004; O’Connor et al., 2009).

In conclusion, the findings of this investigation confirmed that: i) the CCS is a reliable and valid measure of the lower order structure of conscientiousness, ii) the lower order facets of Industriousness, Order, Virtue, Traditionalism and Self-control are robust and distinct, whereas, the content and structure of Responsibility requires further study, and iii) the scales are suitable for use in the US and the UK.

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Table 1

Study 1: Descriptive Statistics and zero order correlations between the facet scales for the CCS

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Facet | Mean | SD | IND | ORD | VIRT | TRAD | SC | RESP |
| **US (n=7569)** |  |  |  |  |  |  |  |  |
| Industriousness | 31.83 | 5.50 | - |  |  |  |  |  |
| Order | 28.30 | 6.88 | .42 | - |  |  |  |  |
| Virtue | 28.71 | 5.81 | .44 | .28 | - |  |  |  |
| Traditionalism | 26.17 | 5.54 | .34 | .39 | .49 | - |  |  |
| Self Control | 29.31 | 5.55 | .34 | .35 | .38 | .34 | - |  |
| Responsibility | 31.60 | 4.47 | .66 | .42 | .54 | .40 | .42 | - |
| **UK (n=649)** |  |  |  |  |  |  |  |  |
| Industriousness | 39.35 | 6.66 | - |  |  |  |  |  |
| Order | 35.52 | 8.12 | .39 | - |  |  |  |  |
| Virtue | 34.82 | 6.12 | .43 | .18 | - |  |  |  |
| Traditionalism | 31.69 | 5.76 | .34 | .30 | .40 | - |  |  |
| Self Control | 34.70 | 6.82 | .32 | .33 | .32 | .37 | - |  |
| Responsibility | 38.58 | 5.23 | .61 | .41 | .46 | .31 | .40 | - |

*Note.* All inter-correlations have a significance value of  *p* < 0.001.

IND = Industriousness; ORD = Order; VIRT = Virtue; TRAD = Traditionalism; SC = Self Control; RESP = Responsibility

**Table 2**

Study 1: Internal consistency reliabilities of the facet scales

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | UK | | US | |
|  | α | n | α | n |
| Industriousness | .87 | 649 | .86 | 7620 |
| Order | .88 | 649 | .90 | 7616 |
| Virtue | .77 | 649 | .81 | 7611 |
| Traditionalism | .74 | 649 | .81 | 7597 |
| Self-Control | .84 | 649 | .82 | 7589 |
| Responsibility | .70 | 649 | .72 | 7590 |

Table 3

Study 1: Principal Axis Factoring of the CCS in US Sample (oblique rotation and 6-factor extraction)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Scale | CCS item | Component | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| I | I have high standards and work towards them | .67 | - | - | - | - | - |
| I | I go above and beyond what is required | .73 | - | - | - | - | - |
| I | I do not work as hard as the majority of people around mer | .57 | - | - | - | - | - |
| I | I invest little effort into my workr | .53 | - | - | - | - | - |
| I | I demand the highest quality in everything I do | .64 | - | - | - | - | - |
| I | I try to be the best at anything I do | .67 | - | - | - | - | - |
| I | I make every effort to do more than what is expected of me | .70 | - | - | - | - | - |
| I | I do what is required, but rarely anything morer | .53 | - | - | - | - | - |
| I | Setting goals and achievement them is not very important to me | .41 | - | - | - | - | - |
| I | Getting average grades is enough for me | .43 | - | - | - | - | - |
| O | Being neat is not exactly my strengthr | - | -.80 | - | - | - | - |
| O | Organization is a key component of most things I do | - | -.62 | - | - | - | - |
| O | I need a neat environment in order to work well | - | -.68 | - | - | - | - |
| O | I become annoyed when things around me are disorganized | - | -.59 | - | - | - | - |
| O | For me, being organized is unimportantr | - | -.61 | - | - | - | - |
| O | Half of the time I do not put things in their proper placer | - | -.76 | - | - | - | - |
| O | Most of the time my room is in complete disarrayr | - | -.76 | - | - | - | - |
| O | Every item in my room and on my desk has its own designated place | - | -.73 | - | - | - | - |
| O | I frequently forget to put things back in their proper placer | - | -.71 | - | - | - | - |
| O | I hate when people are sloppy | - | -.40 | - | - | - | - |
| T1 | I have the highest respect for authorities and assist them whenever I can | - | - | .64 | - | - | - |
| T2 | People respect authority more than they shouldr | - | - | .55 | - | - | - |
| T3 | Even if I knew how to get around the rules without breaking them, I would not do it | - | - | - | - | -.40 | - |
| T4 | I believe that people should be allowed to take drugs, as long as it doesn't affect othersr | - | - | .49 | - | - | - |
| T5 | I support long-established rules and traditions | - | - | .56 | - | - | - |
| T6 | People who resist authority should be severely punished | - | - | .67 | - | - | - |
| T7 | When I was in school, I used to break rules quite regularly | - | - | - | .33 | - | - |
| T8 | In my opinion, all laws should be strictly enforced | - | - | .63 | - | - | - |
| T9 | In my opinion, censorship slows down the progressr | - | - | .42 | - | - | - |
| T10 | When working with others I am usually the one who makes sure that rules are observed | - | - | .32 | - | - | - |
| SC1 | I often rush into action without thinking about potential consequencesr | - | - | - | .74 | - | - |
| SC2 | I rarely jump into something without first thinking about it | - | - | - | .61 | - | - |
| SC3 | I am known to make quick, hot-headed decisionsr | - | - | - | .71 | - | - |
| SC4 | I do not take unnecessary risks | - | - | - | .49 | - | - |
| SC5 | I am easily talked into doing silly thingsr | - | - | - | .47 | - | - |
| SC6 | My friends say I am unpredictabler | - | - | - | .48 | - | - |
| SC7 | I get into trouble because I act on impulses rather than on thoughtsr | - | - | - | .73 | - | - |
| SC8 | I am careful with what I say to others | - | - | - | .37 | - | - |
| SC9 | I dislike being around impulsive people | - | - | - | .31 | - | - |
| SC10 | Even under time pressure, I would rather take my time to think about my answer than to say the first thing that comes to mind | - | - | - | .44 | - | - |
| V1 | If I could get away with it, I would not pay taxesr | - | - | - | - | -.51 | - |
| V2 | I would lie without hesitation if it serves my purposer | - | - | - | - | -.66 | - |
| V3 | I could be insincere and dishonest if situation required me to do sor | - | - | - | - | -.56 | - |
| V4 | If I find money laying around, I 'll keep it to myselfr | - | - | - | - | -.57 | - |
| V5 | If I cashier forgot to charge me for an item I would tell him/her | - | - | - | - | -.63 | - |
| V6 | I would rather get a bad grade than copy some else’s homework and turn it in as my own | - | - | - | - | -.49 | - |
| V7 | It bothers me when other people cheat on their taxes | - | - | - | - | -.36 | - |
| V8 | If I accidentally scratched a parked car, I would try to find the owner to pay for the repairs | - | - | - | - | -.56 | - |
| V9 | I firmly believe that under no circumstances it is okay to lie | - | - | - | - | -.40 | - |
| V10 | The people who know me best would say that I am honest | - | - | - | - | -.35 | - |
| R1 | I carry out my obligations to the best of my ability | .54 | - | - | - | - | - |
| R2 | I often feel responsible for making sure that all group project assignments are completed | .47 | - | - | - | - | - |
| R3 | I go out of my way to keep my promises | .33 | - | - | - | - | - |
| R4 | Sometimes it is too much of a bother to do exactly what is promised | - | - | - | - | - | -.30 |
| R5 | I would gladly spend some of my leisure time trying to improve my community | - | - | - | - | -.37 | - |
| R6 | If I am running late to an appointment, I may decide not to go at allr | - | - | - | - | - | - |
| R7 | I am usually not the most responsible group member, but I will not shirk on my duties eitherr | - | - | - | - | - | - |
| R8 | If I am running late, I try to call ahead to notify those who are waiting for me | - | - | - | - | - | - |
| R9 | When I make mistakes I often blame others | - | - | - | - | - | - |
| R10 | I have a reputation for being late for almost every meeting or eventr | - | - | - | - | - | - |
|  |  |  |  |  |  |  |  |
|  | Eigenvalues after rotation a | 8.14 | 7.37 | 4.91 | 6.09 | 6.75 | 1.68 |

a When factors are correlated, sums of squared loadings cannot be added to obtain a total variance

Table 4

Study 1: Principal Axis Factoring of the CCS in UK Sample (oblique rotation and 6-factor extraction)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Scale | CCS item | Component | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| I1 | I have high standards and work towards them | .64 | - | - | - | - | - |
| I2 | I go above and beyond what is required | .73 | - | - | - | - | - |
| I3 | I do not work as hard as the majority of people around mer | .69 | - | - | - | - | - |
| I4 | I invest little effort into my workr | .68 | - | - | - | - | - |
| I5 | I demand the highest quality in everything I do | .73 | - | - | - | - | - |
| I6 | I try to be the best at anything I do | .64 | - | - | - | - | - |
| I7 | I make every effort to do more than what is expected of me | .66 | - | - | - | - | - |
| I8 | I do what is required, but rarely anything morer | .62 | - | - | - | - | - |
| I9 | Setting goals and achievement them is not very important to me | - | - | - | - | - | - |
| I10 | Getting average grades is enough for me | .43 | - | - | - | - | - |
| O1 | Being neat is not exactly my strengthr | - | -.70 | - | - | - | - |
| O2 | Organization is a key component of most things I do | - | -.53 | - | - | - | - |
| O3 | I need a neat environment in order to work well | - | -.72 | - | - | - | - |
| O4 | I become annoyed when things around me are disorganized | - | -.65 | - | - | - | - |
| O5 | For me, being organized is unimportantr | - | -.56 | - | - | - | - |
| O6 | Half of the time I do not put things in their proper placer | - | -.74 | - | - | - | - |
| O7 | Most of the time my room is in complete disarrayr | - | -.74 | - | - | - | - |
| O8 | Every item in my room and on my desk has its own designated place | - | -.65 | - | - | - | - |
| O9 | I frequently forget to put things back in their proper placer | - | -.73 | - | - | - | - |
| O10 | I hate when people are sloppy | - | -.39 | - | - | - | - |
| SC1 | I often rush into action without thinking about potential consequencesr | - | - | .76 | - | - | - |
| SC2 | I rarely jump into something without first thinking about it | - | - | .66 | - | - | - |
| SC3 | I am known to make quick, hot-headed decisionsr | - | - | .74 | - | - | - |
| SC4 | I do not take unnecessary risks | - | - | .57 | - | - | - |
| SC5 | I am easily talked into doing silly thingsr | - | - | .54 | - | - | - |
| SC6 | My friends say I am unpredictabler | - | - | .51 | - | - | - |
| SC7 | I get into trouble because I act on impulses rather than on thoughtsr | - | - | .74 | - | - | - |
| SC8 | I am careful with what I say to others | - | - | .37 | - | - | - |
| SC9 | I dislike being around impulsive people | - | - | - | - | - | - |
| SC10 | Even under time pressure, I would rather take my time to think about my answer than to say the first thing that comes to mind | - | - | .55 | - | - | - |
| T1 | I have the highest respect for authorities and assist them whenever I can | - | - | - | .51 | - | - |
| T2 | People respect authority more than they shouldr | - | - | - | .40 | - | - |
| T3 | Even if I knew how to get around the rules without breaking them, I would not do it | - | - | - | - | .41 | - |
| T4 | I believe that people should be allowed to take drugs, as long as it doesn't affect othersr | - | - | - | .36 | - | - |
| T5 | I support long-established rules and traditions | - | - | - | .51 | - | - |
| T6 | People who resist authority should be severely punished | - | - | - | .63 | - | - |
| T7 | When I was in school, I used to break rules quite regularly | - | - | - | - | - | - |
| T8 | In my opinion, all laws should be strictly enforced | - | - | - | .56 | - | - |
| T9 | In my opinion, censorship slows down the progressr | - | - | - | - | - | - |
| T10 | When working with others I am usually the one who makes sure that rules are observed | - | - | - | - | - | - |
| V1 | If I could get away with it, I would not pay taxesr | - | - | - | - | .42 | - |
| V2 | I would lie without hesitation if it serves my purposer | - | - | - | - | .76 | - |
| V3 | I could be insincere and dishonest if situation required me to do sor | - | - | - | - | .68 | - |
| V4 | If I find money laying around, I 'll keep it to myselfr | - | - | - | - | .45 | - |
| V5 | If I cashier forgot to charge me for an item I would tell him/her | - | - | - | - | .37 | - |
| V6 | I would rather get a bad grade than copy some else’s homework and turn it in as my own | - | - | - | - | - | - |
| V7 | It bothers me when other people cheat on their taxes | - | - | - | - | - | - |
| V8 | If I accidentally scratched a parked car, I would try to find the owner to pay for the repairs | - | - | - | - | .46 | - |
| V9 | I firmly believe that under no circumstances it is okay to lie | - | - | - | - | .54 | - |
| V10 | The people who know me best would say that I am honest | - | - | - | - | .41 | - |
| R1 | I carry out my obligations to the best of my ability | .50 | - | - | - | - | - |
| R2 | I often feel responsible for making sure that all group project assignments are completed | .43 | - | - | - | - | - |
| R3 | I go out of my way to keep my promises | - | - | - | - | - | - |
| R4 | Sometimes it is too much of a bother to do exactly what is promised | - | - | - | - | - | - |
| R5 | I would gladly spend some of my leisure time trying to improve my community | - | - | - | - | .31 | - |
| R6 | If I am running late to an appointment, I may decide not to go at allr | - | - | - | - | - | - |
| R7 | I am usually not the most responsible group member, but I will not shirk on my duties eitherr | - | - | - | - | - | - |
| R8 | If I am running late, I try to call ahead to notify those who are waiting for me | - | - | - | - | - | - |
| R9 | When I make mistakes I often blame others | - | - | - | - | .32 | - |
| R10 | I have a reputation for being late for almost every meeting or eventr | - | - | - | - | - | - |
|  |  |  |  |  |  |  |  |
|  | Eigenvalues after rotation a | 7.93 | 6.59 | 6.09 | 3.13 | 5.44 | 1.32 |

a When factors are correlated, sums of squared loadings cannot be added to obtain a total variance

Table 5

Study 2: Descriptive statistics and zero order correlations between facet scales

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Facet | Range | Mean | SD | IND | ORD | VIRT | TRAD | SC | RESP |
| CCS |  |  |  |  |  |  |  |  |  |
| Industriousness | 22-50 | 39.47 | 6.55 | - |  |  |  |  |  |
| Order | 14-50 | 31.83 | 5.50 | .31\*\* | - |  |  |  |  |
| Virtue | 17-50 | 34.32 | 6.29 | .09 | .01 | - |  |  |  |
| Traditionalism | 15-44 | 30.69 | 6.27 | .26\*\* | .18\* | .38\*\* | - |  |  |
| Self Control | 16-47 | 35.39 | 6.70 | .19\* | .25\*\* | .09 | .30\*\* | - |  |
| Responsibility | 23-49 | 38.19 | 5.37 | .49\*\* | .38\*\* | .24\* | .27\*\* | .18\* | - |
| Total | 145-262 | 212.27 | 23.25 |  | . |  |  |  |  |

\*\* Correlation is significant at the 0.01 level (2-tailed)

\*Correlation is significant at the 0.05 level (2-tailed)

**Table 6**

Study 2: Descriptive statistics of the International Personality Item Pool dimensions

|  |  |  |  |
| --- | --- | --- | --- |
|  | Range | Mean | SD |
| IPIP |  |  |  |
| Conscientiousness | 19-50 | 35.15 | 7.17 |
| Neuroticism | 12-47 | 29.64 | 9.37 |
| Extraversion | 12-49 | 32.08 | 8.23 |
| Openness | 24-50 | 38.17 | 6.25 |
| Agreeableness | 19-50 | 37.64 | 5.69 |

**Table 7**

Study 2: Descriptive statistics of the Health Behaviours.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Range** | **Mean** | **SD** |
| Risk taking |  |  |  |
| Speeding | 1-5 | 2.19 | 1.24 |
| Chance Taking | 1-5 | 2.54 | 1.33 |
| Obeying Traffic Rules | 1-5 | 3.66 | 1.20 |
| Risky activities | 1-5 | 2.27 | 1.29 |
| Total Score | 4-18 | 9.35 | 3.48 |
|  |  |  |  |
| Alcohol, Smoking and Substance Use |  |  |  |
| Unit consumption | 0-70 | 8.44 | 12.25 |
| Cigarettes smoked in the last week | 0-140 | 4.62 | 21.40 |
|  |  |  |  |
| How often do you have six or more units on one occasion |  | **n** | **%** |
| Never |  | 33 | 28 |
| Less than Monthly |  | 26 | 22 |
| Monthly |  | 17 | 14.4 |
| Fortnightly |  | 21 | 17.8 |
| Weekly |  | 12 | 10.2 |
| 2 to 3 times a week |  | 7 | 5.9 |
| Daily or almost daily |  | 1 | 0.8 |
|  |  |  |  |
| During the last 7 days, how often have you had six or more units on one occasion |  |  |  |
| Never |  | 69 | 59.5 |
| 1 day |  | 30 | 25.9 |
| 2 -3 days |  | 14 | 12.1 |
| 4 or more days |  | 3 | 2.5 |
|  |  |  |  |
| Do you use drugs? |  |  |  |
| Never/rarely |  | 103 | 87.3 |
| sometimes |  | 12 | 10.2 |
| often |  | 3 | 2.5 |

**Table 8**

Study 2: Pearson’s Product Moment Correlations between scores on the CCS and the IPIP

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Conscientiousness Facets | | | | | |  |
| Big Five Domains | Order | Virtue | Traditionalism | Self Control | Responsibility | Industriousness | CCS Total |
| Conscientiousness | .52\*\* | .06 | .22\* | .29\*\* | .61\*\* | .55\*\* | .63\*\* |
| Neuroticism | -.11 | -.12 | -.21\* | -.14 | -.11 | -.09 | -.21\* |
| Extraversion | .22\* | -.00 | .11 | -.32\*\* | .28\*\* | .20\* | .14 |
| Openness | -.03 | .03 | -.36\*\* | -.27\*\* | -.02 | .15 | -.14 |
| Agreeableness | -.04 | .23\* | .27\*\* | .12 | .10 | .19\* | .22\* |

\*\* Correlation is significant at the 0.01 level (2-tailed)

\*Correlation is significant at the 0.05 level (2-tailed)

**Table 9**

Study 2: Pearson’s Product Moment Correlations between the CCS, IPIP and Criterion Variables

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Order | Virtue | Traditionalism | Self-control | responsibility | industriousness | Overall | IPIP |
| Risk taking | -.21\* | -.19\* | -.18 | -.45\*\* | -.10 | .13 | -.36\*\* | -.21\* |
| Speeding | -.10 | -.16 | -.15 | -.37\*\* | -.07 | -.14 | -.27\*\* | -.11 |
| Chance Taking | -.15 | -.13 | -.18 | -.36\*\* | -.04 | -.13 | -.28\*\* | -.16 |
| Obeying Traffic Rules | .23\* | .15 | .11 | .23\* | .10 | .05 | .25\* | .14 |
| Risky activities | -.10 | -.07 | -.05 | -.27\*\* | -.05 | -.02 | -.16 | -.16 |
| Alcohol |  |  |  |  |  |  |  |  |
| Unit consumption | -.15 | -.05 | -.19\* | -.25\* | 0.12 | -.13 | -.25\* | -.16 |
| Binge drinking | -.16 | -.01 | -.16 | -.22\* | -.15 | -.06 | -.21\* | -.22\* |
| Recent binge drinking | -.21\* | -.19\* | -.26\*\* | -.28\*\* | -.21\* | -.18\* | -.37\*\* | -.28\*\* |
| Substance use |  |  |  |  |  |  |  |  |
| Do you smoke? | -.31\*\* | -.11 | -.23\* | -.35\*\* | -.23\* | -.06 | -.36\*\* | -.22\* |
| Cigarettes smoked in the last week | -.21\* | -.15 | -.08 | -.07 | -.21\* | -.06 | -.22\* | -.08 |
| How often do you use drugs? | -.12 | -.23\* | -.24\* (-.19a) | -.21\* | .01 | .04 | -.21\* | -.15 |

a Correlation coefficient when traditionalism was re-scored eliminating item T4 (I believe that people should be allowed to take drugs, as long as it doesn't affect others).

\*\* Correlation is significant at the 0.01 level (2-tailed)

\*Correlation is significant at the 0.05 level (2-tailed)