The relationship of psychopathy with response inhibition and alcohol use

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Introductory Chapter: Thesis Overview

Alcohol use and response inhibition

Alcohol use in the United Kingdom has a rich and detailed history that is often reflected by changing societal and political contexts (see Nicholls, 2014; Vetter, 2012). Its use is often associated with social situations and there had been an observable trend of this increasing over the years, although current figures suggest there has since been a decline following a peak circa 2008 (PHE, 2016a). Despite a general decline in alcohol use, problematic, hazardous or dependent drinking behaviours are still thought to affect around 10 million people in England (Copeland, 2020). Harmful or addictive drinking is often associated with a multitude of potential risks including, but not limited to; sexual health risk, physical risk (e.g., accidents or injury, increased risk of heart disease, liver disease, stroke), psychological/mental health risk (e.g., depression, anxiety, insomnia), and neurological risk (e.g., Wernicke-Korsakoff Syndrome) (NHS, 2018; PHE, 2016b; Zubaran, Fernandes, & Rodnight, 1997). This can subsequently place a significant demand upon National Health Service (NHS) resources with regards to how professionals support and care for these individuals.

Understanding what may influence or maintain alcohol misuse is therefore fundamental in recognising how to offer treatment interventions for this population and there have been multiple proposed theories that can arguably be grouped into three fields: neurobiological, psychosocial, and psychological. An example of neurobiological theorising includes the dopamine theory of addiction. This was considered within the 1970's in light of predominantly rat-based studies that looked at the role of dopamine on maintaining and ceasing addiction (Nutt, Lingford-Hughes, Erritzoe, & Stokes, 2015). Psychosocial

explanations include the influence of family and peer relationships (Friedman, Terras, & Glassman, 2000; McDonough, Jose, & Stuart, 2016), attachment with caregivers (Patock-Peckham, Cheong, Balhorn, & Nagoshi, 2001) and socioeconomic status (Allen et al., 2018). Lastly, psychological theories include ideas such as the role of risk factors, including poor inhibitory control (Weafer, Phan, & de Wit, 2020). This denotes that either disinhibition contributes to the development of misusing alcohol, the misuse of alcohol leads to increased disinhibition, or that there is a combination of the two (De Wit, 2009; Zhao, Qian, Fu, & Maes, 2017). Various studies have explored this relationship between inhibitory control and the development and maintenance of substance dependence (De Wit, 2009; Verdejo-García, Lawrence, & Clark, 2008; Zeng et al., 2013; Zeng, Su, Jiang, Zhu, & Ye, 2016). A meta-analytic review of 97 studies conducted by Smith, Mattick, Jamadar, and Iredale (2014) found that between samples of heavy substance users or those with addiction-like behaviours, versus healthy controls, there was an observable increase in behavioural impulsivity and poorer response inhibition for the former clinical groups, which may represent a vulnerability to addiction. Comparatively, experimental research by Jones and Field (2015) explored response inhibition abilities amongst social drinkers when presented with alcohol-related images and they found increased disinhibition associated with alcohol-related content. These findings suggest that groups of individuals that are characterised by poorer response inhibition may be at increased risk of problematic alcohol use. An example of such a group is people who show a constellation of personality traits clinically referred to as psychopathy, or 'psychopathic personality' (Hare, 2003).

Psychopathy, response inhibition and associations with alcohol use

In 1941, Hervey Cleckley formally outlined the classic concept of psychopathy in his book 'The Mask of Sanity' (Cleckley, 1941). Since then, it has been the subject of considerable empirical investigation (Coffey, Cox, & Kopkin, 2018). The term holds many

negative connotations, perpetuated by the way it is defined as "a pathologic syndrome involving prominent behavioural deviancy in the presence of distinctive emotional and interpersonal features" (Patrick, Fowles, & Krueger, 2009, p. 913). This is coupled with a tendency in forensic and legal settings to label individuals as 'psychopathic' unfavourably. However, it can be a helpful construct in predicting and managing risk and tailoring treatment plans, specifically within secure clinical settings. Despite psychopathy being formerly viewed as a categorical constellation of traits (i.e. 'psychopathic' versus 'non-psychopathic'), there is now shared consensus that a continuous trait approach is more accurate than a categorical approach when considering psychopathy as a construct (Edens, Marcus, Lilienfeld, & Poythress Jr, 2006). Amongst other characteristics, psychopathy is widely considered to be associated with problems in response inhibition (Baskin-Sommers & Newman, 2014), and these problems may contribute to externalising proneness such as substance (mis)use. Previous research that explored the predictive relationship of elevated psychopathy traits and drug use found a positive effect (Ahn & Vassileva, 2016) as well as the Disinhibition facet of the Triarchic Psychopathy Measure (TriPM; Patrick et al., 2009) relating to increased self-report of hazardous drinking (Satchell, Johnson, Hudson, & Harper, 2020). Consequently, further understanding the relationship between psychopathy, response inhibition and alcohol use has clinical importance when considering risk and possible means of assessment and treatment or intervention.

The current studies

This research thesis aimed to address this area of interest. Consequently, chapter one details a systematic review of the research literature on the relationship between elevated personality traits associated with psychopathy (as determined by validated measures), and performance on response inhibition tasks. The review considered this relationship particularly in participants who are reported to have a history of offending or forensic psychiatric care.

Eleven papers were identified and accepted for inclusion within this review. Synthesis of the findings indicated that the relationship between 'psychopathic tendencies' and response inhibition is complex, and given the potential individual, clinical and societal benefits of better understanding this relationship directions for future research were discussed.

Chapter two details a research paper that aims to further the literature base in this area. It describes the results of an empirical study that tested the relationship between increased personality traits associated with psychopathy in the general population, and alcohol use. This relationship is explored after adjusting for the effects of internalising behaviours and behavioural response inhibition abilities. Whilst individuals in secure forensic settings often display heightened levels of 'psychopathic tendencies' and increased alcohol use, we found limited support for a relationship of 'psychopathic tendencies' with alcohol use in a general population sample of social drinkers. Furthermore, internalising features (i.e. anxiety) were the only significant predictor of increased alcohol use following hierarchical regression analysis. The need for extending research within forensic populations and the potential implications for clinical treatment interventions were discussed.

The systematic review and empirical paper are intended to be submitted to the Clinical Psychology Review and the Journal of Abnormal Psychology for publication, respectively. It was determined that the aims and findings of each chapter aligned with the interests and objectives of these journals.

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Chapter One: Systematic Review

Psychopathic tendencies and response inhibition: A systematic review of Go/No-Go and Stop Signal task performance in forensic samples

Prepared in accordance with guidelines for submission to Clinical Psychology Review (see Appendix A for author guidelines).

Abstract

Classic and contemporary conceptualisations of psychopathy recognise disinhibition and poor behavioural control as cardinal features of the construct. Within forensic populations the number of individuals considered to present with elevated traits of psychopathy is far higher than that of the general population. Understanding the association between response inhibition and psychopathy is important as it may be associated with adverse outcomes related to increased rates of reoffending, aggression and substance (mis)use.

Four electronic databases (Embase, Medline, PsycInfo, and PubMed) were searched using keyword search terms and Boolean operators. There was no time limit applied to the database searches and studies were included in the review if they met defined inclusion and exclusion criteria. Eleven studies were identified for inclusion in the review.

Five studies reported that elevated traits of psychopathy were associated with worsened response inhibition. The remaining studies either reported no significant relationship (n = 4), or mixed results (n = 2). All studies used versions of the Go/No-Go task with various stimuli, with no studies reporting on performance on the Stop Signal Task. The findings highlight the complexities of the relationship between psychopathic tendencies and response inhibition. Given the potential individual, clinical and societal benefits of better understanding this relationship directions for future research are discussed.

Key word descriptors: Psychopathy, Response Inhibition, Go/No-Go, Stop Signal

Introduction

Psychopathy is a construct defined by a constellation of interpersonal, behavioural and affective characteristics including, superficial charm, lack of remorse or guilt, callousness, persistent violation of social norms and expectations, poor behaviour control, and impulsivity (Hare, 2003). Although psychopathic tendencies are distributed on a continuum (Hopwood, et al., 2018), the prevalence of psychopathy in forensic contexts is much greater than that found in the general population (Varlamov, Khalifa, Liddle, Duggan, & Howard, 2011; Weidacker, Snowden, Boy, & Johnston, 2017). Estimates suggest less than 1% of the general population would meet established criteria, while the rate in forensic settings is estimated to be between 15-20% (Hare, 2003). It is within incarcerated and institutionalised settings that the majority of research on psychopathy has been completed (Morgan, Gray, & Snowden, 2011).

Because psychopathy is primarily associated with forensic/offending populations, there are many negative connotations acquired by the nature of this diagnostic label. Furthermore, such negative associations are often perpetuated by the use of pejorative language and terminology within research and the wider literature base. In order to reflect the author's position of working towards reducing stigmatising language in this area, this is addressed within the current review by prefacing pejorative phrasing or terminology that previous studies may have used with statements such as 'individuals contentiously categorised as…', and by incorporating single quotation marks around such phrasing.

Psychopathy is widely considered to be associated with problems of response inhibition; that is, the inability to stop, change, or delay an inappropriate response (Jones & Field, 2015). These difficulties in response inhibition may help to account for elevated rates of 'externalising proneness' in psychopathy, including substance misuse, aggression, and antisocial behaviour. The current review seeks to systematically review the literature on the

effects of psychopathic tendencies on response inhibition task performance in individuals with a history of offending or forensic psychiatric care.

The most prominent, validated and widely used measure of psychopathy is the Psychopathy Checklist (PCL; Hare, 1980), together with its Revised version (PCL-R; Hare, 2003), and the Screening Version (PCL:SV; Hart, Cox, & Hare, 1995). The PCL-R comprises of a semi-structured interview and clinical file review, with total scores ranging between 0 and 40. Where a person's score on the PCL-R exceeds a cut-off score of 25 in the UK/Europe, or 30 in the USA, a diagnosis of psychopathy is made. The conceptualisation of psychopathy as assessed by the PCL and its derivatives is based on a two-factor/four-facet model. Factor 1 incorporates highly correlated Interpersonal and Affective facets (e.g., superficial charm, pathological lying, lack of remorse, and lack of empathy), and Factor 2 incorporates highly correlated Lifestyle and Antisocial facets (e.g., impulsivity, irresponsibility, early behavioural problems, and poor behavioural control) (Hare, 2003). Specifically, problems in response inhibition or impulsivity are recognised as core traits of psychopathy (i.e., those people who have elevated PCL-R scores are considered to have worse response inhibition). Response inhibition is multifaceted in nature and is most commonly assessed using the Go/No-Go and Stop Signal tasks. Although both are commonly used tests of response inhibition, each task assesses different components of response inhibition, termed restraint and cancellation, respectively.

The Go/No-Go task requires participants to respond to pre-defined 'Go' stimuli, and withhold (i.e., restrain) a response to pre-defined 'No-Go' stimuli, with a response made upon stimulus presentation. The number of times a participant incorrectly responds to a 'No-Go' stimulus, typically termed commission errors, is indicative of their ability to effectively withhold a response. Although the number of times a participant fails to respond to a 'Go' stimulus is often reported, termed an omission error, these better represent a measure of

attention rather than response inhibition (Schulz, et al., 2007). Participants' reaction time are also commonly reported, and represent the time latency (usually recorded in milliseconds) between the stimulus display and the time of the response (although this can be confounded by other executive functions such as processing speed and concentration). However, speed-accuracy trade-offs are often observed in the Go/No-Go task, whereby faster reaction times lead to increased commission errors (Zhao, Qian, Fu, & Maes, 2017).

In contrast to the Go/No-Go task, the Stop Signal Task requires participants to respond to visual stimuli, but withhold or 'cancel' this response when a 'stop' signal is presented (Logan, 1994). The 'stop' signal is presented following a short delay ensuring that a dominant prepotent response will have been initiated (hence 'cancellation' of the response, rather than restraint), with tasks including a tracking algorithm to adjust the delay latency dependent upon participant performance. Failure to abort an initiated response, or having a longer Stop Signal Reaction Time (SSRT) following the presentation of a 'stop' signal is indicative of worse cancellation ability (Logan, 1994).

Rationale

The relationship between response inhibition and 'psychopathic tendencies' is of interest from a clinical and forensic psychological perspective. Specifically, a better understanding of the nature of response inhibition difficulties associated with the construct of psychopathy may have considerable benefits for clinical practice, including assessing risk and offering interventions. For example, Gottfredson and Hirschi's (1990) criminological 'Self-control Theory' cites low self-control as "the primary individual characteristic causing criminal behaviour" (p. 111). Furthermore, low self-control has been reported to be a primary cause of delinquency and minor offending amongst adults, and the second most frequent cause, following inadequate social control, of more severe and persistent offending (Ellis and Walsh, 1999).

Interestingly, the cognitive and affective dysfunctions associated with psychopathy may reflect differences in the functional architecture of response inhibition in the brain. Specifically, atypical function in the anterior cingulate cortex, which is considered to be implicated in response-withholding, has been reported among those who have been contentiously categorised as 'criminal psychopaths' during functional magnetic resonance imaging (fMRI) (Kiehl, et al., 2001; Müller, et al., 2003), along with abnormalities of cerebral activity during Go/No-Go task completion (Kiehl, Smith, Hare, & Liddle, 2000). Amongst participants with a history of offending and whom have elevated traits associated with psychopathy, the notion of impaired response inhibition and the potential biological correlates of this have been considered a possible reason for the heightened recidivism rates observed within this population as compared to 'non-psychopathic offenders' (Rice & Harris, 1997).

However, not all results have been consistent. Munro, et al. (2007) reported that offenders made more commission errors on 'No-Go' trials, but that this did not correlate with elevated PCL-R scores. Furthermore, Weidacker, et al. (2017) argue that there has been a failure to find "consistent evidence for aberrant inhibitory ability, despite the strong expectations to the contrary" (p. 256) in relation to 'psychopathic tendencies'. This may be a result of the complexity of response inhibition and approaches to measuring it. Inconsistencies have also been identified between self-report versus behavioural measures of response inhibition (see Sharma, Markon, & Clark, 2014), and these differences may further complicate our clinical understanding of psychopathy related impairments in response inhibition. The purpose of this review was to present a comprehensive overview of these findings and to synthesise current understanding of the nature of response inhibition difficulties in those individuals who have increased traits associated with psychopathy. The

review intended to aid clinical and forensic practice, and to highlight areas for future research.

Objectives

Specifically, synthesis of the research studies included in this review sought to determine methodological quality and risk of bias in the studies completed to date, and establish whether elevated personality traits of psychopathy were associated with worsened response inhibition. Identification of how psychopathy is operationalised across studies and consistency of the use of such measures was considered (i.e. use of total scores or individual Factor/facet scores, adopting a continuous trait approach or a categorical/group approach, with use of formal or arbitrary cut-off scores), as well as ascertaining variability between utility of the Go/No-Go and Stop Signal tasks, specifically in relation to task stimuli.

Methods

Protocol and pre-registration

Prior to commencement of the review, an initial protocol was pre-registered with the International Prospective Register of Systematic Reviews (PROSPERO; registration number CRD42020171390, Appendix B). Protocol process was informed by the Preferred Reporting Items for Systematic reviews and Meta-Analyses for Protocols (PRISMA-P) guidance (Moher, et al., 2015).

Search strategy

The search strategy of this review included several scoping searches conducted in 2019 with the final electronic searches conducted in February 2020. The review process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (Liberati, et al., 2009; Moher, Liberati, Tetzlaff, & Altman, 2009). Four electronic databases (Embase, Medline, PsycINFO and PubMed) were searched via the

National Health Services (NHS) Healthcare Database Advance Searches (HDAS) platform. The following keyword search terms, combined with Boolean operators, were used: (psychopathic OR psychopathy OR "call?us-unemotional" OR "CU traits" OR call?us OR unemotional OR "dark triad") AND ("stop signal" OR SSRT OR "go no-go"). The search strategy is outlined in Appendix C.

Study selection

Abstracts and titles were screened for inclusion by the first author. Papers were excluded where there were clear indications that the paper did not meet the full inclusion criteria. Full-text copies of potentially relevant studies were then examined. A Trainee Clinical Psychologist acted as second reviewer to check for consistency. They screened all papers at the title and abstract phase, and a further 10% at the full-text phase. Any uncertainty of study suitability was resolved through consensus with the research team.

As relevant conference abstracts were identified through the literature search the first author contacted the authors/presenters to ask for any eligible published research relating to the abstract. Additionally, hand searching of reference lists and cited articles within all included studies was completed to seek out other relevant publications. Furthermore, authors of the final papers were contacted to seek out additional (un)published papers that might be relevant to the review (Appendix D).

Eligibility criteria

Papers were included in the review if the full text was available in English in a peer-reviewed journal, the study reported upon personality traits associated with psychopathy identified via the use of a validated measure [e.g., PCL (Hare, 1980); PCL-R (Hare, 2003); PCL: SV (Hart, et al., 1995); Triarchic Psychopathy Measure (TriPM; Patrick, Fowles, & Krueger, 2009); Levenson Self-Report Psychopathy Scale (LSRP; Levenson, Kiehl, & Fitzpatrick, 1995); Psychopathic Personality Inventory (PPI; Lilienfeld & Andrews, 1996;

Lilienfeld & Widows, 2005); Self-Report Psychopathy Scale (SRP; Hare, 1980); SRP-II (Hare, Hemphill, & Harpur, 1989); SRP-III (Paulhus, Hemphill, & Hare, 2009); SRP–Short Form (SRP-SF; Paulhus, Neumann, & Hare, in press)], there was inclusion of data relating to participant performance on response inhibition tasks; namely the Go/No-Go and/or Stop Signal task(s), and that there was a quantitative analysis on the relationship of psychopathy with response inhibition task performance (based on correlational or group-based designs). Included studies were also required to have adult only samples, whom were reported to have a history of offending or forensic psychiatric care.

Papers were excluded from the review if they presented qualitative or a mixed methods design. Also, if the quantitative analysis failed to comment on the relationship of psychopathy and performance on Go/No-Go and/or Stop Signal task(s). Participant samples that included general population sample only, children or adolescents (up to age 17), any combination of children, adolescents or adults, and participants with intellectual/learning disability were not included in the review. Samples of individuals with a diagnosis of Antisocial Personality Disorder (APD) and no associated measurement of psychopathy were also excluded. For the latter, it is recognised that many individuals who have personality traits associated with psychopathy would also meet diagnostic criteria for APD and that both are often associated with criminal behaviour. The concept of psychopathy also differs from APD with respect to the core Interpersonal and Affective features of psychopathy, tapped using Factor 1 of the PCL-R, including callousness, remorselessness, and manipulative tendencies (Hare, Hart, & Harpur, 1991). Furthermore, papers that utilised Go/No-Go and/or Stop Signal task(s) in the context of punishment and reward (e.g. Brazil, et al., 2013; Howard & Lumsden, 1996; Howard, Payamal, & Neo, 1997), or learning by trial and error (e.g. Newman & Kosson, 1986; Newman, Patterson, Howland, & Nichols, 1990; Newman & Schmitt, 1998) were also not included in this review. These papers were excluded to prevent

contamination of the relationship of psychopathy with Go/No-Go and Stop Signal responses through learning and reward procedures.

Data extraction and analysis

Relevant study characteristics, participant characteristics, methodological information and outcomes were extracted. Study and participant details are illustrated in Table 1, quality assessment of all studies is presented in Table 2, while the relevant statistical outcomes detailing the associations between psychopathy and performance on response inhibition tasks are provided in Table 3.

Quality assessment and risk of bias

Methodological quality and risk of bias was assessed at the individual study level using the Appraisal tool for Cross-Sectional Studies (AXIS; Downes, Brennan, Williams, & Dean, 2016 (Appendix E)). This facilitated the assessment of study quality across five areas (introduction, methods, results, discussion and other), and was selected due to its ability to scaffold a critical appraisal of all aspects of the study design, analysis, and reporting. The use of this tool promoted the author□s ability to critique and synthesise the evidence quality, evaluate the strengths and weaknesses of each paper, and guide interpretation of the findings in the context of potential biases. Uncertainty in appraisal decisions were resolved through deliberation with the research team.

Results

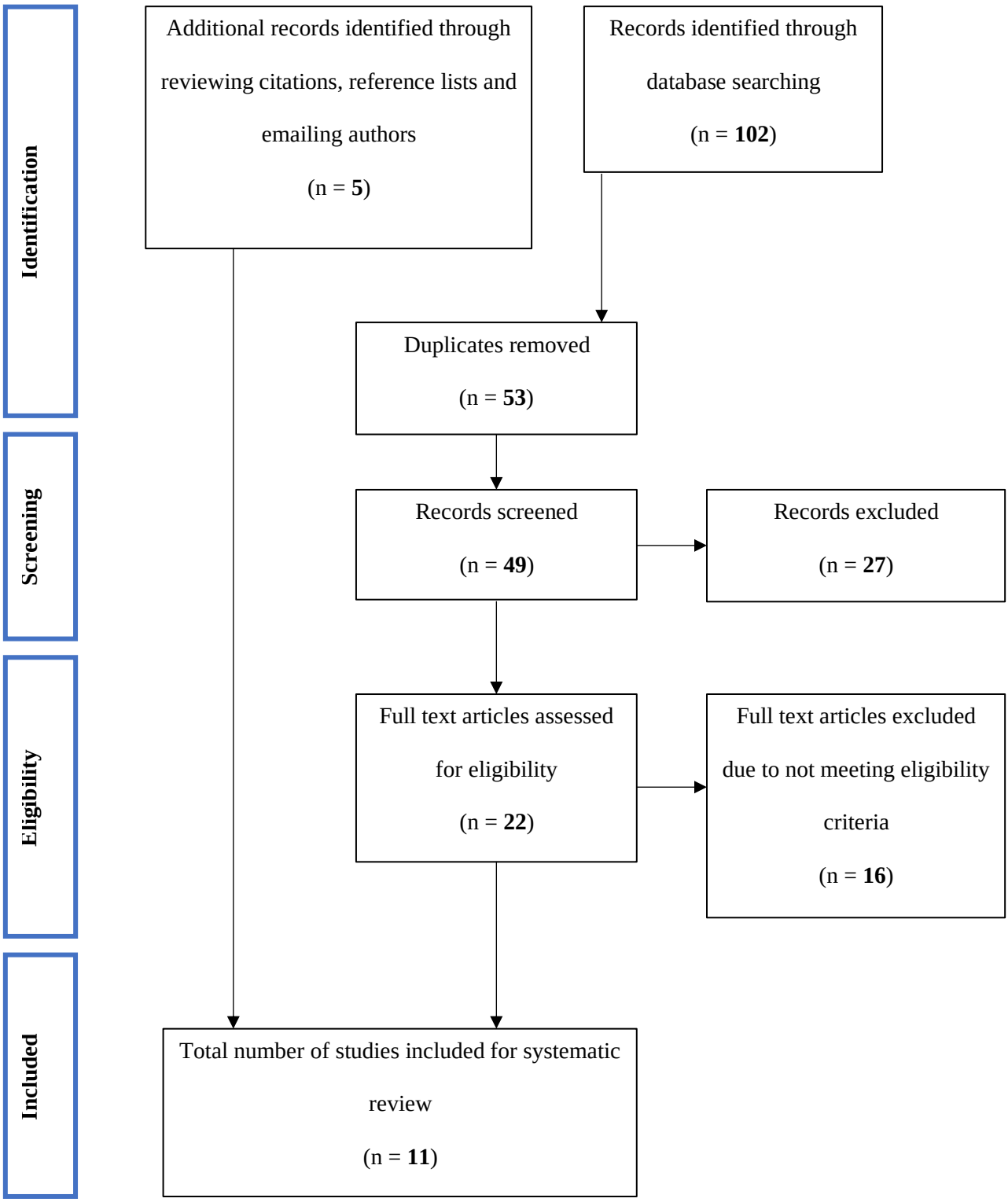
Number of studies identified and included

Initial database searches identified 102 papers, of which 53 were duplicates and subsequently removed. Screening of the titles and abstracts for the remaining 49 papers was completed and resulted in 22 potential papers requiring entire-paper review. After reading these in full, six papers were identified as meeting all eligibility criteria and being suitable for

the review (Iria & Barbosa, 2009; Iria, Barbosa, & Paixão, 2012; Kiehl, et al., 2000; Varlamov, et al., 2011; Verona, Sprague, & Sadeh, 2012; Weidacker, et al., 2017). The first author read all cited articles and reference lists, and emailed authors/presenters of identified conference abstracts and authors of the selected papers to ensure that no relevant (un)published work had been missed. Five authors responded, either stating that they had no additional papers relevant to the review or with attached papers that were potentially relevant. Five additional papers were identified via the cited article and reference list check (Krakowski, et al., 2015; Lapierre, Braun, & Hodgins, 1995; Maurer, et al., 2016; Munro, et al., 2007; Steele, Maurer, Bernat, Calhoun, & Kiehl, 2016). This gave a total of 11 papers to be included in the review (these are marked with an asterisk (*) in the reference list). Figure 1 details this process within a PRISMA flowchart.

Figure 1

PRISMA flowchart of the study selection process



Overview of study and participant characteristics

Table 1 summarises the main study and participant characteristics. The 11 studies were published in peer-reviewed journals between 1995 and 2017. Four of the studies were conducted in the USA, three in Canada, two in Portugal and two in the UK. Seven studies used group-based designs and the remaining four studies used correlational design. All were cross-sectional and used purposive sampling to recruit participants from prisons, medium and high-secure services, correctional facilities, criminal justice agencies (e.g. offender programmes, probation services, associations providing support to ex-prisoners), as well as controls being recruited from prison staff (Munro, et al., 2007), via local employment services (Iria & Barbosa, 2009), and two studies included a self-selecting sampling method for the control group via local advertisements (Iria, et al., 2012; Varlamov, et al., 2011). Sample sizes ranged from N=30 to N=121 with a total of 765 participants across all 11 studies. Participants were predominantly male with seven studies having 100% male samples. Two studies included both genders; Krakowski et al. (2015) had a split of 93.7% male in the psychopathy group and 77.3% male in the control group, whilst Verona et al. (2012) reported that 74% of their total sample was male. One study had an entire female sample (Maurer, et al., 2016), and one study did not report on gender demographics of the sample (Lapierre, et al., 1995). Mean age of the samples ranged from 27.0 to 46.6. Eight studies reported on ethnicity of the sample; two samples were 100% Caucasian (Iria & Barbosa, 2009; Iria, et al., 2012), one was 100% French-Canadian (Lapierre, et al., 1995), and another was 90.9% White British (Weidacker et al., 2017. The remaining four studies that reported ethnicity data demonstrated a variation of ethnic background to include African-American, European-American, Hispanic, American-Indian, Asian and other ethnic minority groups (Krakowski, et al., 2015; Maurer, et al., 2016; Steele, et al., 2016; Verona et al., 2012). All studies used variants of the Psychopathy Checklist (PCL); specifically, five used the Psychopathy

Checklist Revised (PCL-R; Hare, 2003), five used the Psychopathy Checklist Screening Version (PCL:SV; Hart, et al., 1995) two of which were Portuguese versions, and another group-based study used both the PCL-R and PCL:SV (Varlamov, et al., 2011). All studies also used the Go/No-Go task with one study using the Parametric Go/No-Go (PGNG) which is adapted to contain three stages (Weidacker, et al., 2017). No studies used the Stop Signal Task.

Table 1

Study and Participant Characteristics

Author (Year) Location	**Format of publication**	**Study design (Recruitment)**	**Sample size**	**Gender (%) Mean age**	**Ethnicity of the sample (%)**	**Psychopathy measure**	**RI task (Total trials) Trial ratio**
Iria *et al.* (2009) Portugal	Journal article	Group-based (Purposive)	Total N=62 CP (N=22) nCP (N=16) CnP (N=11) nCnP (N=13)	Male (100) CP *Mage*=30.09 nCP *Mage*=28.13 CnP *Mage*=27.36 nCnP *Mage*=28.31	Caucasian (100)	PCL:SV (Portuguese version)	Go/No-Go (56) G/NG: 39/61
Iria *et al.* (2012) Portugal	Journal article	Group-based (Purposive and self-selecting)	Total N=113 CP (N=25) CnP (N=37) nCP (N=12) nCnP (N=39)	Male (100) CP *Mage*=40.76 CnP *Mage*=38.70 nCP *Mage*=36.75 nCnP *Mage*=37.87	Caucasian (100)	PCL:SV (Portuguese version)	Go/No-Go (144) G/NG: NR
Kiehl *et al.* (2000) Canada	Journal article	Group-based (Purposive)	Total N=36 S (N=12) P (N=13) CnP (N=11)	Male (100) S *Mage*=33.0 P *Mage*=28.0 CnP *Mage*=27.0	NR	PCL-R	Go/No-Go (540) G/NG: 50/50

Author (Year) Location	**Format of publication**	**Study design (Recruitment)**	**Sample size**	**Gender (%) Mean age**	**Ethnicity of the sample (%)**	**Psychopathy measure**	**RI task (Total trials) Trial ratio**
Krakowski *et al.* (2015) USA	Journal article	Group-based (Purposive)	Total N=38 P (N=16) CG (N=22)	P: Male (93.7) *Mage*=41.7 CG: Male (77.3) *Mage*=41.4	P: (81.3) African American CG: (59.1) African American	PCL:SV	Go/No-Go (478) G/NG: 85/15
Lapierre *et al.* (1995) Canada	Journal article	Correlational (Purposive)	Total N=60 P (N=30) NP (N=30)	Gender NR *Mage* NR Age range 18-55	French-Canadian (100)	PCL-R	Go/No-Go Block A (50) G/NG: 100/0 Block B (150) G/NG: 50/50
Maurer *et al.* (2016) USA	Journal article	Correlational (Purposive)	Total N=121	Female (100) *Mage*=33.94	Hispanic/Latino (55) White (34) Black/African American (6) American Indian (4)	PCL-R	Go/No-Go (490) G/NG: 84/16

Author (Year) Location	Format of publication	Study design (Recruitment)	Sample size	Gender (%) Mean age	Ethnicity of the sample (%)	Psychopathy measure	RI task (Total trials) Trial ratio
					> than one ethnic category (1)		
Munro *et al.* (2007) Canada	Journal article	Group-based (Purposive)	Total N=30 P (N=15) CG (N=15)	Male (100) P *Mage*=45.9 CG *Mage*=46.6	NR	PCL-R	Go/No-Go (550) G/NG: approx. 66.6/33.3
Steele *et al.* (2016) USA	Journal article	Correlational (Purposive)	Total N=104	Male (100) *Mage*=34.53	White (46) Hispanic (44) American-Indian (20) Other (17) Black/African American (10) Asian (6)	PCL-R	Go/No-Go (490) G/NG: 84/16
Varlamov *et al.* (2010) UK	Journal article	Group-based (Purposive and self-selecting)	Total N=69 CP (N=27) CnP (N=22)	Male (100) CP *Mage*=31.55 CnP *Mage*=33.78	NR	PCL-R and PCL:SV	Go/No-Go (195)

Author (Year) Location	Format of publication	Study design (Recruitment)	Sample size	Gender (%) Mean age	Ethnicity of the sample (%)	Psychopathy measure	RI task (Total trials) Trial ratio
			CG (N=20)	CG *Mage*=32.55			G/NG: approx. 66.6/33.3
Verona *et al.* (2012) USA	Journal article	Group-based (Purposive)	Total N=55 P (N=14) APD (N=16) CG (N=15)	Male (74) P *Mage*=36 APD *Mage*=30.44 CG *Mage*=30	P: European American (57.1), African-American (42.9) APD: European American (50), African-American (43.8), Hispanic (6.3) CG: European American (53.3), African-American (46.7)	PCL:SV	Go/No-Go (576) G/NG: 72/28

Author (Year) Location	Format of publication	Study design (Recruitment)	Sample size	Gender (%) Mean age	Ethnicity of the sample (%)	Psychopathy measure	RI task (Total trials) Trial ratio
Weidacker *et al.* (2017) UK	Journal article	Correlational (Purposive)	Total N=77	Male (100) *Mage*=41.18	White British (90.9)	PCL:SV	Parametric Go/No-Go Stage 1 (150) G/NG: 100/0 Stage 2 (180) G/NG: 40/10* Stage 3 (180) G/NG: 40/10* * there was no Go/No-Go rule applied to the remaining 50%

Note: RI = Response inhibition; P = Psychopathic; CP = Criminal psychopathic; CnP = Criminal non-psychopathic; nCP = Non-criminal psychopathic; nCnP = Non-criminal non-psychopathic; NP = Non-psychopathic; S = Schizophrenic; APD = Antisocial Personality Disorder; CG = Control group; NR = information was not reported; PCL-R = Psychopathy Checklist Revised; PCL:SV = Psychopathy Checklist Screening Version; *Mage* = Mean age; G/NG = percentage ratio of Go versus No-Go trials.

Risk of bias within studies

A summary of the quality assessment for all included papers is displayed in Table 2. Overall there were five areas of bias identified across the studies. All 11 studies failed to explicitly report sample size justification via statistical power analysis. As sample size affects the significance of reported outcomes and effect sizes, the absence of this information raises the probability for failing to detect an effect which truly exists (Type II error), or drawing significant conclusions when no real difference exists (Type I error; albeit less likely for the latter), within the reported outcomes of the studies (Downes, et al., 2016). Furthermore, all studies failed to report on the non-responding of individuals who chose not to engage in the research giving rise to possible non-responder bias. This is considered important as it may be that particular groups of people opt to engage with research, or not. Consequently, if non-responders were included their responses may alter the outcome of the studies. Similarly, four of the studies included participant payment (Iria, et al., 2012; Kiehl, et al., 2000; Maurer, et al., 2016; Steele, et al., 2016) with such incentives potentially biasing participant uptake.

Four of the studies failed to report on obtaining appropriate ethical approvals and informed consent from participants (Iria & Barbosa, 2009; Kiehl, et al., 2000; Munro, et al., 2007; Verona, et al., 2012). That is not to say that this was not completed, however failure to detail this within the papers leads to uncertainty of this practice. Six of the 11 papers received funding or bursaries that supported the completion of the research (Kiehl, et al., 2000; Krakowski, et al., 2015; Lapierre, et al., 1995; Maurer, et al., 2016; Munro, et al., 2007; Steele, et al., 2016). Such information is important to consider when reviewing papers for potential bias or possible conflicts of interest of the authors.

Validated measures were used across all studies, however Weidacker, et al. (2017) acknowledge that a limitation of their study was failing to conduct interviews alongside file reviews in order to obtain PCL:SV scores. This was also reported within the Munro, et al.

(2007) paper albeit with use of the PCL-R. Whilst this is considered appropriate for research purposes (Hart, et al., 1995), it nonetheless raises some concerns about the measurement of psychopathy. It is not clear if the PCL-R was completed reliably within one further study (Lapierre et al. 1995) as specific details are not reported, and a further study reported using a lower cut-off score than conventionally recommended for the PCL-R (Varlamov et al. 2011), despite the cut-off of 25 being conventional in the UK.

The types of bias detailed above may impact upon the ability to confidently generalise study findings, meaning that results and subsequent conclusions ought to be considered with caution where necessary. The AXIS framework can support interpretations made of the individual study findings in the context of these potential biases, and highlight those that have been conducted particularly well and others that may be considered to be of lower quality. It is in the authors opinion that studies by Maurer et al. (2016) and Steele et al. (2016) have been found to demonstrate good methodological rigour and subsequent reduced risk of bias relative to other studies included in the review. Nonetheless, caution is still urged in relation to use of participant payment, the lack of reporting on non-responders, and both studies obtaining grants from the National Institute of Mental Health. Of note, the study by Krakowski et al. (2015) also showed relatively good methodological rigour, however the total sample size (N=38) was comparatively lower than those recruited by Maurer et al. (2016) and Steele et al. (2016) (N=121 and N=104, respectively). Whilst lack of power analysis was identified across all studies, those with a higher number of participants are likely to reduce the likelihood of type I and type II error. Alternatively, it is in the authors opinion that the methodological approach utilised by Iria and Barbosa (2009) and Iria, et al. (2012) was not optimal for the intended aims of the studies. Specifically, they both intended to explore accuracy of facial affect recognition in the context of a Go/No-Go task, however it could be argued that facial affect recognition will have confounded the relationship of psychopathy

with response inhibition. This argument is raised as more conservative response styles for classifying expressions and misclassification errors are documented amongst offender samples (Gillespie, Rotshtein, Beech, & Mitchell, 2017; Gillespie, Rotshtein, Satherley, Beech, & Mitchell, 2015). Furthermore, optimal study design for Go/No-Go tasks as a valid assessment of response inhibition requires a greater number of 'Go' versus 'No-Go' trials (Young, Sutherland, & McCoy, 2018). It is a concern therefore that in the study reported by Iria and Barbosa (2009), the 'Go' stimulus was not the prepotent response (Go/No-Go ratio = 39% / 61%) whilst Go/No-Go ratio frequencies were not reported within the Iria et al. (2012) study. Consequently, these methodological issues raise concerns about the validity, and subsequent bias, of the data pertaining to the relationship between elevated traits of psychopathy and response inhibition reported within these studies.

Table 2

Quality Assessment of Included Studies

Author's	Introduction	Methods					
	Clear aims & objectives	**Appropriate study design**	**Sample size justification**	**Population clearly defined**	**Appropriate sample frame**	**Representative selection process**	**Categorisation of non-responders**
Iria *et al.* (2009)	Yes	Yes	No	Yes	Yes	Yes	No
Iria *et al.* (2012)	Yes	Yes	No	Yes	Yes	Yes	No
Kiehl *et al.* (2000)	Yes	Yes	No	Yes	Yes	Yes	No
Krakowski *et al.* (2015)	Yes	Yes	No	Yes	Yes	Yes	No
Lapierre *et al.* (1995)	Yes	Yes	No	Yes	Yes	Yes	No
Maurer *et al.* (2016)	Yes	Yes	No	Yes	Yes	Yes	No
Munro *et al.* (2007)	Yes	Yes	No	Yes	Yes	Yes	No
Steele *et al.* (2016)	Yes	Yes	No	Yes	Yes	Yes	No
Varlamov *et al.* (2011)	Yes	Yes	No	Yes	Yes	Yes	No
Verona *et al.* (2012)	Yes	Yes	No	Yes	Yes	Yes	No
Weidacker *et al.* (2017)	Yes	Yes	No	Yes	Yes	Yes	No

Note: NC = Not clear; NS = Not stated; Partial = some of the required information is available.

Quality Assessment of Included Studies (continued)

Author's	Methods (continued)			Results			
	Variables appropriate to the aim	**Validated measures used**	**Clear reporting of statistical significance**	**Methods described for replication**	**Descriptive statistics reported**	**Concern for non-response bias**	**Detail of any non-responding**
Iria *et al.* (2009)	Yes	Yes	Yes	Yes	Yes	No	No
Iria *et al.* (2012)	Yes	Yes	Yes	Yes	Yes	No	No
Kiehl *et al.* (2000)	Yes	Yes	Yes	Yes	Yes	No	No
Krakowski *et al.* (2015)	Yes	Yes	Yes	Yes	Yes	No	No
Lapierre *et al.* (1995)	Yes	Partial[a]	Yes	Yes	Yes	No	No
Maurer *et al.* (2016)	Yes	Yes	Yes	Yes	Yes	No	No
Munro *et al.* (2007)	Yes	Partial[a]	Yes	Yes	Yes	No	No
Steele *et al.* (2016)	Yes	Yes	Yes	Yes	Yes	No	No
Varlamov *et al.* (2011)	Yes	Yes[b]	Yes	Yes	Yes	No	No
Verona *et al.* (2012)	Yes	Yes	Yes	Yes	Yes	No	No
Weidacker *et al.* (2017)	Yes	Partial[b]	Yes	Yes	Yes	No	No

Note: NC = Not clear; NS = Not stated; Partial = some of the required information is available.

[a] whilst it is acknowledged that the PCL-R and PCL:SV are validated measures to be used in these studies, it is unclear if a file review and interview has contributed to the total score to measure individual psychopathy scores which may impact upon the reliability of the score.
[b] study authors report the use of a lower cut-off score than conventionally recommended (Varlamov et al. 2011), and total scores being calculated with sole use of a file review and no accompanying interview (Weidacker et al. 2017).

Quality Assessment of Included Studies (continued)

Author's	Results (continued)		Discussion		Other	
	Internal consistency of results	**Analysis as described in method**	**Justification of discussion and conclusion**	**Limitations discussed**	**Any funding or conflict of interest**	**Ethical approval or consent obtained**
Iria *et al.* (2009)	Yes	Yes	Yes	No	NS	NS
Iria *et al.* (2012)	Partial	Yes	Yes	Yes	NS	Yes
Kiehl *et al.* (2000)	NC	Yes	Yes	Yes	Yes	NS
Krakowski *et al.* (2015)	Yes	Yes	Yes	Yes	Yes	Yes
Lapierre *et al.* (1995)	Yes	Yes	Yes	Yes	Yes	Yes
Maurer *et al.* (2016)	Yes	Yes	Yes	Yes	Yes	Yes
Munro *et al.* (2007)	NC	Yes	Yes	Yes	Yes	NS
Steele *et al.* (2016)	Yes	Yes	Yes	Yes	Yes	Yes
Varlamov *et al.* (2011)	NC	Yes	Yes	Partial	NS	Yes
Verona *et al.* (2012)	Yes	Yes	Yes	Yes	NS	NS
Weidacker *et al.* (2017)	Yes	Yes	Yes	Yes	NS	Yes

Note: NC = Not clear; NS = Not stated; Partial = some of the required information is available.

Assessment of psychopathy traits

The PCL-R and PCL:SV were used across all studies (*n* = 5 and *n* = 5 respectively), while Varlamov, et al. (2011) used both measures (the PCL-R to assess criminal participants, and the PCL:SV to assess control participants). The cut-off scores used in the five studies that assessed psychopathy using only the PCL-R varied considerably. Both Kiehl, et al. (2000) and Lapierre, et al. (1995) used a cut-off score of 30 or above to determine elevated psychopathy traits. However, these studies differed in the scores used to identify low or 'non-psychopathic' participants, with Kiehl, et al. (2000) using scores below 30, and Lapierre, et al. (1995) using scores below 20. Alternatively, Munro, et al. (2007) used a score of 25 or above to identify participants with psychopathy and did not report a lower cut-off to identify low or 'non-psychopathic' participants but acknowledged a range of PCL-R scores from 9 to 36 (M = 25.8, SD = 2.54) across the entire sample. Lastly, Maurer, et al. (2016) and Steele, et al. (2016) do not report that they used cut-off scores to determine clinical levels of psychopathy but they do provide a PCL-R total range for the entire sample of 3 to 35 (M = 18.75, SD = 6.37), and 7 to 38 (M = 22.08, SD = 7.69) respectively.

Of the five studies that used the PCL:SV only, Iria and Barbosa (2009) used a total score cut-off of above 18 for the 'psychopathic' group and below 12 for the 'non-psychopathic' group. Krakowski, et al. (2015) used cut-off scores of 18 or above to determine their 'psychopathic' group and a score of 10 or below for 'non-psychopathic' group. Verona, et al. (2012) similarly identified 'psychopaths' via a total score of 18 or above alongside high scores on Factors 1 and 2 with the Factor 1 score required to be above the median for the entire sample (>5). Their 'non-psychopathic' APD group was also determined by a total PCL:SV score of 18 or above alongside high Factor 2 score, with the Factor 1 score required to be below the median for the entire sample (<5), and lastly their control group was determined by a total PCL:SV score below 12 with the Factor 1 and 2 scores required to be

below respective medians for the sample (<5 and <7, respectively). Iria, et al. (2012) and Weidacker, et al. (2017) also used PCL:SV Factor/facet scores. Iria, et al. (2012) used Factor 1 scores only with a split of 7-12 for the 'psychopathic group' and 0-6 for the 'non-psychopathic group'. Weidacker, et al. (2017) do not report cut-off scores, but they provide a total PCL:SV score for the entire sample of 2 to 22 (M = 11.01, SD = 4.89) and a full range of scores was evidenced for each facet; Interpersonal (M = 1.81, SD = 1.66), Affective (M = 2.86, SD = 1.64), Lifestyle (M = 2.88, SD = 1.94), and Antisocial Behaviour (M = 3.44, SD = 1.82).

Varlamov, et al. (2011) was the only study that used both the PCL-R and PCL:SV. For the PCL-R they used a cut-off of 25 or above for the 'criminal psychopathic' group, and a cut-off score of below 25 for their 'criminal non-psychopathic' group. They used the PCL:SV to screen their healthy controls and used a cut-off score of above 18 to identify and exclude individuals with elevated traits of psychopathy from this group; consequently, all of their healthy controls had a PCL:SV score of below 18.

Assessment of response inhibition

The Go/No-Go task was used to assess response inhibition performance across all studies, with Weidacker, et al. (2017) using the three-stage PGNG. Despite the Stop Signal Task being included within the search terms no studies were identified that used it to assess response inhibition amongst criminal or forensic institutionalised populations. The stimuli used for the Go/No-Go tasks within the individual papers differed dependent on the overarching aim of the study. Subsequently, the 'Go' cue (requiring a response) and 'No-Go' cue (requiring inhibition of a response) that participants were required to adhere to varied across studies.

Affective stimuli. Four of the studies used affective stimuli of either words (Verona, et al., 2012); where the 'Go' cue was an affective word written in normal font and the 'No-Go' cue was written in italic font, or affective images (Iria & Barbosa, 2009; Iria, et al., 2012;

Krakowski, et al., 2015). For example, Iria and Barbosa (2009) used any face expressing fear to indicate a 'Go' trial, while all other emotions indicated a 'No-Go' trial. Facial expressive cues were also used by Iria, et al. (2012), with any face expressing fear, anger or sadness indicating a 'Go' trial, and faces displaying emotions of happiness, disgust, and surprise indicating 'No-Go' trials. Furthermore, Krakowski, et al. (2015) included 478 pictures from the International Affective Picture System (IAPS) for which the emotional valence in the pictures was rated on a scale from 1 (negative) to 9 (positive). Participants were required to respond when an image was displayed on their screen, and withhold a response to the presentation of any stimulus that was repeated twice in a row.

Neutral visual stimuli. The remaining seven studies used neutral visual stimuli including shapes and letters. The shapes used included arrows (Kiehl, et al., 2000), white squares and crosses (Lapierre, et al., 1995), and white triangles (Varlamov, et al., 2011). Kiehl, et al. (2000) ran two blocks of the Go/No-Go with block A depicting the 'Go' cue as a downward facing arrow and the 'No-Go' cue as an upward facing arrow, and vice versa for block B. Lapierre, et al. (1995) stipulated a white square as the 'Go' cue and white crosses as the 'No-Go' cue, whilst Varlamov, et al. (2011) informed participants to respond to triangles pointing either up or down, and to inhibit responding when triangles pointed either left or right.

Maurer, et al. (2016), Munro, et al. (2007), Steele, et al. (2016) and Weidacker, et al. (2017) all utilised letters as stimuli. Maurer, et al. (2016) and Steele, et al. (2016) both informed participants to respond to a white 'X' and inhibit responding to a white 'K', whilst Munro, et al. (2007) stipulated that a response was required when the stimulus letter was different from the preceding one, and to withhold responding when the stimulus letter was the same as the preceding trial. The task was completed over three blocks with the stimulus letters changing for each; block one used 'X' and 'Y', block two used 'O' and 'P', and block

three used ‘D’ and ‘U’. Weidacker, et al. (2017) utilised the PGNG meaning that the task was run over three stages and the Go/No-Go cues altered with the corresponding stage. They used 12 letters of the alphabet from O – Z, with ‘X’, ‘Y’ and ‘Z’ being target letters. The first phase of the PGNG was designed to establish a prepotent response to the stimuli with responses required for the target letters, and the ‘No-Go’ cue being any non-target letter. The second stage introduced an inhibitory component whereby participants only respond to two of the target letters if the previous target letter was not identical (i.e. respond to ‘X’ following ‘Y’, but not ‘X’ following ‘X’). The third stage followed the same rules, but with increased demand of three target letters (‘X’, ‘Y’, and ‘Z’).

Synthesis of findings on the relationship between psychopathy and response inhibition

The available behavioural data for commission errors was reviewed for all studies to determine whether results obtained on the Go/No-Go tasks demonstrated an observable difference in the response inhibition abilities of individuals with elevated psychopathic traits. Table 3 details a summary of all the relevant study results. In total, five of the 11 studies identified a significant relationship between those with elevated traits of psychopathy and worsened response inhibition, four of the 11 papers identified no relationship, and two of the 11 papers reported mixed results.

Iria and Barbosa (2009) and Iria, et al. (2012) both used affective stimuli within their studies and utilised the Go/No-Go task as a means of determining the ability of psychopathic individuals to identify particular affective expressions. Iria and Barbosa (2009) reported no effect of criminal status ($F(1,58) = 2.208$, $p=.14$), and no effect based on PCL:SV total score ($F<1$) when using the expression of fear as a ‘Go’ cue. Iria, et al. (2012) analysed performance separately for expressions of fear, sadness and anger. When considering commission errors a main group effect was found for fear and anger stimuli. For the fear stimuli both ‘criminal psychopathic’ and ‘criminal non-psychopathic’ groups showed more

errors than the ‘non-criminal non-psychopathic’ group ($F(3,106) = 3.11$, $p=.03$), whilst for the anger stimuli the ‘criminal psychopathic’ group showed more errors than both ‘criminal non-psychopathic’ and ‘non-criminal non-psychopathic’ groups ($F(3,106) = 10.286$, $p<.001$). No effect was found for commission errors when using the sadness stimuli ($F(3,109) = 2.00$, $p=.12$). Because these studies used facial affect stimuli as ‘Go’ and ‘No-Go’ cues, response inhibition in these tests was confounded by affect recognition abilities. Similarly, it is difficult to draw any reliable conclusions about facial affect recognition, as responses to the different facial affect stimuli were confounded by participants ability to correctly withhold a response to ‘No-Go’ cues.

Krakowski, et al. (2015) also used affective stimuli (inclusive of both affective and neutral images) and reported that ‘psychopathic’ participants with offending histories made more commission errors than healthy controls across conditions that varied in emotional valence: neutral ($p<.04$), positive ($p<.03$) and negative ($p<.03$). Similar reports of significant effects were found relating to psychopathy and increased commission errors in studies by Lapierre, et al. (1995) ($t=7.87$, $p=0.0001$), Maurer, et al. (2016) ($t=(102) = 13.79$, $p<0.001$), Steele, et al. (2016) ($t(92) = 18.82$, $p<.001$), and Varlamov, et al. (2011) ($F(2, 65) = 3.24$, $p=.046$).

However, not all studies reported significant findings. Kiehl, et al. (2000) used the Go/No-Go task during a brain imaging procedure and reported no significant differences in behavioural data between ‘psychopaths’ and ‘non-psychopaths’ within an offending population ($p<.50$). Similarly, Verona, et al. (2012) used the Go/No-Go with affective word stimuli whilst recording event related potentials within the brain, requiring participants to respond to words written in normal font and withhold a response to words written in italicised font. They found no effect for affective words on ‘No-Go’ trials ($F(1, 13) =□.08$, $p=□.79$). They further reported that whilst the type of affective word did not influence inhibitory

performance, there was a main effect across groups for 'offender-relative' negative words (e.g., scum, jail) in comparison to neutral words (e.g., umbrella, lamp) ($F(1, 38) = 4.21$, $p<.05$). This finding suggests that all participant groups included in the study (i.e. 'psychopathic', APD and controls) showed worse response inhibition when negative words were presented as part of the stimuli content. Interestingly, Munro, et al. (2007) found a main effect for group, with offenders making more commission errors than controls ($F(1, 22) = 6.45$, $p=.019$). However, further analysis revealed a non-significant relationship with PCL-R scores ($r = -.46$, $p=.13$), calling in to question the extent to which these findings reflected differences in psychopathy. Furthermore, not only was the relationship non-significant, it was negative suggesting that those with lower psychopathy scores had worse response inhibition.

Lastly, Weidacker, et al. (2017) detail varied differences in task performance on the PGNG dependent on PCL:SV facets. They used a repeated measures ANCOVA on the percentage of correctly inhibited trials for stage 2 and 3 of the task, using the Interpersonal (Facet 1), Affective (Facet 2), and Lifestyle (Facet 3) facet scores as covariates. They reported a significant main effect of the Interpersonal facet (Facet 1) ($F(1,75)=6.38$, $p<0.05$), but no interaction between Interpersonal facet and difficulty level when progressing on to phase two and three of the task ($F(1,75)=0.003$, ns). There was no relationship found for response inhibition with the Affective facet (Facet 2) ($F(1,75) = 1.38$, ns), and no interaction of Affective facet with difficulty level ($F(1,75) = 0.06$, ns). Similarly, there was no relationship found for response inhibition with the Lifestyle facet (Facet 3) ($F(1,75) = 0.62$, ns), but there was a significant interaction between the Lifestyle facet and difficulty level ($F(1,75) = 5.15$, $p<0.05$).

Table 3

Summary of Study Results

Author (Year) Study design	Number of participants included in the results	Stimuli and Go/No-Go cues	Psychopathy variables	Response inhibition variables	Main findings
Iria *et al.* (2009) Group-based	62	Affective images	CP & nCP (PCL:SV >18) CnP & nCnP (PCL:SV <12)	Commission errors	No significant effect found based on PCL:SV score. (F<1)
Iria *et al.* (2012) Group-based	113	Affective images	CP & nCP (PCL:SV Factor 1 score 7-12) CnP & nCnP (PCL:SV Factor 1 score 0-6)	Commission errors	Fear: main group effect for fear stimuli with both criminal groups showing more errors than the nCnP group. (F(3,106) = 3.11, p=.03) Sadness: No effect found. (F(3,109) = 2.00, p=.12) Anger: main group effect for anger stimuli with the criminal psychopathic group showing more errors than the CnP

Author (Year) Study design	Number of participants included in the results	Stimuli and Go/No-Go cues	Psychopathy variables	Response inhibition variables	Main findings
					(p<.05) and nCnP (p<.001) groups. (F(3,106) = 10.286, p<.001)
Kiehl *et al.* (2000) Group-based	36	Neutral shapes	S & P (PCL-R ≥30) CnP (PCL-R <30)	Commission errors	No significant differences found between psychopaths and non-psychopaths. (p<.50)
Krakowski *et al.* (2015) Group-based	38	Affective and neutral images	P (PCL:SV ≥18) CG (PCL:SV ≤10)	Commission errors	Main group effect with psychopathic offenders making more errors than healthy controls across three emotional valences; neutral, (p<.04), positive (p<.03) and negative (p<.03).
Lapierre *et al.* (1995) Correlational	60	Neutral shapes	P (PCL-R ≥30) NP (PCL-R ≤20)	Commission errors	Elevated traits of psychopathy associated with increased errors. (t=7.87, p=0.0001)

Author (Year) Study design	Number of participants included in the results	Stimuli and Go/No-Go cues	Psychopathy variables	Response inhibition variables	Main findings
Maurer *et al.* (2016) Correlational	121	Neutral shapes	PCL-R Total score PCL Factor 1 & 2 PCL Facet 1, 2, 3, 4	Commission errors	Elevated traits of psychopathy associated with increased errors. (t=(102) = 13.79, p<0.001)
Munro *et al.* (2007) Group-based	30	Neutral letters	P (varying levels of psychopathy; 9 had PCL-R score ≥25) CG (NR)	Commission errors	Main group effect with offenders making more commission errors than controls. (F(1, 22) = 6.45, p=.019) Further analysis revealed a negative relationship with PCL-R scores. (r = −.46, p=.13)
Steele *et al.* (2016) Correlational	104	Neutral letters	PCL-R Total score PCL Factor 1 & 2 PCL Facet 1, 2, 3, 4	Commission errors	Elevated traits of psychopathy associated with increased errors. (t(92) = 18.82, p<.001)
Varlamov *et al.* (2011) Group-based	69	Neutral shapes	CP (PCL-R ≥25) CnP (PCL-R <25) CG (NR)	Commission errors	Main group effect criminal psychopaths making more errors than healthy controls.

Author (Year) Study design	Number of participants included in the results	Stimuli and Go/No-Go cues	Psychopathy variables	Response inhibition variables	Main findings
					(F(2, 65) = 3.24, p=.046)
Verona *et al.* (2012) Group-based	45	Affective words	P (PCL:SV ≥18, Factor 1 score >5) APD (PCL:SV ≤18, Factor 1 score <5) CG (PCL:SV <12, Factor scores below respective medians for the sample (<5 and <7)	Commission errors	No effect found. (F(1, 13) =□.08, p=□.79)
Weidacker *et al.* (2017) Correlational	77	Neutral letters	PCL:SV Facet 1 PCL:SV Facet 2 PCL:SV Facet 3	Commission errors	Interpersonal facet (Facet 1): Main effect of interpersonal facet when included as a covariate. (F(1,75) = 6.38, p<0.05). Affective facet (Facet 2):

Author (Year) Study design	Number of participants included in the results	Stimuli and Go/No-Go cues	Psychopathy variables	Response inhibition variables	Main findings
					No main effect of affective facet when included as a covariate. ($F(1,75) = 1.38$, ns) Lifestyle facet (Facet 3): No main effect of lifestyle facet when entered as a covariate. ($F(1,75) = 0.62$, ns).

Note: P = Psychopathic; CP = Criminal psychopathic; CnP = Criminal non-psychopathic; nCP = Non-criminal psychopathic; nCnP = Non-criminal non-psychopathic; NP = Non-psychopathic; S = Schizophrenic; APD = Antisocial Personality Disorder; CG = Control group; NR = information was not reported; PCL-R = Psychopathy Checklist Revised; PCL:SV = Psychopathy Checklist Screening Version.

Discussion

The current review aimed to systematically review the relationship between elevated traits of psychopathy and response inhibition specifically in participant groups with criminal or forensic psychiatric histories. Eleven papers were identified that met inclusion criteria, all of which were published in peer-reviewed journals between 1995 and 2017. Across all studies, the PCL-R and the PCL:SV, were used to assess psychopathy. The Go/No-Go and the PGNG were the only tasks used to measure response inhibition, despite the inclusion of search terms such as "Stop Signal" to broaden the scope of the search to include tasks that assessed both restraint and cancellation. Results showed that of the 11 studies included in the review, five (i.e., 45%) found a relationship between elevated traits of psychopathy and poorer response inhibition. Four studies (i.e., 36%) found no significant relationship of heightened psychopathy scores with poorer response inhibition, and two studies (i.e., 18%) reported mixed results. As all of the studies indexed the response inhibition dimension of restraint (via the Go/No-Go), conclusions cannot be drawn about the relationship of psychopathy with cancellation (as measured by the Stop Signal Task).

Based on the findings of this review, it is tentatively concluded that elevated psychopathy traits are associated with worse response inhibition abilities amongst individuals within criminogenic and forensic institutionalised contexts. Due to methodological variances between studies, including the use of different task stimuli and often small sample sizes, any conclusions should be drawn with some caution. Of the five studies that found a significant relationship, two used a group-based design (Krakowski, et al., 2015; Varlamov, et al., 2011), and three were correlational (Lapierre, et al., 1995; Maurer, et al., 2016; Steele, et al., 2016), and the nature of the stimuli varied between affective/neutral images (Krakowski, et al., 2015), neutral shapes (Lapierre, et al., 1995; Varlamov, et al., 2011), and neutral letters (Maurer, et al., 2016; Steele, et al., 2016). Of the four studies that found no significant

relationship, all were group-based designs with stimuli varying between affective images (Iria & Barbosa, 2009), affective words (Verona, et al., 2012), neutral shapes (Kiehl, et al., 2000), and neutral letters (Munro, et al., 2007). Of the two studies that found mixed results, Iria, et al. (2012) used a group-based design with affective images, and Weidacker, et al. (2017) used a correlational design with neutral letters. Munro, et al. (2007) proposed that tasks that use affective stimuli (e.g., emotional faces) may observe a greater dissociation between psychopathic and control groups, but this hypothesis was not supported in the current review. Thus, heterogeneity in study design and choice of stimuli mean that conclusive comments about this relationship of psychopathy with response inhibition cannot be made with confidence.

Quality assessment was completed to enable a structured critical overview of all the included studies and highlighted areas for consideration. Specifically, none of the studies justified sample sizes or reported on participant non-responding, all studies utilised a purposive sampling method, and four of the studies provided payment to participants. This arguably impacts upon study quality as it raises the possibility of responder bias and subsequent biased findings (Downes, et al., 2016). To some extent, methodological limitations of some studies made the relationship of psychopathy with response inhibition difficult to reliably assess. For example, in some studies accuracy of facial affect recognition will have confounded the relationship of psychopathy with response inhibition. Specifically, Iria and Barbosa (2009) and Iria, et al. (2012) aimed to explore accuracy of facial affect recognition in the context of a Go/No-Go task. In the study by Iria and Barbosa (2009), participants were asked to respond to faces of fear and withhold responses to all other emotional expressions. They found that participants who exceeded a cut-off on the measure of psychopathy failed to respond to the 'Go' stimuli, and it was therefore concluded that this group were less able to detect and distinguish expressions of fear. However, these results may

also reflect a more conservative response style for classifying expressions as afraid in offender samples (Gillespie, Rotshtein, Satherley, Beech, & Mitchell, 2015). Iria and Barbosa (2009) also reported the absence of a significant relationship of psychopathy with commission errors. However, the 'Go' stimulus was not the prepotent response (Go/No-Go ratio = 39% / 61%), and optimal designs for Go/No-Go tasks as a valid assessment of response inhibition require a greater number of 'Go' versus 'No-Go' trials (Young, Sutherland, & McCoy, 2018). Consequently, responses to 'No-Go' stimuli could have reflected either impaired response inhibition abilities, or a tendency to incorrectly classify happy, neutral or surprised expressions as afraid, with similar misclassification errors commonly reported in offender samples (Gillespie, Rotshtein, Beech, & Mitchell, 2017). These issues highlight questions about the validity of this method for the assessment of either facial affect recognition or response inhibition. Iria, et al. (2012) used a similar design with participants required to respond to fear, sadness, and anger. However, Go/No-Go ratio frequencies were not reported, again raising concerns about the validity of the study.

All studies included in the review used derivatives of the PCL to assess psychopathy amongst their samples, namely the PCL-R and the PCL:SV. Of the studies that found a significant relationship between elevated psychopathy and poor response inhibition, three used the PCL-R (Lapierre, et al., 1995; Maurer, et al., 2016; Steele, et al., 2016), one used the PCL:SV (Krakowski, et al., 2015), and Varlamov, et al. (2011) used both the PCL-R and PCL:SV. Specifically, Lapierre, et al. (1995), Maurer, et al. (2016), and Steele, et al. (2016) reported that elevated PCL-R scores were associated with increased commission errors, Krakowski, et al. (2015) reported a main group effect with 'psychopathic offenders' making more errors than healthy controls, and Varlamov, et al. (2011) reported a main group effect with 'criminal psychopaths' (as determined by PCL-R) making more errors than healthy controls (as determined by PCL:SV).

Of the studies that found no significant relationship, two used the PCL-R (Kiehl, et al., 2000; Munro, et al., 2007) and two used the PCL:SV (Iria & Barbosa, 2009; Verona, et al., 2012). All four studies reported no significant difference between 'psychopathic' and 'non-psychopathic' groups, although interestingly Munro, et al. (2007) reported a main group effect for commission errors, with offenders making more errors than controls. Further analysis revealed an unexpected negative relationship of PCL-R scores with response inhibition, suggesting that those who had lower scores of psychopathy had worse response inhibition.

The two studies reporting mixed results used the PCL:SV (Iria, et al., 2012; Weidacker, et al., 2017). Iria, et al. (2012) utilised Factor 1 scores of 7 or above to determine the 'criminal psychopathic' and 'non-criminal psychopathic' groups, and Factor 1 scores of 6 or below to determine 'criminal non-psychopathic' and 'non-criminal non-psychopathic' groups. They reported observed response inhibition difficulties among 'psychopathic criminal' and non-criminal groups, the 'psychopathic' group alone, or neither group, dependent on the emotional expressions shown. The restricted ranges used on the PCL:SV may, however, pose problems for reliably determining 'psychopathic' and 'non-psychopathic' groups in this study. Interestingly, the results of Iria et al. (2012) and Munro, et al. (2007), raise the possibility of a criminogenic trait underpinning response inhibition. Lastly, Weidacker, et al. (2017) also showed mixed results, finding a significant effect of Interpersonal facet (Facet 1) scores, but no effect of Affective or Lifestyle facet (Facet 2 and 3 respectively) scores.

The use of varying assessment measures, differing cut-off scores, and interpretations (i.e., total scores or individual Factor/facet scores), makes comparisons between the studies difficult. Furthermore, reliability of the use of these measures across the studies is inconclusive. Munro, et al. (2007) and Weidacker, et al. (2017) both acknowledge that they

did not conduct interviews alongside file reviews in order to obtain PCL-R and PCL:SV scores, respectively. Whilst this has been considered appropriate for research purposes (Hart, et al., 1995), the absence of conducting an interview may affect the validity of scoring these measures, particularly the PCL-R, and therefore may impact on reported outcomes.

Strengths and limitations

It is intended that the current review can contribute to the literature base concerning psychopathy and response inhibition within criminal and forensic institutionalised populations. This review highlights considerable methodological variability between studies that have tested the relationship of psychopathy with response inhibition, and the review is therefore beneficial for informing the direction of future research.

There are, however, limitations to the review that must be considered. The concept of response inhibition is vast and the objective of this review was to examine restraint and cancellation abilities. However, no studies were identified that met our inclusion criteria and assessed cancellation (i.e., using the Stop Signal Task). Consequently, the review is limited to the 'restraint' aspect of response inhibition only. Furthermore, the focus of this review was on more objective, behavioural measures of response inhibition, and conclusions cannot be drawn about findings based on neurophysiological responses or self-reports of response inhibition (although, the relationship between objective and subjective behavioural control is equivocal (see Enkavi, et al., 2019)). Furthermore, the issues associated with measuring response inhibition are potentially vast given its association with higher order brain function, including executive function. The response modulation hypothesis highlights a complex relationship between psychopathy and response inhibition (see Smith & Lilienfeld, 2015 for a review). According to this hypothesis, individuals with elevated traits associated with psychopathy tend to focus their attention on the dominant response set and are less sensitive to, or less likely to be distracted by, stimuli that are outside of their attentional span. This

hypothesis also predicts that performance on attentional tasks is mediated by reward (Newman, et al., 1990). Given that extrinsic motivations of reward varied across the studies included in the review it may be important to consider the impact of motivation across samples.

Conclusions and considerations for future research

To the best of the authors knowledge, this is the first systematic review to consider the relationship between psychopathy and response inhibition within the context of offending and forensic institutionalised samples. This review has highlighted areas that would benefit from further exploration, as well highlighting potential clinical implications to be considered when supporting individuals who may present within forensic contexts with response inhibition deficits.

The 11 studies that have contributed to this review are largely varied with regards to outcomes, study design, and use of measures; for both psychopathy and response inhibition (i.e., consistency of conducting standard assessment on the PCL-R and PCL:SV, using various stimuli on the Go/No-Go, and one study using the PGNG). This highlights a need for future research within this area to enable improved clarity, for which some recommendations are made. Firstly, this review has highlighted a need to assess cancellation abilities in psychopathy using, for example, the Stop Signal Task. An understanding of cancellation abilities in psychopathy could usefully inform a more nuanced understanding of response inhibition within this particular group. Consequently, additional studies that utilise this method of response inhibition measure, either independently or in conjunction with the Go/No-Go task, would be welcome. Secondly, consistent use and clear reporting of validated measures is called for. This review highlighted that some studies vary in their approach to assessing psychopathy. Whilst Hart, et al. (1995) have proposed that a lack of interview for PCL assessments is adequate within research settings, an argument for a collective approach

to scoring these measures is made. Specifically, inclusion of both interview and file review for the PCL-R would improve measurement validity and be consistent with its clinical utility. The review also highlighted that some studies used the Go/No-Go task as a means of assessing affect recognition in forensic samples (Iria & Barbosa, 2009; Iria, et al., 2012), but in both cases study design confounded results on response inhibition. Reporting of behavioural data in full across all studies would go some way toward building a sound evidence base to inform clinical practice.

This review reports a tentative relationship between psychopathy and response inhibition and accordingly clinical implications are also considered. Currently, many treatments provided to offenders are psychoeducational (e.g. Enhanced Thinking Skills programme) as they tend to be based upon an assumption that rational choices lead to offending behaviour (Ward & Nee, 2009). Given that the underpinnings of poor response inhibition are likely to be more complex, we would propose that building upon neuropsychological understanding of (dis)inhibition to specific behavioural patterns may help to match available rehabilitation resources to the needs of the offenders on an individual basis. This may include cognitive skills training and development of other executive functions, such as attentional set shifting and planning ability, to further improve the ability to effectively inhibit responses amongst those individuals who are within forensic settings and obtain elevated scores on psychopathy measures (see Mullin & Simpson, 2007).

Whilst such interventions would hopefully be of benefit, fundamentally further research is required in order to continue building current understanding and improve clinical practice. Such research advances may go some way to help reduce antisocial and externalising behaviours (e.g. drug and alcohol misuse) which are often cardinal features of offending, institutionalised or ‘psychopathic’ populations.

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Chapter Two: Empirical Paper

Internalising, but not psychopathy, is related to alcohol use after adjusting for response inhibition

Prepared in accordance with guidelines for submission to Journal of Abnormal Psychology (see Appendix F for author guidelines).

Abstract

This study aimed to examine the relationship of personality traits associated with psychopathy with self-reported alcohol use in a community sample of social drinkers, while adjusting for response inhibition as measured by performance on Go/No-Go and Stop Signal tasks. The construct of psychopathy has acquired longstanding negative-associations with related behaviours and personality traits considered to be problematic for the individual and those around them. Specifically, elevated 'psychopathic' traits have been linked with problematic alcohol use in clinical and non-clinical samples. However, it remains unclear if this relationship can be accounted for by difficulties in response inhibition. We hypothesised that poor response inhibition would predict problematic alcohol use, and that there will be a significant positive relationship of 'psychopathic traits' with alcohol use after adjusting for response inhibition difficulties.

The study was completed via an online research platform; Prolific Academic. A total of 110 participants completed questionnaires that assessed internalising behaviour, problematic drinking, and personality traits associated with the triarchic construct of psychopathy. In addition, they completed the Go/No-Go and Stop Signal tasks, both modified with alcohol-related pictorial cues, which are designed to measure separable dimensions of response inhibition; restraint and cancellation.

We found that the triarchic index of Disinhibition was positively correlated with alcohol use. After adjusting for response inhibition and internalising features, this relationship was no longer significant but internalising did significantly predict increased alcohol use. This is suggestive of a complex relationship between psychopathy and alcohol use, and directions for future research are discussed.

Key words: Psychopathy, Alcohol Use, Response Inhibition, Go/No-Go, Stop Signal.

General Scientific Summary: This study found that internalising features (i.e., anxiety) are implicated with problematic alcohol use, beyond the effects of poor response inhibition and elevated traits associated with psychopathy in social drinkers amongst the general population. Replication of this study amongst forensic settings may have valuable clinical implications for treatment interventions within that setting.

Introduction

The term 'psychopathy' refers to a multifaceted construct that has held longstanding interest within psychological research due to its potential impact on the individual, and the considerable impact on society. Research exploring this construct has predominantly been conducted with forensic or institutionalised participant groups in order to better understand its relationship with maladaptive behaviour(s). However, current research suggests that psychopathy does not exist as a taxon, where 'psychopaths' are distinguishable from 'non-psychopaths', but rather that personality traits that are characteristic of psychopathy exist dimensionally along a continuum (Coid & Ullrich, 2010; Hopwood et al., 2018). Psychopathy is associated with various long-term outcomes, including heightened rates of aggression and violence, substance use, and problematic alcohol use (Ahn & Vassileva, 2016; Hemphill, Hare, & Wong, 1998; Howard, 2006; Waller & Hicks, 2019; Walsh, Allen, & Kosson, 2007; Woodworth & Porter, 2002). However, it is unclear as to whether there is a specific relationship of psychopathy with alcohol use, or if this relationship is better explained by impairments in response inhibition that are associated with psychopathy. Building upon previous research on psychopathy and response inhibition, the current study aimed to test the association of 'psychopathic traits' with alcohol use in a community sample of social drinkers after adjusting for response inhibition abilities. Specifically, we examined

separable dimensions of restraint and cancellation, using Go/No-Go and Stop Signal tasks, respectively, that were modified to include pictorial alcohol cues.

Classic conceptualisations of psychopathy describe a convincing 'Mask of Sanity', whereby interpersonal features of the disorder mask underlying features including a lack of remorse or guilt, and disregard for social norms (Cleckley, 1941). Building on the work of Cleckley, the development of the Psychopathy Checklist (PCL; Hare, 1980), and later the Psychopathy Checklist-Revised (PCL-R; Hare, 1991; Hare, 2003), provided reliable instruments for the assessment of 'psychopathic traits' in clinical and forensic samples (Hare, 1980). The PCL-R comprises of two correlated factors, with Factor 1 describing the Interpersonal (e.g., superficial charm, pathological lying, manipulativeness) and Affective (e.g., lack of remorse, callousness, lack of empathy) features of psychopathy, and Factor 2 describing the Lifestyle (e.g., impulsivity, irresponsibility, lack of realistic long-term goals) and Antisocial (e.g., juvenile delinquency, poor behavioural control, criminal versatility) features (Hare, 2003). The PCL and its various derivatives, for example the PCL Screening Version (PCL:SV; Hart, Cox, & Hare, 1995), have been widely used in empirical studies, particularly within mental health and forensic populations. Although the PCL-R specifies a cut-off point for diagnosing psychopathy, the recommended cut-off varies between the UK/Europe and the USA, and the use of a cut-off is not consistent with the contemporary understanding that psychopathic traits exist along a continuum (Thompson, Ramos, & Willett, 2014).

Although the four-factor structure employed by the PCL family of instruments has received the most attention in psychopathy research, alternative conceptualisations argue for the existence of three distinct factors. For example, the triarchic model of psychopathy proposes a relatively contemporary conceptualisation of the construct and includes three distinct but interrelated phenotypic dispositions; Boldness, Meanness, and Disinhibition.

These dimensions can be reliably assessed using the Triarchic Psychopathy Measure (TriPM; Patrick, Fowles, & Krueger, 2009). Boldness is defined as a "capacity to remain calm and focused in situations involving pressure or threat, an ability to recover quickly from stressful events, high self-assurance and social efficacy, and a tolerance for unfamiliarity and danger" (Patrick et al., 2009, p. 926). Meanness is defined as "deficient empathy, disdain for and lack of close attachments with others, rebelliousness, excitement seeking, exploitativeness, and empowerment through cruelty" (p. 927). Lastly, Disinhibition is defined as a "propensity toward impulse control problems entailing a lack of planfulness and foresight, impaired regulation of affect and urges, insistence on immediate gratification, and deficient behavioural restraint" (p. 925). Furthermore, the TriPM does not use a cut-off score to determine whether 'psychopathic' tendencies are present or not, but instead follows the approach whereby the psychopathy construct is recognised to be more akin to a continuum, with people having varying levels of the associated traits within society and various contexts (Coid & Ullrich, 2010; Hopwood, et al., 2018).

Despite differences in conceptualisations and variations of measurement, Patrick and Drislane (2015) detailed associations that support interrelations between the conceptualisations of psychopathy. Specifically, the TriPM indexes constructs that are common with the PCL-R. Boldness, which refers to high self-assurance, fearlessness and interpersonal dominance (Patrick, et al., 2009), closely resembles the Factor 1 Interpersonal features (Patrick & Drislane, 2015). Meanness, which refers to lack of empathy, exploitativeness and callousness, closely resembles the Factor 1 Affective features but is also well correlated with Factor 2 Antisocial features (Drislane, Patrick, & Arsal, 2014), whilst Disinhibition, which refers to impulsivity, poor affective regulation and poor behavioural restraint (Patrick, et al., 2009), closely resembles the Factor 2 Lifestyle and Antisocial features of the PCL-R (Patrick & Drislane, 2015). Furthermore, Patrick and Drislane (2015)

highlight how the TriPM has shown strong convergence with other self-report measures of psychopathy to include, the Self-Report Psychopathy Scale-III (SRP-III; Paulhus, Hemphill, & Hare, 2009), the Levenson Self-Report Psychopathy Scale (LSRP; Levenson, Kiehl, & Fitzpatrick, 1995), and the Psychopathic Personality Inventory (PPI; Lilienfeld & Andrews, 1996; Lilienfeld & Widows, 2005).

The dimensions of psychopathy identified using the PCL or TriPM are differentially associated with alcohol use in offender and community samples. For example, studies that have looked at prevalence rates of alcohol misuse amongst 'psychopathic offenders' have found that elevated scores on the PCL-R are associated with increased alcohol misuse (Coid, Yang, Ullrich, Roberts, Moran, et al., 2009; Yitayih et al., 2018). Similar findings have also been demonstrated in non-offending, community samples. Neumann and Hare (2008) reviewed associations between elevated scores on the PCL:SV within a community sample of 514 adults (male N=196, women N=318). Whilst they acknowledged that participants had low PCL:SV scores (< 3), indicative of low levels of psychopathy in the community, they found that the Interpersonal, Affective, Lifestyle and Antisocial factors on this measure were significantly correlated with externalising behaviours, including alcohol use. Similarly, Coid, Yang, Ullrich, Roberts, and Hare (2009) found significant associations of PCL:SV assessed Lifestyle and Antisocial facets with substance misuse in a community sample of 638 adults living in the UK. However, in the latter study the relationship with alcohol use in particular was non-significant. In contrast, Coid, Yang, Ullrich, Roberts, Moran, et al. (2009) found that the Interpersonal and Affective features of psychopathy were positively associated with alcohol use, whilst the Impulsive and Antisocial features were not.

When considering the TriPM framework, Satchell, Johnson, Hudson, and Harper (2020) detail index associations with alcohol use. Specifically, they reported that elevated scores on the Disinhibition index positively predicted problematic alcohol use, after adjusting

for anxiety, impulsivity and low fear, within a general population sample. This is consistent with this facet having potential positive risk associated for alcohol use due to the fundamental element of individuals having low self-control (Patrick et al., 2009; Sayette & Creswell, 2016). Furthermore, they reported that whilst Disinhibition accounted for the majority of the variance in stage 2 of the regression model, anxiety also remained a significant predictor of alcohol use (Satchell et al., 2020). The latter finding being consistent with known comorbidities between internalising disorders and alcohol abuse (Anker et al., 2017).

Although results point toward a relationship of psychopathy with alcohol use, this relationship may reflect shared difficulties in response inhibition. Response inhibition can be defined as the inability to stop, change, or delay an inappropriate response (Jones & Field, 2015). It is a type of motor-impulse response, and details the ability to choose and maintain an appropriate goal-oriented response, while suppressing a non-goal-aligned response (Luna, Padmanabhan, & O'Hearn, 2010). Difficulties inhibiting a response are considered a risk factor for various maladaptive behaviours including problematic substance use in adolescents (Thomsen, Osterland, Hesse, & Ewing, 2018), and adults (Verdejo-García, Lawrence, & Clark, 2008) within both clinical and non-clinical settings. This makes it a candidate mechanism for risk screening and the focus for treatment interventions in this area (Jones, Christiansen, Nederkoorn, Houben, & Field, 2013). Importantly, whilst response inhibition is an umbrella term for controlling or stopping current actions or thoughts, it is important to differentiate between the processes of restraint and cancellation. The former refers to restraining a prepotent response when a signal to stop is observed, whilst the latter refers to cancelling an ongoing response when a stop signal is observed (Schachar et al., 2007). Whilst the mesial, medial, inferior frontal, and parietal cortices are considered to be part of a shared inhibitory neurocognitive network (Rubia et al., 2001), these two components are also considered to differ in relation to the implicated neural pathways that they acquire.

Neuroimaging studies have suggested that restraint processes implicate dorsolateral and medial prefrontal areas (Matthews, Simmons, Arce, & Paulus, 2005; Rubia et al., 2001), compared to implication of the right inferior frontal gyrus and basal ganglia for cancellation processes (Aron, Fletcher, Bullmore, Sahakian, & Robbins, 2003; Chambers et al., 2006). These specific means of response inhibition can be measured separately by the Go/No-Go and Stop Signal tasks. The Go/No-Go task requires quick responding to specified cues whilst restraining responses to others (i.e. 'Go' when you see 'x', and 'No-Go' when you see 'y'), whereas the Stop Signal Task requires quick responding to identified stimuli and cancellation of that response if a 'stop' signal follows the initial presentation of the stimulus. Poor performance on these tasks, which each require inhibition of a dominant motor response, is indicative of the broader construct of impulsivity which is considered a central feature of alcohol misuse. However, one of the problems with operationalising response inhibition using these tasks is that it may vary depending on participant engagement and motivation to respond.

Previous research has included the use of alcohol-related cues in both Go/No-Go and Stop Signal tasks as a means of ensuring a more accurate measure of disinhibition that is specifically associated with alcohol use. Noël et al. (2007) found that modifying the Go/No-Go task to include alcohol-related words increased disinhibition in alcoholic participants, whilst Weafer and Fillmore (2012) found that modification of the task to include alcohol-related images increased social drinker inhibition errors. Modification of the Stop Signal Task, where detoxified alcoholics were instructed to smell alcohol rather than water, found increased Stop Signal Reaction Times; that is, poorer response inhibition (Gauggel et al., 2010). A possible explanation for this is that the inclusion of alcohol-related cues results in a shift from goal-directed to habitual behaviour (Hogarth, Field, & Rose, 2013). Modification of both the Go/No-Go and Stop Signal tasks to include pictorial alcohol-related content have

been used to demonstrate the role of response inhibition in problematic alcohol use amongst normative samples (see Jones & Field, 2015; Jones et al., 2011; Verdejo-García et al., 2008). Therefore, modification of these tasks to include alcohol-related content appears more likely to improve validity of the tasks.

In addition to response inhibition, psychopathy and alcohol use also share relationships with internalising behaviours, in particular anxiety. Despite early descriptions of psychopathy describing a pronounced lack of anxiety, studies have since reported that whilst Interpersonal and Affective facets tend to be negatively associated with trait anxiety, the Antisocial facets are positively associated (Hicks & Patrick, 2006; Schmitt & Newman, 1999; Skeem, Poythress, Edens, Lilienfeld, & Cale, 2003). Similarly, elevated anxiety and problematic alcohol use are an observed comorbid phenomenon, with anxiety sensitivity (i.e. the fear of experiencing raised arousal) associated with alcohol use problems in community samples (Howell, Leyro, Hogan, Buckner, & Zvolensky, 2010). These vulnerabilities in affective processing and inhibitory control deficits seem to be shared across substance use and elevated psychopathy traits (Verona, Hoffmann, & Edwards, 2018). For example, research conducted on juvenile offenders aged 14-18 reported different mediating factors for problematic alcohol use between those with elevated psychopathy traits and low anxiety (i.e., 'primary psychopathy'), versus those with elevated psychopathy traits and high anxiety (i.e., 'secondary psychopathy'). Whilst both groups showed similar rates of alcohol use over a four-year follow-up, the mechanisms for use were supposedly different. Specifically, problematic alcohol use amongst those with elevated psychopathy traits and high anxiety was considered to be mediated by worse impulse control, which was observed to be higher in this group (Waller & Hicks, 2019). These findings ought to be considered tentatively however, as response inhibition was assessed via subscales of the Weinberger Adjustment Inventory which aims to assess social-emotional adjustment (Weinberger & Schwartz, 1990).

Subsequently, the measure did not present alcohol-related cues and is arguably not an objective measure of response inhibition. Furthermore, it is important to note that psychopathy fundamentally differs from the construct of internalising by virtue of 'psychopathic traits' being associated with "a deficiency rather than an excess of affective reactivity" (Patrick et al., 2009, p. 914). However, it remains important to consider the role of internalising when examining the relationship of psychopathy and alcohol use.

Given the potential individual and societal impacts and interest in providing effective interventions, the factors contributing to alcohol use, such as personality traits, warrant being a focus of study. Identifying possible personality traits associated with alcohol use could allow for better identification of at-risk individuals and the development of more effective, individually responsive intervention(s) (Satchell et al., 2020). Therefore, further exploration of the relationship between 'psychopathic' personality and problematic alcohol use within a sub-clinical sample could be important for understanding risk and potential interventions.

Objectives and hypothesis

The current study aimed to explore how personality traits associated with psychopathy are associated with alcohol use, after adjusting for the effects of internalising and two separable components of behavioural response inhibition: restraint and cancellation. We hypothesised that there will be a significant positive relationship of response inhibition difficulties with alcohol use and elevated traits of Meanness and Disinhibition, as well as a significant positive relationship of Meanness and Disinhibition with alcohol use after adjusting for response inhibition difficulties and internalising features.

Method

Ethical approval and pre-registration

Ethical approval for this study was obtained from the University of Liverpool's Committee of Research Ethics (CORE) prior to data collection (Appendix G), and the proposed protocol was pre-registered with AsPredicted with the registration number #29410 (Appendix H). All participants were provided with an online information sheet (Appendix I) and were required to confirm that they had received all relevant information and wanted to continue with participation having provided informed consent (Appendix J). As this study was conducted online, debrief information (Appendix K), including details of where participants may seek support if they required it, but excluding information about hypotheses, was included at the end of the study, as well as within the information sheet. This sought to mitigate any event where a participant may leave the task early and not have access to the debrief information. Participants were informed that their right to withdraw their data ceased at the point of completing the online tasks as all data was anonymised at this stage and would therefore be unidentifiable.

Participants and study design

A quantitative, cross-sectional design was used, and participants were recruited online following the dissemination of an advertisement placed on Prolific Academic (ProA; Appendix L). This is an online company that was launched in 2014 by Oxford and Sheffield University graduates, providing a platform for conducting paid research (Peer, Brandimarte, Samat, & Acquisti, 2017). Peer et al.'s (2017) study reported that participants recruited via ProA produced high quality data from a more diverse population than similar recruiting tools (e.g. MTurk, CrowdFlower), therefore evidencing its suitability as an online recruitment platform. Participants were paid £3.75 each, for 45 minutes of their time. The time taken to complete the measures was determined by the first author piloting all measures.

Inclusion and exclusion criteria

The following inclusion and exclusion criteria were applied in order that the research question could be assessed and answered appropriately. As the study aimed to examine the relationship of 'psychopathic' tendencies with alcohol use, all participants had to be adults aged 18 and over, and self-report as being 'social drinkers' (defined as consuming alcohol on at least one occasion per week; Jones & Field, 2015; Jones et al., 2011). Participants were also required to own or have access to a laptop, PC or iPad in order to complete the online task. This was due to the software package (Inquisit 5, Millisecond Software, Seattle) being incompatible with some iOS and Android devices.

Exclusion criteria included any person who self-reported to have consumed alcohol on the day that they completed the task, as determined by a screening question prior to completion of the study (see Appendix J), or anyone who was currently accessing treatment for alcohol dependence. This was considered necessary due to the known effects of alcohol on a person's ability to inhibit responses that would otherwise be typical for them (see; Jones et al., 2013). In addition, people with a history of accessing treatment for alcohol dependence were excluded from taking part. This criterion was applied due to the potential risks associated with presenting alcohol-related images to individuals with reduced capacity to effectively debrief, and because our hypothesis was not intended to be tested in a clinical sample. Lastly, anyone who self-reported having never engaged in drinking alcohol was unable to participate as it would have led to an invalid assessment of the research question.

Power analysis

The number of required participants was calculated by power analysis. A priori power calculation using G*Power 3 software (Faul, Erdfelder, Lang, & Buchner, 2007) indicated a sample size of 114 participants (Appendix M). This was computed for a hierarchical regression (R_2 increase) with a total of six predictors; cancellation, restraint, Meanness,

Disinhibition, Boldness, internalising, (parameters: power = 0.80, alpha = 0.05, effect size = 0.0869565) and two tested predictors; Meanness, Disinhibition. Post hoc power analysis was also completed following participant recruitment and data cleaning (Appendix N; see results section).

Measures

Assessment of response inhibition. Two online tasks were modified to incorporate alcohol-related images, and were included within this study to measure each participant's ability to either restrain a response, or cancel an already initiated response.

Go/No-Go task. The Go/No-Go task presented images of both neutral stimuli (e.g. stationary) and alcohol-related stimuli (e.g. a glass of wine), one at a time. Participants were required to respond as quickly and as accurately as they could to seeing the neutral stimuli by pressing the space bar on their keyboard, and also inhibit this response (i.e. do not press the space bar) when they saw alcohol related stimuli. Participants were presented with 200 trials, with 150 of the trials showing images that were neutral and the remaining 50 trials showing images that were alcohol-related. Thus, participants were required to inhibit their response on 25% of trials. In this condition, the 'Go' and 'No-Go' signals were always presented concurrently; that is, the mean delay between the signal was always zero (see Schachar et al., 2007). The number of 'No-Go' errors derived from participants performance on this task was used to quantify and assess restraint inhibition.

Stop Signal Task. The Stop Signal Task (Logan, Carr, & Dagenbach, 1994) presented images of alcohol-related stimuli only. Participants had to respond by stating the position of the image on the screen; they were required to press the 'D' key if the image was on the left side of the screen, or the 'K' key if it was on the right. During the task participants were presented with 216 trials. On 25% (n = 54) of the trials a 'stop' signal appeared over the original image. These 'stop' signals followed the presentation of the visual stimulus by a

determined stop signal delay and informed the participant that the ongoing response must be interrupted and cancelled. The stop signal delay started at 250 milliseconds for each participant. If the participant successfully inhibited a response, the stop signal delay increased by 50 milliseconds on the subsequent 'stop' trial. The stop signal delay was reduced by 50 milliseconds if the participant failed to inhibit a response, with the delay between the stimulus onset and 'stop' signals being automatically adjusted via a tracking algorithm. The dynamic adjustment of the delay ensured that each participant inhibited approximately 50% of their responses when a 'stop' signal was presented (Verbruggen et al., 2019).

Assessment of psychopathy. We assessed psychopathy using the Triarchic Psychopathy Measure (TriPM; Patrick et al., 2009) (Appendix O). This is a 58-item self-report measure, for which participants respond on a 4-point Likert scale (0 = false, 1 = somewhat false, 2 = somewhat true, 3 = true). The items delineate scores on three subscales: Boldness, which indexes tolerance for danger, fearlessness, increased self-efficacy, and interpersonal dominance (Patrick et al., 2009); Meanness, which indexes callousness, lack of empathy, and exploitative tendencies (Brislin et al., 2018; Drislane et al., 2014); and Disinhibition, which indexes impulsivity, emotional reactivity, and a lack of self-control (Patrick et al., 2009). Higher scores on each of these subscales is indicative of a greater presence of those traits. The TriPM has been found to be a valid measure of self-reported psychopathy in non-offender samples (Drislane et al., 2014), and internal consistencies for the Boldness, Meanness, and Disinhibition subscales were adequate (Cronbach's α .90, .83, and .84, respectively).

Assessment of internalising. Internalising behaviours are those that are directed inwards such as disordered mood, withdrawal, or anxiety. The Generalised Anxiety Disorder-7 (GAD-7; Löwe et al., 2008) was used to assess participants level of internalising behaviour (Appendix P). This is a 7-item self-report questionnaire that considers an individual's

experience of anxiety within the last two weeks. Participants responded on a 4-point Likert scale (0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day). A total score that is equal to or above 10 is indicative of moderate to severe experiences of anxiety. Löwe et al. (2008) reported good reliability and validity for the GAD-7 in the general population, and the internal consistency for this questionnaire was good (Cronbach's α .94).

Assessment of substance use. We used the Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) to assess problematic drinking behaviour (Appendix Q). This is a 10-item questionnaire that requires participants to identify drinking habits/behaviours. It is validated within non-clinical samples, with a score of 8 or above signifying drinking alcohol at harmful or hazardous levels, whilst a score above 13 for women and 15 for men is indicative of dependence (Babor et al., 2001). Internal consistency for this questionnaire was adequate (Cronbach's α .80).

Procedure

The study was conducted entirely online with participant recruitment occurring via an opportunity sampling method. Advertisements placed on ProA included a link to the study which participants clicked in order to gain access. Engagement commenced once participants had read and understood all of the relevant information (see Appendix I and J).

Initially, participants completed the two computerised tasks; Go/No-Go and Stop Signal. The order in which these tasks were presented to the participants was randomised to control for fatigue and practice effects. Next, participants were asked to provide demographic information relating to age and gender. No personally identifiable information was collected and the anonymity of participants was upheld throughout the study. Then, participants were required to complete the questionnaires in a routine order (GAD-7, TriPM and AUDIT, respectively). Participants were also required to respond to an instructed response item

(Appendix R). This is a means of identifying inattentive respondents when completing self-report measures by requiring participants to respond in a pre-defined way (Curran, 2016). Evidence of correct responding enables the researchers a level of certainty that respondents have engaged meaningfully (Gummer, Roßmann, & Silber, 2018). Upon completion of the study, participants were provided with a unique completion code that could be submitted via ProA to enable a more efficient payment response.

Engagement was assessed by reviewing all collected data, ensuring that there were no gaps in responses, or incorrect responses to the instructed response item. Data cleaning also included the removal of any participants with inhibition accuracy at or below 25% and at or above 75% as such responses may have been indicative of the participant adopting a wait/delay strategy or failing to complete the task (Verbruggen et al., 2019).

Data reduction and statistical analysis

The data were analysed using the Statistical Package for Social Science (SPSS) version 25 (IBM Corp., 2017). First, descriptive statistics were used to analyse age and gender information, and zero order correlations were used to examine relationships between the study variables. Next, a hierarchical regression was used to test the relationship of 'psychopathic traits' with problematic alcohol use, after adjusting for the effects of internalising and response inhibition (with the latter measured by No-Go errors and Stop Signal Reaction Time (SSRT)). These analyses were pre-registered with AsPredicted in advance of the data collection (https://aspredicted.org/see_one.php). Finally, additional unregistered multiple linear regressions were used to explore the relationship of 'psychopathic traits' (i.e. Boldness, Meanness, and Disinhibition) with restraint and cancellation abilities (via No-Go errors and SSRT, respectively).

No-Go errors refer to the number of commission errors made on 'No-Go' trials (i.e. responding to an alcohol-related image despite being instructed to inhibit this response). A

higher number of errors represents greater problems in restraint. SSRT is the unobserved latency of inhibition (i.e. the delay in responding to the 'stop' signal). The SSRT is calculated by subtracting the N_{th} reaction time from the mean stop signal delay. The N_{th} reaction time is chosen from the ranked (fastest —› slowest) reaction time distribution on 'go' trials, where N is the probability of failed inhibition, times by, the number of reaction times. For example, if participants failed to inhibit on 40% of the 'stop' trials the N_{th} reaction time would be the 66_{th} fastest reaction time (0.40 X 164 = 65.6 (66_{th})). A longer SSRT represents greater difficulty with cancellation ability.

Results

Descriptive statistics

At the time the study was advertised, it was available to an audience of 4,450 potential participants who were deemed eligible from a pool of 86,967 ProA site users. People accessing ProA were predominantly from the United Kingdom and the United States of America, although specific nationality data cannot be reported as it was not explicitly obtained for this study. A total of 123 responses were received, with 110 data sets analysed following data cleaning. Removal of several data sets was required to ensure that the data included was of acceptable quality. Data sets were removed due to; self-report of not drinking alcohol (n = 1), failure to complete all questionnaire(s) items (n = 6), and failure to accurately respond to the instructed response item (n = 6). Of those whose data was included in the study there was a relatively equal gender split (Male = 57, Female = 52, Other = 1), and the age range of the sample was 20 to 87 years (M = 41.25, SD = 14.27).

Associations between variables

Firstly, we looked at the inter-correlational relationships between each of the included variables via zero-order correlation (see Table 1). We identified expected relationships

between the three TriPM subscales; Boldness and Disinhibition were found to be negatively correlated, whilst Meanness and Disinhibition were positively correlated. Boldness was negatively correlated with increased self-report of anxiety, while Disinhibition was positively correlated with increased self-report of anxiety.

Boldness and Meanness showed opposing relationships with the number of No-Go commission errors (measuring participants restraint). Boldness was associated with fewer errors (i.e., greater restraint), while Meanness was associated with more errors (i.e., poorer restraint). On the other hand, Meanness was associated with shorter SSRTs on the Stop Signal Task, indicative of better cancelation abilities. This suggests that participants who scored highly for Boldness showed greater restraint ability, while those who scored highly for Meanness showed poorer restraint ability but better cancellation ability. In addition, increased anxiety was associated with more No-Go errors, indicative of poorer restraint ability, whilst there was a non-significant relationship of anxiety with cancellation.

With regards to psychopathy and alcohol use, Boldness was negatively correlated with hazardous drinking, whereas Disinhibition was positively correlated with hazardous drinking. This suggests that those who are more disinhibited are more likely to engage in this type of behaviour. The relationship of Meanness with alcohol use was non-significant, and there were no observable relationships between alcohol use and performance on response inhibition tasks.

Table 1

Zero-order Correlations[1]

Variables	AUDIT	Boldness	Meanness	Disinhibition	No-Go errors	Go/No-Go RT	SSRT	GAD-7
AUDIT	1							
Boldness	-.294**	1						
Meanness	.181	. 036	1					
Disinhibition	.397**	-.466**	.428**	1				
No-Go errors	.086	-.192*	.218*	.178	1			
Go/No-Go RT	.070	.129	-.045	-.143	-.523**	1		
SSRT	-.090	.142	-.213*	-.138	.067	.342**	1	
GAD-7	.436**	-.557**	.022	.457**	.342**	-.283**	-.047	1

* p <0.05, **p <0.01

[1] *AUDIT* = scores obtained on The Alcohol Use Disorders Identification Test. *Boldness, Meanness and Disinhibition* = scores obtained on the Triarchic Psychopathy Measure. *No-Go errors* = errors of commission obtained on Go/No-Go task as a measure of restraint. *Go/No-Go RT* = reaction time on the Go/No-Go task. *SSRT* = Stop Signal Reaction Time as a measure of cancellation. *GAD-7* = scores obtained on the Generalised Anxiety Disorder 7. *GAD-7* = scores obtained on the Generalised Anxiety Disorder 7.

Hierarchical regression analysis

A hierarchical regression was conducted that included two models to determine if elevated psychopathy traits predicted alcohol use after adjusting for internalising, restraint, and cancellation abilities (Table 2).

Model one included scores for Boldness, GAD-7, No-Go errors (restraint), and SSRT (cancellation). As Boldness is considered to be a more adaptive trait associated with social poise and resilience, we did not hypothesise that there would be a specific relationship with alcohol use, hence its inclusion within step one of the model. The overall model was significant, Adjusted R_2 = 0.17, $F(4,105) = 6.64$, $p<.001$, and predicted approximately 17.1% of the variance in AUDIT scores. The results for the first model showed that increased levels of self-reported anxiety were associated with increased alcohol use, but there was no significant effect of restraint or cancellation.

Model two included the addition of Meanness and Disinhibition. Again, the model was significant, Adjusted R_2 = 0.21, $F(6,103) = 5.88$, $p<.001$, and predicted approximately 21.2% of the variance in AUDIT scores. Similarly, it was found that increased anxiety scores, but not Meanness or Disinhibition, were associated with greater scores on the AUDIT.

The regression was repeated without the inclusion of participants aged 65 and over (n = 7) due to the known effects of age on response inhibition (Andrés, Guerrini, Phillips, & Perfect, 2008). Models one and two remained significant; Adjusted R_2 = 0.16, $F(4,98) = 5.68$, $p<.001$ predicting 15.5% of the variance, and Adjusted R_2 = 0.19, $F(6,96) = 4.98$, $p<.001$ predicting 19.0% of the variance, respectively. Comparably, across both models increased anxiety scores only were associated with greater AUDIT scores.

Table 2

Hierarchical Regression Analysis

Predictors	B	SE	β	t	*p*	95% CI
Model 1						
Boldness	-.037	.062	-.064	-.601	.549	-.161, .086
GAD-7	.455	.119	.421	3.839	**.000**	.220, .690
Stop Signal Reaction Time	-.006	.009	-.057	-.644	.521	-.025, .013
No-Go Errors	-.049	.069	-.067	-.717	.475	-.185, .087
Model 2						
Boldness	-.013	.065	-.023	-.204	.839	-.143, .116
GAD-7	.401	.121	.372	3.313	**.001**	.161, .642
Stop Signal Reaction Time	-.001	.010	-.013	-.144	.886	-.020, .018
No-Go Errors	-.076	.070	-.103	-1.086	.280	-.213, .062
Meanness	.134	.085	.184	1.580	.117	-.034, .303
Disinhibition	.098	.090	.114	1.090	.278	-.080, .276

Note. Values in bold are significant.

Exploratory analysis

Linear regression analysis. To better understand the relationships of distinct psychopathic traits with restraint and cancellation, a series of additional, unregistered multiple linear regressions were undertaken, with Boldness, Meanness, and Disinhibition included in the model simultaneously (see Table 3). The model for restraint (No-Go errors) was significant, Adjusted R_2 = 0.06, $F(3, 106)$, p=0.02, and predicted approximately 6.2% of the variance in No-Go errors. Parameter estimates showed that participants who scored higher for Meanness made more errors, indicative of greater difficulty restraining a response.

The model for cancellation (SSRT) was non-significant, Adjusted R_2 = 0.04, $F(3, 106)$, p=0.06. Parameter estimates for this model are reported in Table 3 for information only.

Further analysis was completed without inclusion of participants aged 65 and over. The model for restraint was non-significant, Adjusted R_2 = 0.04, $F(3, 99)$, p=0.08, whilst the model for cancellation was significant, Adjusted R_2 = 0.07, $F(3, 99)$, p=0.01 and predicted approximately 7.3% of the variance. For the latter, parameter estimates showed that participants who scored higher on Meanness had longer Stop Signal Reaction Times, indicative of greater difficulty cancelling a response (p=0.007).

Table 3

Linear Regression Analysis

Predictors	B	SE	β	t	*p*	95% CI
No-Go errors (Restraint)						
Boldness	-.167	.087	-.209	-1.908	.159	-.340, .006
Meanness	.272	.125	.234	2.180	**.031**	.025, .520
Disinhibition	-.020	.120	-.020	-.165	.870	-.258, .218
SSRT (Cancellation)						
Boldness	.934	.609	.170	1.534	.128	-.273, 2.141
Meanness	-1.905	.871	-.237	-2.188	.031	-3.631, -.179
Disinhibition	.288	.836	.042	.345	.731	-1.369, 1.946

Note. Values in bold are significant (p<0.05).

Discussion

For the first time, in this study we attempted to shed new light on whether personality traits associated with psychopathy, specifically Meanness and Disinhibition as determined by self-report on the TriPM, were predictive of alcohol use. In addition, we sought to explore whether this relationship remained apparent after adjusting for the effects of internalising (i.e. anxiety) and separable components of response inhibition; restraint and cancellation. The hypothesised pattern of zero-order relationships was partially supported. The initial predictions that Meanness and response inhibition difficulties would be associated with greater alcohol use were not supported. However, a significant positive relationship between the Disinhibition facet and alcohol use was identified. Subsequent hierarchical regression analysis discounted our further hypotheses that the relationship of 'psychopathic' traits and

alcohol use would remain significant after adjusting for internalising features and response inhibition. Our findings point toward a complex relationship of elevated psychopathy traits and alcohol use, and suggest that much of this association may be accounted for by shared variance with internalising features.

Some of the relationships demonstrated in the current study were consistent with previous research and understanding. Specifically, the inter-correlational patterns of the TriPM, whereby Boldness and Disinhibition were negatively correlated, and Meanness and Disinhibition were positively correlated, is consistent with the expected pattern of relationships between these constructs (Patrick et al., 2009). Furthermore, the way that these indexes associate with internalising features was consistent with previous findings, whereby anxiety was negatively correlated with Boldness, but positively correlated with Disinhibition (Hicks & Patrick, 2006; Skeem et al., 2003).

With regards to performance on the Go/No-Go (restraint) and Stop Signal (cancellation) tasks, we found no support for the hypothesis that problems in either restraint or cancellation are associated with more hazardous drinking behaviour. This is largely inconsistent with previous research (for reviews see; De Wit, 2009; Verdejo-García et al., 2008). Smith, Mattick, Iredale, and Jamadar (2014) conducted a meta-analysis of 97 studies that used the Go/No-Go and Stop Signal tasks as measures of response inhibition. They reported that alcohol misuse and addictive behaviour was associated with poor inhibitory control, albeit those studies were inclusive of clinical samples. Similarly, and within a non-clinical sample utilising the same modified tasks used within the current study, Jones and Field (2015) also reported an observable relationship of poor response inhibition and increased alcohol use.

Furthermore, there were arguably unexpected observed associations of performance on response inhibition tasks with internalising features. Specifically, elevated anxiety scores

were associated with more No-Go errors. This implies poorer restraint abilities on this task, whereas we may have expected an approach that ensured that 'No-Go' stimuli were responded to as requested, similar to harm-avoidant behaviour that is associated with anxiety (Robinson, Krimsky, & Grillon, 2013). However, elevated anxiety was positively correlated with Disinhibition which may account for this type of responding. Additionally, higher scores for Boldness were associated with greater restraint abilities, whilst higher scores for Meanness were associated with both tasks in divergent directions with poorer restraint ability yet greater cancellation ability. This suggests that particular features within the triarchic construct of psychopathy lend themselves differently to response inhibition abilities. Interestingly, there was no significant relationship observed for traits of Disinhibition on either the restraint or cancellation tasks, however this index was positively associated with alcohol use. Therefore, this suggests that people who score more highly on the Disinhibition facet are more likely to engage in drinking behaviour, regardless of any response inhibition deficit.

The current study specifically aimed to disentangle some of the overlap between shared relationships of internalising features and response inhibition that are found within both 'psychopathic' and alcohol misusing populations. By controlling for these variables, we hoped to determine whether elevated psychopathy traits had a positive association with alcohol use that was not otherwise accounted for by shared difficulties in response inhibition. The results of a hierarchical regression showed that greater scores for anxiety, but not Meanness or Disinhibition, were associated with more problematic drinking behaviour. Whilst this is consistent with much of the literature on the use of alcohol as a self-medicating coping mechanism for anxiety (for a review see; Kushner, Abrams, & Borchardt, 2000) it is inconsistent with reports that Disinhibition features, such as lack of self-control, may be uniquely associated with alcohol use (Satchell et al., 2020).

Clinical implications and future research

This study provides a contribution to the current literature that identifies the complexity of psychopathy and the underlying processes that may lead to problematic drinking behaviour. The finding that elevated Disinhibition is associated with problematic alcohol use, but not after adjusting for internalising features (i.e., anxiety) indicates a need for these associations to be examined further. Although continuities have been highlighted in the mechanisms underlying 'psychopathic' tendencies in both clinical and non-clinical samples, suggesting that results can be representative of the broader psychopathy continuum, rates of psychopathy in the general population are notably lower (Coid, Yang, Ullrich, Roberts, & Hare, 2009). Therefore, it is possible that associations between 'psychopathic' traits and alcohol use may be more observable within samples who demonstrate higher scores for 'psychopathic' traits. Consequently, we propose that future research should replicate the current study with participants who have more severe problems with alcohol use and traits associated with psychopathy, such as those within forensic settings where this is found to be more prevalent (Walsh et al., 2007). Our current findings suggest that the relationship of Disinhibition with alcohol use may be largely accounted for by shared variance with internalising features, and suggests that problematic alcohol use in relation to Disinhibition may be best understood using frameworks related to anxiety and alcohol use. Speculatively, we would suggest that this relationship may represent attempts to self-medicate to cope with psychological distress, although if our findings are replicated within a forensic setting, it may suggest a need for a review of more focused treatment efforts at a clinical level.

Specifically, successful forms of intervention to manage alcohol use in forensic populations ought to aim to address underlying psychological distress associated with anxiety and symptoms of internalising disorders. Consideration of developing positive coping strategies in the comorbid context of low impulse control and heightened anxiety may help

inform ways of working with, and providing treatment for these individuals. Cognitive Behaviour Therapy (CBT) is currently recognised as the gold-standard psychological intervention for anxiety disorders (NICE, 2013). Attempts to reduce alcohol use by solely targeting difficulties in self-control or anti-sociality may fail unless internalising features are successfully managed. Adaptation of current CBT interventions to include specific behavioural training of inhibition, which has been shown to reduce alcohol consumption (Bowley et al., 2013), may provide a more holistic approach to treatment for these individuals. Furthermore, exploration of the impact of other factors (e.g., access to illicit substances, opportunity, and privilege), which may predispose somebody from being reprimanded/institutionalised or not, may further the current understanding of the extent to which the co-occurrence of 'psychopathic' tendencies with problematic drinking represents a direct relationship of 'psychopathic' tendencies with alcohol use.

Strengths and limitations

These results and clinical implications ought to be considered within the context of this studies strengths and limitations. Relative strengths of the study include elements of the participant sample. There was a relatively equal gender split, and scores obtained on the AUDIT showed that 62% of the sample were below the cut-off for hazardous drinking, therefore being representative of a general population sample in which we aimed to test our hypotheses. Furthermore, use of the TriPM is considered a strength within this study as the three phenotypic constructs have been considered to represent an understanding of the psychopathy construct in its varying manifestations: criminal and non-criminal, primary and secondary, stable and aggressive, and unsuccessful and successful (Patrick et al., 2009). This means that replication of this study across a variety of settings using the same triarchic concept of psychopathy would be possible.

This study also has limitations. It was conducted online using a platform that required pre-registration of its members, with compulsory participant payment, and was only compatible with laptops, PC's and iPad. It also utilised self-report measures for all variables. This may have biased the types of respondents who were able to engage, as well as potentially biased responding on some measures. Ethnicity data was not collected, and there was a large age range (20 – 87) meaning that there was considerable heterogeneity within the sample. Considering the latter, we identified seven respondents who were 65 years of age and above. Given the known effects of age on response inhibition (Andrés et al., 2008) the analysis was repeated without inclusion of their data. This did not significantly impact upon the results suggesting that older age has not compromised the findings reported.

Conclusion

To conclude, the current study found that association between psychopathy traits and problematic alcohol use were better explained by anxiety features than poor response inhibition. We propose that future research replicates this study amongst forensic populations. If our current findings are imitated, the success of interventions that target internalising features for reducing hazardous drinking in forensic samples should be evaluated.

Conflict of interest

We hereby confirm that the authors included on this paper do not have any conflicting interests in the conduction, completion and publication of this study.

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Appendix A: Journal author guidelines, Clinical Psychology Review

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and supply a concise, descriptive caption for each supplementary file. If you wish to make changes to supplementary material during any stage of the process, please make sure to provide an updated file. Do not annotate any corrections on a previous version. Please switch off the 'Track Changes' option in Microsoft Office files as these will appear in the published version.

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For more information, visit the Mendeley Data for journals page.

Data statement

To foster transparency, we encourage you to state the availability of your data in your submission. This may be a requirement of your funding body or institution. If your data is unavailable to access or unsuitable to post, you will have the opportunity to indicate why during the submission process, for example by stating that the research data is confidential. The statement will appear with your published article on ScienceDirect. For more information, visit the Data Statement page.

AFTER ACCEPTANCE

Online proof correction

To ensure a fast publication process of the article, we kindly ask authors to provide us with their proof corrections within two days. Corresponding authors will receive an e-mail with a link to our online proofing system, allowing annotation and correction of proofs online. The environment is similar to MS Word: in addition to editing text, you can also comment on figures/tables and answer questions from the Copy Editor. Web-based proofing provides a faster and less error-prone process by allowing you to directly type your corrections, eliminating the potential introduction of errors.
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Appendix B: Systematic Review registration with PROSPERO

CRD-REGISTER

PROSPERO Registration message [171390]

To: rachael.williams@liverpool.ac.uk,

Reply-To: CRD-REGISTER

Siri found new contact info Crd-Register irss505@york.ac.uk

Dear Rachael,

Thank you for submitting details of your systematic review "How do people who have increased scores on measures of psychopathy in conjunction with psychiatric or offending histories perform on Go/No-Go and/or Stop Signal tasks?" to the PROSPERO register. We are pleased to confirm that the record will be published on our website within the next hour.

Your registration number is: CRD42020171390

You are free to update the record at any time, all submitted changes will be displayed as the latest version with previous versions available to public view. Please also give brief details of the key changes in the Revision notes facility and remember to update your record when your review is published. You can log in to PROSPERO and access your records at https://www.crd.york.ac.uk/PROSPERO.

Comments and feedback on your experience of registering with PROSPERO are welcome at crd-register@york.ac.uk

Is your team looking for a platform to conduct data extraction for your systematic review? SRDR-Plus is a free, powerful, easy-to-use systematic review data management and archival tool. You can get started here: http://srdrplus.ahrq.gov.

Best wishes for the successful completion of your review.

Yours sincerely,

PROSPERO Administrator
Centre for Reviews and Dissemination
University of York
York YO10 5DD
t: +44 (0) 1904 321049
e: CRD-register@york.ac.uk
www.york.ac.uk/inst/crd

PROSPERO is funded by the National Institute for Health Research and produced by CRD, which is an academic department of the University of York.

Appendix C: Search strategy used for each electronic database

HDAS Export
Search Strategy Psychopathy, go/no-go and stop signal

09 Feb 20 - 14:11

Strategy 802776

#	Database	Search term	Results
1	EMBASE	(psychopathic OR psychopathy OR "call?us-unemotional" OR "CU traits" OR call?us OR unemotional OR "dark triad").ti,ab	17736
2	EMBASE	("stop signal" OR SSRT OR "go no-go").ti,ab	6156
3	EMBASE	(1 AND 2)	26
4	Medline	(psychopathic OR psychopathy OR "call?us-unemotional" OR "CU traits" OR call?us OR unemotional OR "dark triad").ti,ab	16740
5	Medline	("stop signal" OR SSRT OR "go no-go").ti,ab	4784
6	Medline	(4 AND 5)	19
7	PsycINFO	(psychopathic OR psychopathy OR "call?us-unemotional" OR "CU traits" OR call?us OR unemotional OR "dark triad").ti,ab	11584
8	PsycINFO	("stop signal" OR SSRT OR "go no-go").ti,ab	4178
9	PsycINFO	(7 AND 8)	30
10	PubMed	(psychopathic OR psychopathy OR "call?us-unemotional" OR "CU traits" OR call?us OR unemotional OR "dark triad").ti,ab	13214
11	PubMed	("stop signal" OR SSRT OR "go no-go").ti,ab	4787
12	PubMed	(10 AND 11)	27

Appendix D: Email sent to included authors seeking further publications to consider for inclusion

Dear (conference presenter/author's name),

I am a trainee clinical psychologist at the University of Liverpool, and I am undertaking a systematic review of research exploring the relationship between psychopathic tendencies and performance on go/no-go and stop signal tasks.

During the literature search, I identified your (conference abstract/paper) entitled (name of /conference abstract/paper), which is relevant to the review.

I am emailing to check if you have any research articles that informed your conference/paper, or if you have undertaken any further research which meets the following inclusion/exclusion criteria:

- Participating adults are being cared for in a psychiatric or forensic context (e.g., secure hospital or prison)
- Participating adults have been assessed using a validated psychopathy instrument (including self-report and/or interview based checklist)
- Participating adults have completed the Go/No-Go and/or Stop Signal task to measure response inhibition.
- The relationship between psychopathy and response inhibition task performance has been analysed using quantitative techniques (based on correlational or group-based design).

If so, I was wondering if you could please send me any articles relating to this work to consider for inclusion in this review.

Thank you for your time.

Kind Regards,

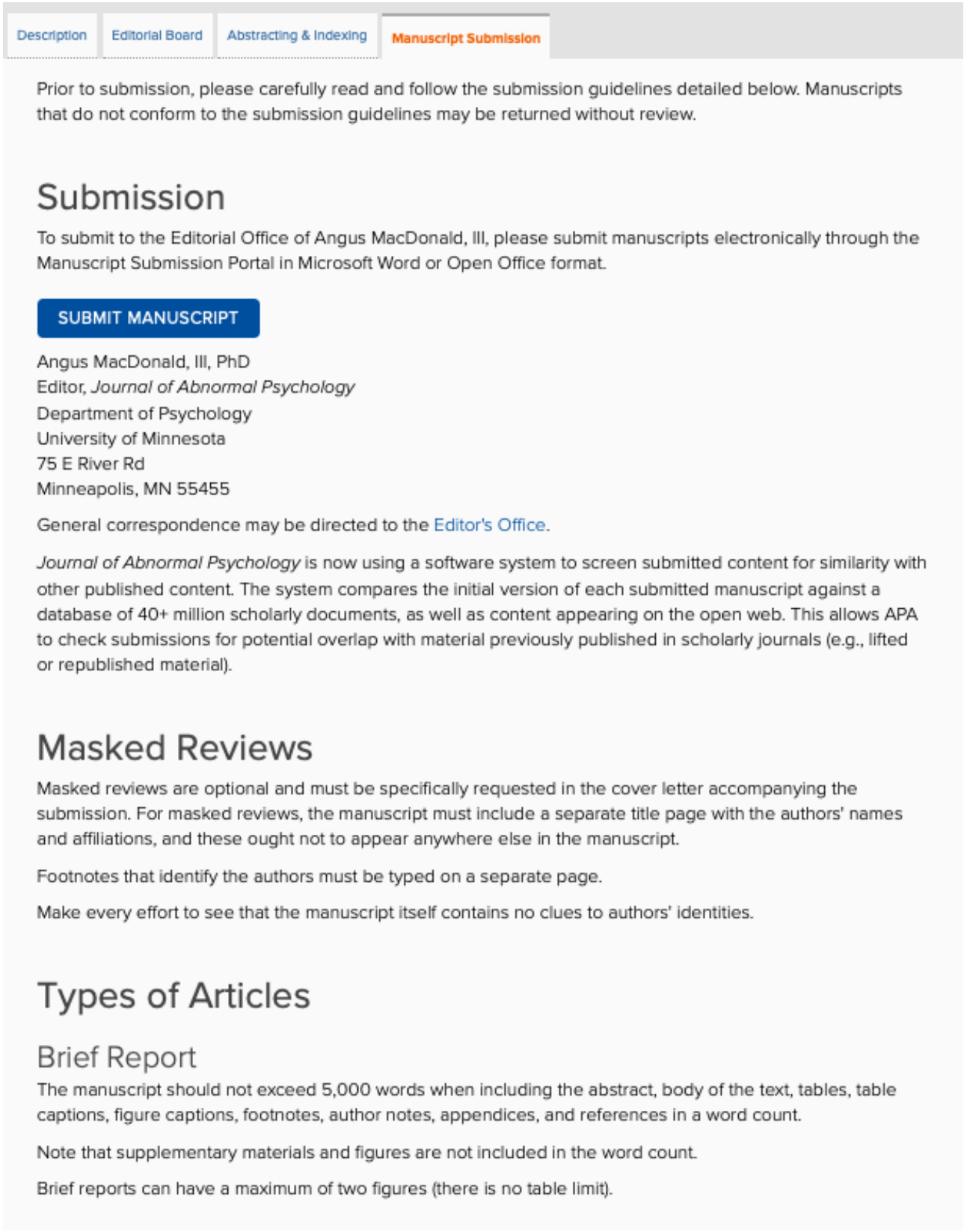
Rachael Williams
Trainee Clinical Psychologist
Under the supervision of Dr Steven Gillespie and Dr Andy Jones

Doctorate in Clinical Psychology Programme
Division of Clinical Psychology
The University of Liverpool
Whelan Building
Brownlow Hill
Liverpool, L69 3GB

Appendix E: Quality assessment tool

		Yes	No	Do not know/ comment
Introduction				
1	Were the aims/objectives of the study clear?			
Methods				
2	Was the study design appropriate for the stated aim(s)?			
3	Was the sample size justified?			
4	Was the target/reference population clearly defined? (Is it clear who the research was about?)			
5	Was the sample frame taken from an appropriate population base so that it closely represented the target/reference population under investigation?			
6	Was the selection process likely to select subjects/participants that were representative of the target/reference population under investigation?			
7	Were measures undertaken to address and categorise non-responders?			
8	Were the risk factor and outcome variables measured appropriate to the aims of the study?			
9	Were the risk factor and outcome variables measured correctly using instruments/ measurements that had been trialled, piloted or published previously?			
10	Is it clear what was used to determined statistical significance and/or precision estimates? (eg, p values, CIs)			
11	Were the methods (including statistical methods) sufficiently described to enable them to be repeated?			
Results				
12	Were the basic data adequately described?			
13	Does the response rate raise concerns about non-response bias?			
14	If appropriate, was information about non-responders described?			
15	Were the results internally consistent?			
16	Were the results for the analyses described in the methods, presented?			
Discussion				
17	Were the authors' discussions and conclusions justified by the results?			
18	Were the limitations of the study discussed?			
Other				
19	Were there any funding sources or conflicts of interest that may affect the authors' interpretation of the results?			
20	Was ethical approval or consent of participants attained?			

Appendix F: Journal author guidelines, Journal of Abnormal Psychology



Description | Editorial Board | Abstracting & Indexing | Manuscript Submission

Prior to submission, please carefully read and follow the submission guidelines detailed below. Manuscripts that do not conform to the submission guidelines may be returned without review.

Submission

To submit to the Editorial Office of Angus MacDonald, III, please submit manuscripts electronically through the Manuscript Submission Portal in Microsoft Word or Open Office format.

SUBMIT MANUSCRIPT

Angus MacDonald, III, PhD
Editor, *Journal of Abnormal Psychology*
Department of Psychology
University of Minnesota
75 E River Rd
Minneapolis, MN 55455

General correspondence may be directed to the Editor's Office.

Journal of Abnormal Psychology is now using a software system to screen submitted content for similarity with other published content. The system compares the initial version of each submitted manuscript against a database of 40+ million scholarly documents, as well as content appearing on the open web. This allows APA to check submissions for potential overlap with material previously published in scholarly journals (e.g., lifted or republished material).

Masked Reviews

Masked reviews are optional and must be specifically requested in the cover letter accompanying the submission. For masked reviews, the manuscript must include a separate title page with the authors' names and affiliations, and these ought not to appear anywhere else in the manuscript.

Footnotes that identify the authors must be typed on a separate page.

Make every effort to see that the manuscript itself contains no clues to authors' identities.

Types of Articles

Brief Report

The manuscript should not exceed 5,000 words when including the abstract, body of the text, tables, table captions, figure captions, footnotes, author notes, appendices, and references in a word count.

Note that supplementary materials and figures are not included in the word count.

Brief reports can have a maximum of two figures (there is no table limit).

Regular Article

The manuscript should not exceed 9,000 words when including the abstract, body of the text, tables, table captions, figure captions, footnotes, author notes, appendices, and references in a word count.

Note that supplementary materials and figures are not included in the word count.

Extended Article

Extended articles are published within regular issues of the journal (they are not free-standing). This article type is reserved for manuscripts that require extended exposition beyond the length of a regular article (e.g., reporting results of multiple experiments, multifaceted longitudinal studies, cross-disciplinary investigations, or studies that are extraordinarily complex in terms of methodology or analysis).

Extended article submissions are expected to be precleared by contacting the editorial office to determine the appropriateness for this format. When seeking preclearance, please provide a description of your manuscript and its significance.

Other submissions that exceed 9,000 words will be returned for shortening.

Commentary

Commentaries on articles previously published in Journal of Abnormal Psychology are also considered for publication. Commentaries should contain original data relevant to the topic at hand. They are subject to the same process of peer review and the same editorial criteria and standards as any other manuscript. If a commentary is deemed acceptable for publication, authors of the original submission are given the opportunity to reply to the commentary. Commentaries may be no more than half the length of the original article, and replies may be no more than half the length of the commentary. A commentary and reply will be published together. Except under rare circumstances, there will be only one round of comment and reply.

Cover Letters

All cover letters must contain the following:

- a statement that the material is original — if findings from the dataset have been previously published or are in other submitted articles, please include the following information:

  a. Is the present study a new analysis of previously analyzed data? If yes, please describe differences in analytic approach.

  b. Are some of the data used in the present study being analyzed for the first time? If yes, please identify data (constructs) that were not included in previously published or submitted manuscripts.

  c. Are there published or submitted papers from this data set that address related questions? If yes, please provide the citations, and describe the degree of overlap and the unique contributions of your submitted manuscript.

- if the manuscript has been pre-posted online prior to peer review, this fact should be stated in the acknowledgements and the URL for the posting should be included in the acknowledgements as well.
- the full postal and email address of the corresponding author;
- the complete telephone and fax numbers of the same;
- the proposed category under which the manuscript was submitted;

- a statement that the authors complied with APA ethical standards in the treatment of their participants and that the work was approved by the relevant Institutional Review Board(s);
- whether or not the manuscript has been or is posted on a web site;
- that APA style (*Publication Manual,* 6th or 7th edition) has been followed;
- the disclosure of any conflicts of interest with regard to the submitted work;
- a request for masked review, if desired, along with a statement ensuring that the manuscript was prepared in accordance with the guidelines above.

Authors should also specify the overall word length of the manuscript (including all aspects of the manuscript, except figures) and indicate the number of tables, figures, and supplemental materials that are included.

Manuscript Preparation

Until May 31st 2020, prepare manuscripts according to the *Publication Manual of the American Psychological Association* using the 6th or 7th edition. Starting June 1st 2020, all manuscripts should be submitted in the 7th edition. Manuscripts may be copyedited for bias-free language (see Chapter 3 of the 6th edition or Chapter 5 of the 7th edition).

Double-space all copy. Other formatting instructions, as well as instructions on preparing tables, figures, references, metrics, and abstracts, appear in the *Manual*. Additional guidance on APA Style is available on the APA Style website.

Below are additional instructions regarding the preparation of display equations, computer code, and tables.

Display Equations

We strongly encourage you to use MathType (third-party software) or Equation Editor 3.0 (built into pre-2007 versions of Word) to construct your equations, rather than the equation support that is built into Word 2007 and Word 2010. Equations composed with the built-in Word 2007/Word 2010 equation support are converted to low-resolution graphics when they enter the production process and must be rekeyed by the typesetter, which may introduce errors.

To construct your equations with MathType or Equation Editor 3.0:

- Go to the Text section of the Insert tab and select Object.
- Select MathType or Equation Editor 3.0 in the drop-down menu.

If you have an equation that has already been produced using Microsoft Word 2007 or 2010 and you have access to the full version of MathType 6.5 or later, you can convert this equation to MathType by clicking on MathType Insert Equation. Copy the equation from Microsoft Word and paste it into the MathType box. Verify that your equation is correct, click File, and then click Update. Your equation has now been inserted into your Word file as a MathType Equation.

Use Equation Editor 3.0 or MathType only for equations or for formulas that cannot be produced as Word text using the Times or Symbol font.

Computer Code

Because altering computer code in any way (e.g., indents, line spacing, line breaks, page breaks) during the typesetting process could alter its meaning, we treat computer code differently from the rest of your article in our production process. To that end, we request separate files for computer code.

In Online Supplemental Material

We request that runnable source code be included as supplemental material to the article. For more information, visit Supplementing Your Article With Online Material.

In the Text of the Article

If you would like to include code in the text of your published manuscript, please submit a separate file with your code exactly as you want it to appear, using Courier New font with a type size of 8 points. We will make an image of each segment of code in your article that exceeds 40 characters in length. (Shorter snippets of code that appear in text will be typeset in Courier New and run in with the rest of the text.) If an appendix contains a mix of code and explanatory text, please submit a file that contains the entire appendix, with the code keyed in 8-point Courier New.

Tables

Use Word's Insert Table function when you create tables. Using spaces or tabs in your table will create problems when the table is typeset and may result in errors.

Academic Writing and English Language Editing Services

Authors who feel that their manuscript may benefit from additional academic writing or language editing support prior to submission are encouraged to seek out such services at their host institutions, engage with colleagues and subject matter experts, and/or consider several vendors that offer discounts to APA authors.

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APA can place supplemental materials online, available via the published article in the PsycARTICLES® database. Please see Supplementing Your Article With Online Material for more details.

Abstract and Keywords

All manuscripts must include an abstract containing a maximum of 250 words typed on a separate page. After the abstract, please supply up to five keywords or brief phrases.

General Scientific Summaries (GSS)

Please provide a General Scientific Summary of the paper on the manuscript file below the abstract.

This should be a brief (2-3 sentences) statement that, in nontechnical language, explains the contributions of the paper.

This is not a simplified version of the abstract, which highlights the details of your study and its findings for other specialists who know the history of the research, will be able to comprehend a description of methodology, and can determine the significance of your results amidst more technical language.

Rather, assume that the reader is an intelligent, interested individual who might know something about abnormal psychology, but may not know technical terms or abbreviations such as ERP, SEM, endophenotype, error-related negativity, or mediation.

Examples are included below:

"This study suggests that some approaches to subtyping eating disorders in adolescence, specifically those that include _____, _____, and _____, may be more useful than _____in predicting outcomes in young adulthood."

"Decreased motivation to seek out rewarding experiences is a key symptom in depression. This study supports the notion that for depressed individuals, this decrease in motivation is more likely due to lower anticipation that an activity will be pleasurable than by the ability to actually experience pleasure during the activity itself."

References

List references in alphabetical order. Each listed reference should be cited in text, and each text citation should be listed in the References section.

Examples of basic reference formats:

- **Journal Article:**
  Hughes, G., Desantis, A., & Waszak, F. (2013). Mechanisms of intentional binding and sensory attenuation: The role of temporal prediction, temporal control, identity prediction, and motor prediction. *Psychological Bulletin, 139,* 133–151. http://dx.doi.org/10.1037/a0028566
- **Authored Book:**
  Rogers, T. T., & McClelland, J. L. (2004). *Semantic cognition: A parallel distributed processing approach.* Cambridge, MA: MIT Press.
- **Chapter in an Edited Book:**
  Gill, M. J., & Sypher, B. D. (2009). Workplace incivility and organizational trust. In P. Lutgen-Sandvik & B. D. Sypher (Eds.), *Destructive organizational communication: Processes, consequences, and constructive ways of organizing* (pp. 53–73). New York, NY: Taylor & Francis.

Figures

Graphics files are welcome if supplied as Tiff or EPS files. Multipanel figures (i.e., figures with parts labeled a, b, c, d, etc.) should be assembled into one file.

The minimum line weight for line art is 0.5 point for optimal printing.

For more information about acceptable resolutions, fonts, sizing, and other figure issues, please see the general guidelines.

When possible, please place symbol legends below the figure instead of to the side.

APA offers authors the option to publish their figures online in color without the costs associated with print publication of color figures.

The same caption will appear on both the online (color) and print (black and white) versions. To ensure that the figure can be understood in both formats, authors should add alternative wording (e.g., "the red (dark gray) bars represent") as needed.

For authors who prefer their figures to be published in color both in print and online, original color figures can be printed in color at the editor's and publisher's discretion provided the author agrees to pay:

- $900 for one figure
- An additional $600 for the second figure
- An additional $450 for each subsequent figure

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  Publication Rights (Copyright Transfer) Form (PDF, 83KB)
- For manuscripts funded by the Wellcome Trust or the Research Councils UK
  Wellcome Trust or Research Councils UK Publication Rights Form (PDF, 34KB)

Ethical Principles

It is a violation of APA Ethical Principles to publish "as original data, data that have been previously published" (Standard 8.13).

In addition, APA Ethical Principles specify that "after research results are published, psychologists do not withhold the data on which their conclusions are based from other competent professionals who seek to verify the substantive claims through reanalysis and who intend to use such data only for that purpose, provided that the confidentiality of the participants can be protected and unless legal rights concerning proprietary data preclude their release" (Standard 8.14).

APA expects authors to adhere to these standards. Specifically, APA expects authors to have their data available throughout the editorial review process and for at least 5 years after the date of publication.

Authors are required to state in writing that they have complied with APA ethical standards in the treatment of their sample, human or animal, or to describe the details of treatment.

Please include in the Author Note information regarding your research ethics committee approval (i.e., institution granting approval, study name, or study #).

- Download Certification of Compliance With APA Ethical Principles Form (PDF, 26KB)

The APA Ethics Office provides the full Ethical Principles of Psychologists and Code of Conduct electronically on itsr website in HTML, PDF, and Word format. You may also request a copy by emailing or calling the APA Ethics Office (202-336-5930). You may also read "Ethical Principles," December 1992, *American Psychologist*, Vol. 47, pp. 1597–1611.

Other Information

Visit the Journals Publishing Resource Center for more resources for writing, reviewing, and editing articles for publishing in APA journals.

Appendix G: University of Liverpool's Committee of Research Ethics (CORE) approval

Health and Life Sciences Research Ethics Committee (Psychology, Health and Society)

27 September 2019

Dear Dr Gillespie

I am pleased to inform you that your application for research ethics approval has been approved. Application details and conditions of approval can be found below. Appendix A contains a list of documents approved by the Committee.

Application Details

Reference:	5538
Project Title:	Personality traits and alcohol consumption
Principal Investigator/Supervisor:	Dr Steven Gillespie
Co-Investigator(s):	Miss Rachael Williams
Lead Student Investigator:	-
Department:	Psychological Sciences
Approval Date:	27/09/2019
Approval Expiry Date:	Five years from the approval date listed above

The application was **APPROVED** subject to the following conditions:

Conditions of approval

- All serious adverse events must be reported to the Committee (ethics@liverpool.ac.uk) in accordance with the procedure for reporting adverse events.
- If you wish to extend the duration of the study beyond the research ethics approval expiry date listed above, a new application should be submitted.
- If you wish to make an amendment to the study, please create and submit an amendment form using the research ethics system.
- If the named Principal Investigator or Supervisor changes, or leaves the employment of the University during the course of this approval, the approval will lapse. Therefore it will be necessary to create and submit an amendment form within the research ethics system.
- It is the responsibility of the Principal Investigator/Supervisor to inform all the investigators of the terms of the approval.

Kind regards,

Health and Life Sciences Research Ethics Committee (Psychology, Health and Society)

iphsrec@liverpool.ac.uk

0151 795 5420

Appendix - Approved Documents

(Relevant only to amendments involving changes to the study documentation)

The final document set reviewed and approved by the committee is listed below:

Document Type	File Name	Date	Version
Evidence Of Peer Review	UoL Research review approval letter	19/07/2019	1.0
Study Proposal/Protocol	Study protocol	19/07/2019	1.0
Risk Assessment	Risk Assessment	19/07/2019	1.0
Advertisement	Advert [v1.1]	23/09/2019	1.1
Advertisement	Advert [v1.1]	23/09/2019	1.1
Research Tools	Debrief [v1.1]	23/09/2019	1.1
Questionnaire	Questionnaires [v1.1]	23/09/2019	1.1
Participant Information Sheet	Participant information sheet [v1.1]	23/09/2019	1.1
Participant Consent Form	Informed consent form [v1.1]	23/09/2019	1.1

Appendix H: AsPredicted registration confirmation

CONFIDENTIAL - FOR PEER-REVIEW ONLY

ASPREDICTED

The relationship of psychopathic tendencies with alcohol use. (#29410)

Created: 10/18/2019 09:08 AM (PT)
Shared: 02/28/2020 03:08 AM (PT)

This pre-registration is not yet public. This anonymized copy (without author names) was created by the author(s) to use during peer-review.
A non-anonymized version (containing author names) will become publicly available only if an author makes it public. Until that happens the contents of this pre-registration are confidential.

1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
This study aims to determine whether having increased personality traits associated with psychopathy plays a role in predicting alcohol use, after controlling for the effects of internalising and response inhibition.
The following hypothesis are to be considered:
1. There will be a significant positive relationship of response inhibition difficulties (i.e. action cancellation and action restraint) with alcohol use.
2. There will be a significant positive relationship of meanness and disinhibition with alcohol use after controlling for response inhibition difficulties. As boldness is considered to be a more adaptive trait associated with social poise and resilience, we do not expect a positive relationship with alcohol use.
3. These relationships will remain significant after controlling for internalising features.

3) Describe the key dependent variable(s) specifying how they will be measured.
Dependent variables include;
Scores on the Alcohol Use Disorders Identification Task (AUDIT) as a measure of alcohol use.
Commission Errors on the Go/No-Go task will be indicative of action restraint.
Stop Signal Reaction time on the Stop Signal task, as measured using the integration method, will be indicative of action cancellation.
Scores on the TriPM will be used as a measure of boldness, meanness and disinhibition traits associated with the construct of psychopathy.

4) How many and which conditions will participants be assigned to?
This is a cross sectional design and thus participants will not be allocated to a condition.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
Zero order correlations will be conducted to analyse relationships between variables. We will conduct a hierarchical multiple regression to predict variance in AUDIT Scores (dependent variable).
At step one we will include measures of internalising, action cancellation and action restraint.
At step two we will include meanness, boldness and disinhibition from the Triarchic Psychopathy Measure.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
We will exclude any participants who fail an attention check during the online study. Stop Signal Data will be handled as proposed in Verbruggen et al (2019; eLife.46323.001). Outlier analysis will be conducted using box plots in SPSS for all variables.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.
Power analysis has been used to determine the required sample size for a linear multiple regression with a total of six predictors; cancellation, restraint, meanness, disinhibition, boldness, internalising (parameters: power = 0.80, alpha = 0.05, effect size = 0.08) and two tested predictors; meanness, disinhibition. This indicates N = 114.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
Internalising will be measured via self-report questionnaire (Generalised Anxiety Disorder 7; GAD-7).
A separate measure of externalising behaviour was not included due to considerable content overlap with the disinhibition sub-scale of the TriPM.

Appendix I: Participant information sheet

Participant information sheet

Version 1.1 (23-09-2019)
Research ethics approval number: 5538
Title of the research project: Personality traits and alcohol consumption.
Name of researchers: Dr Steven Gillespie, Dr Andrew Jones and Rachael Williams.

Invitation

You are being invited to participate in a research study. Before you decide whether to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and feel free to ask us if you would like more information or if there is anything that you do not understand. Please also feel free to discuss this with your friends, relatives and GP if you wish. We would like to stress that you do not have to accept this invitation and should only agree to take part if you want to.

Thank you for reading this.

What is the purpose of the study?

This study intends to investigate possible associations between personality traits and alcohol consumption.

Why have I been chosen to take part?

We are looking for people who are aged 18 years or older, have access to a laptop, PC or iPad, and who would consider themselves to be 'social drinkers'.
If you have drunk alcohol on the day of considering participation, or have a history of, or currently are dependent on alcohol we regret that you will be unable to participate in this study.

Do I have to take part?

We would like to stress that you do not have to accept this invitation and you should only take part in this research study if you want to. If you begin and change your mind you can withdraw from the study at any time without providing an explanation. Once you complete and submit your responses, the data will be anonymised immediately and therefore you will not be able to request access to, or withdraw your data as the researchers will be unable to identify it.

What will happen if I take part?

This research study will take place online and will take no longer than 45 minutes of your time for which you will receive payment of £3.75 via Prolific Academic. Please be aware that you must complete all of this study in order to receive payment. You will also need to complete this research study on a laptop, PC or iPad as the software is not compatible with smartphones and some android tablets.
You will be asked to provide demographic information, including your age and gender.
You will be asked to complete an online task. This will involve watching images on a screen and responding to these in accordance with specific instructions that will be explained to you.
You will then complete 3 questionnaires. These will ask questions about your personality, drinking behaviour and general emotional responses.

How will my data be used?

The University of Liverpool processes personal data as part of its research and teaching activities in accordance with the lawful basis of 'public task', and in accordance with the University's purpose of "advancing education, learning and research for the public benefit".

Under UK data protection legislation, the University acts as the Data Controller for personal data collected as part of the University's research. Dr Steven Gillespie acts as the Data Processor for this study, and any queries relating to the handling of your personal data can be sent to him via email at: Steven.Gillespie@liverpool.ac.uk

Further information on how your data will be used can be found in the table below.

How will my data be stored?	Data will be stored on a password protected website until it is transferred (within one-week) to a password protected file on a secure computer. Each participant will be assigned a 'participant number' with no identifying information being included. All data stored on the password-protected computer will remain the responsibility of the researchers throughout. All data is held securely in line with the General Data Protection Regulation (GDPR) and Data Protection Act (2018) at the University of Liverpool. In the event of the researchers leaving the University, the data will be transferred to the University of Liverpool's Active Datastore.
How long will my data be used for?	Your data will be used for the purposes of this research study which is anticipated to be complete by May 2020. In addition, the anonymised data will be freely available alongside any publications that arise from this study. No participant will be identifiable from this data.

What measures are in place to protect the security and confidentiality of my data?	All websites, software and computers used to analyse data will be password-protected to ensure security.
Will my data be anonymised?	Yes.
How will my data be used?	Your data will be analysed within Rachael Williams' research project forming part of her academic fulfilment of the Doctorate in Clinical Psychology. The results of this study may be published in an academic journal. As all responses will be anonymised, your individual data will not be identifiable.
Who will have access to my data?	Because we will not be collecting personally identifiable information, all responses submitted online will be anonymous. The following named investigators; Dr Steven Gillespie, Dr Andrew Jones and Rachael Williams will have access to the data collected. Once published, the anonymised data will be stored in accordance with the University's Research Data Management policy. Anonymous data collected as part of this study may be made publicly available as part of a data archive, or alongside any publications arising from this study. Data may also be shared with other academics or researchers.
Will my data be archived for use in other research projects in the future?	No.
How will my data be destroyed?	All anonymised data will remain Rachael Williams' responsibility until completion of the doctoral program. Following this, the data custodian, Dr Steven Gillespie, will be responsible for the data in accordance with the University's Research Data Management policy.

Payment

You will receive payment of £3.75 for taking part in this study ensuring that you have responded to <u>everything</u> presented to you. This will be paid via your usual payment receipt for studies completed on Prolific Academic.

Are there any risks in taking part?

There are no anticipated risks to you taking part in this study. If you experience any discomfort or disadvantage as part of your participation please let the researchers know immediately (details below).

Are there any benefits in taking part?

There are no direct benefits to you taking part in this study although this does provide an opportunity to contribute to psychology research that may guide future interventions and clinical practice.

What if I start the research study, but don't finish it?

It is ok to exit the study once you have started it if you no longer want to participate. If you are worried about your health or wellbeing after taking part in this study we would recommend that you talk to your GP. The following information resources may also be informative for you:

- NHS website (www.nhs.uk)
- Mind (www.mind.org.uk)
- NHS Alcohol Support (www.nhs.uk/live-well/alcohol-support/)

What if I am unhappy or if there is a problem?

If you are unhappy, or if there is a problem, please let us know by contacting the Principal Investigator (Steven.Gillespie@liverpool.ac.uk) and we will do our best to help you.

If you remain unhappy or have a complaint which you feel you cannot share with us then you may contact the Research Ethics and Integrity Office at ethics@liv.ac.uk. When contacting the Research Ethics and Integrity Office, please provide details of the name, or a description of the study (so that it can be identified), names of the researchers involved and details of the complaint you wish to make.

The University strives to maintain the highest standards of rigour in the processing of your data. However, if you have any concerns about the way in which the University processes your personal data, it is important that you are aware of your right to lodge a complaint with the Information Commissioner's Office by calling 0303 123 1113.

Who can I contact if I have further questions?

Rachael Williams – Lead Student Investigator
Department of Psychological Sciences
Institute of Psychology, Health and Society
University of Liverpool, L69 3GB, UK
0151 794 4140
Rachael.Williams@liverpool.ac.uk

Additional contact details of investigatory team

Principal Investigator
Dr Steven Gillespie
Department of Psychological Sciences
Institute of Psychology, Health and Society
University of Liverpool, L69 3GB, UK
0151 794 4140
Steven.Gillespie@liverpool.ac.uk

Second Supervisor
Dr Andrew Jones
School of Psychology
Eleanor Rathbone Building
University of Liverpool, L69 7ZA, UK
0151 794 1120
ajj@liverpool.ac.uk

Appendix J: Participant informed consent form

Participant consent form

Version 1.1 (23-09-2019)
Research ethics approval number: 5538
Title of the research study: Personality traits and alcohol consumption.
Name of researchers: Dr Steven Gillespie, Dr Andrew Jones and Rachael Williams.

- I confirm that I have read and have understood the participant information sheet (version 1.1, dated 23-09-2019) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
- I understand that taking part in the study involves answering demographic information (age and gender) completing an online task, and online questionnaires. ☐
- I understand that my participation is voluntary, and that I am free to stop taking part and can withdraw from the study at any time without giving any reason or explanation as to why. ☐
- I understand that once my responses have been submitted, the data will be anonymous and therefore I will not be able to request access to, or withdraw my data. ☐
- I understand that due to the effects that alcohol has on a person's thinking I am unable to take part in this study if I have drunk alcohol today, or I have a history/current dependency on alcohol. (Please note that by ticking this box you are confirming that you have not drank alcohol today, and that you do not have a history or current dependency on alcohol). ☐
- I understand that my anonymised data will be stored on a password protected website until it is transferred (within one-week) to a password protected file on a secure computer. It will remain there whilst the data is analysed by the researchers. ☐
- I understand that the information I provide will be held securely and in line with the General Data Protection Regulation (GDPR) and Data Protection Act (2018) at the University of Liverpool. The data will be stored in accordance with the University's Research Data Management policy (this will remain Rachael Williams' responsibility until completion of the doctoral program, following this, the data custodian, Dr Steven Gillespie, will be responsible for the data). ☐

- I understand that the anonymised data may be made publicly available as part of a data archive, may be published alongside publications reporting the results of this study, or may be shared upon request with other academics or researchers. ☐

- I can request the general results of the study from the researchers on the below contact information. ☐

Please tick this box to confirm that you agree with each of the points above and would like to take part in this study.

☐ SUBMIT AND CONTINUE

Principal Investigator
Dr Steven Gillespie
Department of Psychological Sciences
Institute of Psychology, Health and Society
University of Liverpool, L69 3GB, UK
0151 794 4140
Steven.Gillespie@liverpool.ac.uk

Student Investigator
Rachael Williams
Department of Psychological Sciences
Institute of Psychology, Health and Society
University of Liverpool, L69 3GB, UK
0151 794 4140
Rachael.Williams@liverpool.ac.uk

Appendix K: Participant debrief information

Debrief

Version 1.1 (23-07-2019)
Research ethics approval number: 5538
Title of the research study: Personality traits and alcohol consumption.
Name of researchers: Dr Steven Gillespie, Dr Andrew Jones and Rachael Williams.

Thank you for taking part in this research study!

What was the study about?

This study intends to investigate possible associations between personality traits and alcohol consumption. The online task and questionnaires you have completed allows us to investigate this. The findings are likely to have important implications for health improvement strategies and support services.

What next?

There is nothing more that you have to do as part of your participation in this study. We would like to remind you that you are now no longer able to withdraw your data from the research study as your responses have been submitted and anonymised.

Please feel free to contact the researchers if you have any further questions (details below).

What if I want advice or I am worried about my health or wellbeing after taking part in this study?

If you feel that you would like to talk about your health or wellbeing we would recommend that you talk to your GP. The following information resources may also be informative for you:

- NHS website (www.nhs.uk)
- Mind (www.mind.org.uk)
- NHS Alcohol Support (www.nhs.uk/live-well/alcohol-support/)

Who can I contact if I have further questions about the research?

If you have any further questions that have not been answered here please contact the lead student investigator, Rachael Williams:

Rachael Williams, Lead Student Investigator
Department of Psychological Sciences
Institute of Psychology, Health and Society
University of Liverpool, L69 3GB, UK
Tel: 0151 794 4140
Email: Rachael.Williams@liverpool.ac.uk

Alternatively, you can contact the principal investigator, Dr Steven Gillespie:

Dr Steven Gillespie, Principal Investigator
Department of Psychological Sciences
Institute of Psychology, Health and Society
University of Liverpool, L69 3GB, UK
Tel: 0151 794 4140
Email: Steven.Gillespie@liverpool.ac.uk

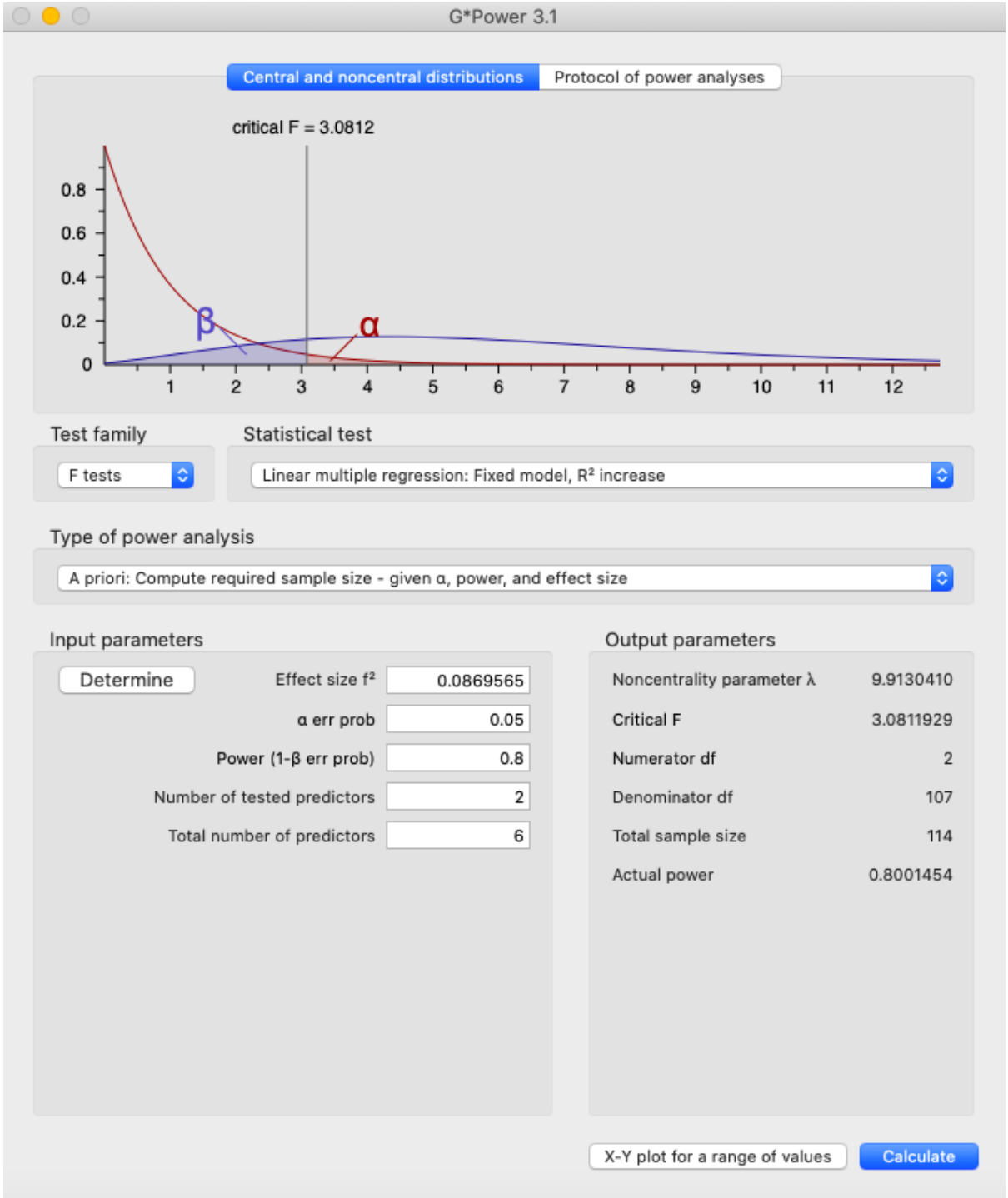
You may also contact us on the above information if you would like information on the results of this study. As all of the data is anonymised this will not be your individual results, rather the general results following data analysis.

If you remain unhappy or have a complaint which you cannot take up with the above contacts you should contact the Research Governance Officer at ethics@liv.ac.uk. When contacting the Research Governance Officer please provide details of the name, or a description of the study (so that it can be identified), names of the researchers involved and details of the complaint you wish to make.

THE SURVEY HAS NOW ENDED. PLEASE CLICK 'X' TO CLOSE THIS PAGE.

Appendix L: Advertisement on Prolific Academic

Appendix M: A priori power analysis



Appendix N: Post hoc power analysis

Appendix O: Triarchic Psychopathy Measure (TriPM; Drislane et al., 2014)

Triarchic Psychopathy Measure (TriPM)

Directions: This questionnaire contains statements that different people might use to describe themselves. Each statement is followed by four choices: T t f F. The meaning of these four choices is as follows:

T = True	t = somewhat true	f = somewhat false	F = False

For each statement, select the choice that describes you best. There are no right or wrong answers; just choice the answer that best describes you.

Remember: Select only one answer per question. If you make a mistake you can select a new answer. Answer all of the items. Please work rapidly and do not spend too much time on any one statement.

1. I'm optimistic more often than not.	T	t	f	F
2. How other people feel is important to me.	T	t	f	F
3. I often act on immediate needs.	T	t	f	F
4. I have no strong desire to parachute out of an airplane.	T	t	f	F
5. I've often missed things I promised to attend.	T	t	f	F
6. I would enjoy being in a high-speed chase.	T	t	f	F
7. I am well-equipped to deal with stress.	T	t	f	F
8. I don't mind if someone I dislike gets hurt.	T	t	f	F
9. My impulsive decisions have caused problems with loved ones.	T	t	f	F
10. I get scared easily.	T	t	f	F
11. I sympathise with others' problems.	T	t	f	F
12. I have missed work without bothering to call in.	T	t	f	F
13. I'm a born leader.	T	t	f	F
14. I enjoy a good physical fight.	T	t	f	F
15. I jump into things without thinking.	T	t	f	F
16. I have a hard time making things turn out the way I want.	T	t	f	F
17. I return insults.	T	t	f	F
18. I've gotten in trouble because I missed too much school.	T	t	f	F
19. I have a knack for influencing people.	T	t	f	F
20. It doesn't bother me to see someone else in pain.	T	t	f	F
21. I have good control over myself.	T	t	f	F

22. I function well in new situations, even when unprepared.	T	t	f	F
23. I enjoy pushing people around sometimes.	T	t	f	F
24. I have taken money from someone's purse or wallet without asking.	T	t	f	F
25. I don't think of myself as talented.	T	t	f	F
26. I taunt people just to stir things up.	T	t	f	F
27. People often abuse my trust.	T	t	f	F
28. I'm afraid of far fewer things than most people.	T	t	f	F
29. I don't see any point in worrying if what I do hurts someone else.	T	t	f	F
30. I keep appointments I make.	T	t	f	F
31. I often get bored quickly and lose interest.	T	t	f	F
32. I can get over things that would traumatise others.	T	t	f	F
33. I am sensitive to the feelings of others.	T	t	f	F
34. I have conned people to get money from them.	T	t	f	F
35. It worries me to go into an unfamiliar situation without knowing all the details.	T	t	f	F
36. I don't have much sympathy for people.	T	t	f	F
37. I get in trouble for not considering the consequences of my actions.	T	t	f	F
38. I can convince people to do what I want.	T	t	f	F
39. For me, honesty really is the best policy.	T	t	f	F
40. I've injured people to see them in pain.	T	t	f	F
41. I don't like to take the lead in groups.	T	t	f	F
42. I sometimes insult people on purpose to get a reaction from them.	T	t	f	F
43. I have taken items from a store without paying for them.	T	t	f	F
44. It's easy to embarrass me.	T	t	f	F
45. Things are more fun if a little danger is involved.	T	t	f	F
46. I have a hard time waiting patiently for things I want.	T	t	f	F
47. I stay away from physical danger as much as I can.	T	t	f	F
48. I don't care much if what I do hurts others.	T	t	f	F
49. I have lost a friend because of irresponsible things I've done.	T	t	f	F
50. I don't stack up well against most others.	T	t	f	F
51. Others have told me they are concerned about my lack of self-control.	T	t	f	F
52. It's easy for me to relate to other people's emotions.	T	t	f	F
53. I have robbed someone.	T	t	f	F

54. I never worry about making a fool of myself with others.	T	t	f	F
55. It doesn't bother me when people around me are hurting.	T	t	f	F
56. I have had problems at work because I was irresponsible.	T	t	f	F
57. I'm not very good at influencing people.	T	t	f	F
58. I have stolen something out of a vehicle.	T	t	f	F

Appendix P: Generalised Anxiety Disorder-7 (GAD-7; Lowe et. al., 2008)

GAD-7

Instructions: Over the last 2 weeks, how often have you been bothered by the following problems? (Tick the box to indicate your answer).

	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge				
2. Not being able to stop or control worrying				
3. Worrying too much about different things				
4. Trouble relaxing				
5. Being so restless that it is hard to sit still				
6. Becoming easily annoyed or irritable				
7. Feeling afraid as if something awful might happen				

If you checked off any of the problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult

Appendix Q: Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders & Monteiro, 2001)

Alcohol Use Disorders Identification Test (AUDIT)

Instructions: Please answer the questions in terms of standard drinks. A chart illustrating the approximate number of standard drinks in different alcohol beverages is included for reference.

STANDARD DRINK EQUIVALENTS	APPROXIMATE NUMBER OF STANDARD DRINKS IN:
BEER or COOLER	
12 oz.  **~5% alcohol**	12 oz. = 1 16 oz. = 1.3 22 oz. = 2 40 oz. = 3.3
MALT LIQUOR	
8-9 oz.  **~7% alcohol**	12 oz. = 1.5 16 oz. = 2 22 oz. = 2.5 40 oz. = 4.5
TABLE WINE	
5 oz.  **~12% alcohol**	a 750 mL (25 oz.) bottle = 5
80-proof SPIRITS (hard liquor)	
1.5 oz.  **~40% alcohol**	a mixed drink = 1 or more* a pint (16 oz.) = 11 a fifth (25 oz.) = 17 1.75 L (59 oz.) = 39 *Note: Depending on factors such as the type of spirits and the recipe, one mixed drink can contain from one to three or more standard drinks.

Place an X in one box that best describes your answer to each question.

Questions	0	1	2	3	4
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
4. How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
5. How often during the last year have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily

7. How often during the last year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
8. How often during the last year have you been unable to remember what happened the night before because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
9. Have you or someone else been injured because of your drinking?	No	-	Yes, but not in the last year	-	Yes, during the last year
10. Has a relative, friend, doctor or other health care worker been concerned about your drinking or suggested you cut down?	No	-	Yes, but not in the last year	-	Yes, during the last year
Total: (For office use only)					

Appendix R: Instructed response item