DOCTORATE IN CLINICAL PSYCHOLOGY

Time perspective and risky behaviour

Tom Merrill

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Supervised by:

Dr Steven Gillespie

Dr Luna Centifanti

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Introductory Chapter: Thesis Overview

Drug use and aggression are behaviours which commonly co-occur, and both can have significant adverse psychological and physical effects at the societal and individual level (Tomlinson, Brown, & Hoaken, 2016). They are both health-harming behaviours that represent a major public health problem and incur a considerable financial cost (Hammersley, 2011). Developing a better understanding of these phenomena is therefore of great importance, both in terms of reducing the prevalence of drug use and aggression within society, and for developing effective clinical interventions aimed at treating addiction and aggressive and violent behaviour. Research into drug use and aggression has identified a number of individual differences, some of which are common to both behaviours (e.g. (Giancola, 2004; Hoaken, Assaad, & Pihl, 1998; Parrott & Zeichner, 2002). One area of research that is gaining increasing attention within the sphere of health-harming behaviour is the psychological construction of time (Boyd & Zimbardo, 2005).

Zimbardo's theory of time perspective (Zimbardo & Boyd, 1999) is one of the most prominent and well researched models of psychological time. Prior to the development of Zimbardo's model of time perspective most models of psychological time typically conceptualised an individual's time perspective as existing along a unidimensional continuum (e.g. Strathman, Gleicher, Boninger, & Edwards, 1994). However, Zimbardo and colleagues argued that this could potentially lead to erroneous research findings, for example arguing that 'scoring low on a scale of future orientation is [not] equivalent to scoring high on a scale of present orientation' (Zimbardo & Boyd, 1999, p. 1273). Instead, Zimbardo argued that time perspective should be considered as a multidimensional construct. Through a process of factor analysis, Zimbardo and colleagues identified five theoretically orthogonal time dimensions: past-negative, past-positive, present-hedonism, present-fatalism and future (Zimbardo & Boyd, 1999). As such, individuals can, in theory, be high (or low) on all five

factors, although the theoretical independence of the five temporal dimensions is rarely manifest in practice (Zimbardo & Boyd, 1999). Consequently, Zimbardo's multidimensional theory of time perspective affords a more nuanced understanding of an individual's unique time perspective 'profile' than is possible through a unidimensional approach to psychological time.

The theory suggests that an individual's time perspective- whether they get drawn to positive or negative aspects of their past, live only for the present moment, or endlessly strive towards future goals, has a significant impact on their thoughts, feelings, and behaviours (Zimbardo & Boyd, 2008). A growing body of research has shown that time perspective, or specific facets of it, are related to numerous psychological constructs and behaviours. For example, individuals who have a tendency to focus on negative past experiences (past-negative time perspective) or who experience a sense of powerlessness over their current situation (present-fatalistic time perspective) tend to report being more pessimistic (Shipp, Edwards, & Lambert, 2009). Conversely, individuals who view their past in a positive way (past-positive time perspective) or who report an increased tendency to focus on their goals for the future (future time perspective) report increased optimism (Boniwell et al., 2010).

Notably, recent research has shown a consistent relationship between time perspective and a range of personality traits. Particularly strong relationships are found between future time perspective and conscientiousness (Zimbardo & Boyd, 1999) and past-negative time perspective and neuroticism (Shipp, Edwards, & Lambert, 2009). Moreover, research appears to suggest that time perspective functions as an independent personality level variable, that has additional predictive value over and above established personality traits (Kairys & Liniauskaite, 2015). As such, time perspective theorists argue that time perspective can be considered as a stable dispositional personality characteristic. Furthermore, it is argued that time perspective has particular relevance from a clinical perspective as an individual's time

perspective, unlike other personality level variables, is essentially flexible and amenable to change (Zimbardo & Boyd, 1999) and can therefore be effectively targeted for clinical intervention (Sword, Sword, Brunskill, & Zimbardo, 2014), making it a potentially important and fruitful concept for clinical researchers.

Importantly, and particularly relevant to drug use and aggressive behaviour, research into time perspective suggests that it can have a significant impact on decision-making processes, influencing whether individuals tend to prioritise present-moment enjoyment over planning and working towards the future, or tend to forego todays enjoyment in order to achieve tomorrows goals (Boyd & Zimbardo, 1999). The overarching aim of the present thesis is, therefore, to explore the relationship between time perspective and health-harming or health-risking behaviours, specifically drug use and aggression.

Chapter one presents a systematic literature review exploring the relationship between time perspective and drug use and had the aim of synthesising all the available empirical research in this area. The review specifically focused on papers measuring time perspective using either the Zimbardo time perspective inventory (ZTPI) (Zimbardo & Boyd, 1999), or its precursor, the Stanford time perspective inventory (STPI) (Zimbardo, 1992). The ZTPI and STPI are valid and reliable self-report measures of time perspective and distinguish five temporal categories: Past-negative, past-positive, present-hedonism, present-fatalism and future (Zimbardo & Boyd, 1999). The principal aim of the review was to investigate which of these temporal frames were related to increased drug use and which were related to reduced drug use. As such, the review aimed to explore which time perspectives, past, present or future, might be protective against drug use, and which might function as a risk factor for drug use. Results suggest that increased present time perspective is associated with greater drug use, while increased future time perspective is associated with reduced drug use. Results also suggest that time perspective is related to the way that individuals think about drugs and

drug use. Clinical implications of the finding are discussed, along with limitation of the reviewed studies and avenues for future research.

Chapter two reports on an empirical study into the relationship between time perspective and aggression. Very little research has been done to investigate this relationship and to date, no research has investigated the relation between time perspective and two clinically important frameworks for understanding aggression, namely the distinction between reactive and proactive aggression, and between impulsive and premeditated aggression. A sample of 389 adult participants completed the ZTPI, along with measures of aggression and emotion regulation. A deviation from a balanced time perspective coefficient score was calculated for each participant, which measures the extent to which individuals can cognitively switch between past, present and future time perspectives (Zhang, Howell, & Stolarski, 2013).

As expected, increased reactive and impulsive aggression, which are characterised by impulsive, unplanned, emotion-driven aggressive behaviours (Allen, Anderson, & Bushman, 2018), were associated with a greater deviation from a balanced time perspective. Results therefore suggest that reactive and impulsive aggression are related to a reduced ability to switch between temporal dimensions. Further, controlling for a range of emotion regulation abilities and strategies, an increased deviation from balanced time perspective was found to predict increased reactive aggression. However, this relationship only accounted for a small increase in the variance of reactive aggression. Additionally, an increased deviation from a balanced time perspective was not found to predict increased impulsive aggression, over and above emotion regulation abilities.

Proactive and premeditated aggression, which are characterised by the planned and calculated use of aggressive behaviour in order to achieve some desired goal or rewards (Stanford et al., 2003), were not associated with an increased deviation from a balanced time

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perspective, suggesting that these subtypes of aggression are not related to a difficulty switching between temporal perspectives. As expected, an increased deviation from a balanced time perspective was not associated with increased proactive and premeditated aggression. Clinical implications and directions for future research are discussed.

Findings from the two chapters provide some evidence to suggest that time perspective is related to risky behaviours. In particular, it would appear that an increased focus on the present is associated with increased drug use and reactive and impulsive aggression. However, findings from both the systematic review and empirical paper suggests that other factors, such as emotion regulation ability and personality traits, might play a more significant role in predicting drug use and aggression. Further research exploring the extent to which time perspective is related to health risking behaviour is therefore needed.

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Chapter One: Literature Review

Time perspective and drug use: A systematic review.[1]

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[1] Article prepared for submission to Frontiers in Psychology journal for peer review. Please see Appendix A for a copy of the journal guidelines for authors.

Abstract

Background: Drug use is a problem that has a significant health impact on individuals and financial impact on society. Time perspective, the extent to which individuals focus on the past, present, and future, has been shown to have a significant impact on health-harming and health-protecting behaviour. **Objectives:** The main aim of the present review was to investigate the relationship between time perspective and drug use. It aimed to investigate which time perspectives, past, present, and future, are associated with increased or decreased drug use. It also aimed to investigate the relationship between time perspective and the way that people think about drugs and drug use (drug use cognitions). **Methods:** A systematic search strategy was used to identify all the available empirical research that has investigated the relationship between time perspective, as measured by the Stanford time perspective inventory or the Zimbardo time perspective inventory, and drug use. Thirteen studies met the inclusion criteria for review. **Results:** Results suggest that individuals with higher future time perspective are less likely to use illicit drugs. They are also likely to hold negative attitudes towards drug use. Individuals with higher present time perspective are more likely to use drugs, and to use them more frequently and in greater quantities. They are also more likely to hold positive views about drug use. **Conclusions:** There is emerging evidence to suggest that increased future time perspective is protective against drug use while increased present time perspective represents a risk factor for drug use.

Keywords: time perspective, Zimbardo time perspective inventory, drug use, substance use, protective factor, risk factor.

Drug use is a problem that affects people and communities all over the world. The United Nations Office on Drugs and Crime report that, globally, approximately 275 million people aged 15 to 64 used drugs at least once during 2016 (The United Nations Office on Drugs and Crime, 2018). It is a problem that particularly affects young people, with recent statistics suggesting that, in the UK, 19.8% of adults aged 16 to 24 years had taken drugs in the year between 2017-18 (Home Office, 2018). With an increasing prevalence of drug use worldwide, it has become a leading cause of morbidity and mortality (Brannigan, Schackman, Falco, & Millman, 2004). Globally, around 450,000 people died as a result of drug use in 2015 (The United Nations Office on Drugs and Crime, 2018).

In addition to the detrimental effects of drug use for individuals, it also represents a significant cost to society, with an increasing number of people seeking treatment for drug related problems. Public Health England estimates that the annual cost to society of drug addiction is £15.4bn, while every year drug misuse costs the NHS £488m (Home Office, 2018). Recent data compiled by Public Health England suggests that, in the UK, 268,390 adults, including nearly 60,000 people in secure settings, are in contact with substance misuse services (Public Health England, 2018). Globally, however, only around 1 in 6 people suffering from a drug use disorder receives treatment (The United Nations Office on Drugs and Crime, 2018).

Due to the wide-ranging impact of drug use, from the societal to the individual, a large body of research has emerged that aims to understand both the causes and consequences of drug use. Research has shown that drug use is associated with a range of adverse physical and psychological outcomes (D'Amico, Edelen, Miles, & Morral, 2008; Englund, Egeland, Oliva, & Collins, 2008; Krohn, Lizotte, & Perez, 1997). At the same time, research has identified a range of individual differences as related to drug use (e.g. Linnoila et al., 1983; Moeller et al., 2001; Wills, DuHamel, & Vaccaro, 1995).

One area of research that is particularly relevant to the study of drug use is the degree to which people consider the potential consequences of their behaviour, both in the short term and in the longer term (Bickel & Johnson, 2003). Research in this area has shown that the extent to which a person emphasises future benefits over present-moment gratification determines both health-protecting and health-harming behaviour. Moreover, there are a range of individual differences in how much people focus on the present or the future (Norman, 2005).

Emerging out of this body of research, there has been a growing recognition of the importance of time as a cognitive, affective and motivational influence on decision making and behaviour. Zimbardo and colleagues (Zimbardo & Boyd, 1999) developed the theory of time perspective (TP), which is defined as the subjective, often unconscious, manner in which individuals construct psychological time (Zimbardo & Boyd, 2008). This theory aims to account for the importance of time in psychological and behavioural processes. TP is considered a relatively stable individual difference and encompasses the way that personal and social experiences are parsed into the discrete temporal categories of past, present and future. These temporal categories, or time perspectives, are involved in encoding, storing, and recalling experienced events and, as such, help individuals to give order to, and make sense of, everyday personal experiences (Zimbardo & Boyd, 2008). In particular, they help guide cognitive, motivational and affective processes that influence temporally-based decision making. For example, TP is proposed to influence the extent to which individuals consider the immediate benefits of a given behavior against the potential future costs (in the case of risk-taking behaviors), or consider the immediate costs compared to the future benefits (in the case of health protective ones) (Fieulaine & Martinez, 2010).

Zimbardo and Boyd's (1999) model of TP proposed five discrete temporal categories: Past-positive—reflecting a sentimental, nostalgic view of the past; past-negative—reflecting

a negative, pessimistic view of the past; present-hedonism—reflecting a tendency towards immediate pleasure, risk-taking and sensation seeking, with minimal concern for future consequences; present-fatalism—reflecting a hopeless and helpless view of life and the future, suggesting little relation between actions in the present and potential future benefits or costs; and, future—reflecting goal-setting and goal-striving, with little regard for present enjoyment or immediate benefits.

In response to both the conceptual and methodological difficulties in assessing TP, Zimbardo and colleagues first developed the Stanford time perspective inventory (STPI) (Zimbardo, 1992) and, later, the refined and expanded Zimbardo time perspective inventory (ZTPI) (Zimbardo & Boyd, 1999). Research suggests that these measures are valid and reliable measures of individual differences in TP (Zimbardo & Boyd, 1999). Since the publication of the STPI, and in particular the ZTPI, individual differences in TP have been explored in relation to a number of psychological constructs and behaviours across a range of life domains. These include, among others, subjective well-being (Drake, Duncan, Sutherland, Abernethy, & Henry, 2008), self-esteem (Anagnostopoulos & Griva, 2012), depression and anxiety (Carelli & Wiberg, 2012), and attachment (Thornhill & Fincher, 2007). One area that is gaining an increasing amount of attention from researchers is the association between TP and drug use. Prior to the publication of the STPI and ZTPI, few studies that investigated the relationship between personality variables and drug use had considered the influence of the subjective construction of psychological time as a significant individual difference (Keough, Zimbardo, & Boyd, 1999).

Of the limited research that was conducted before the publication of the STPI and ZTPI, findings suggest that an orientation towards the future is associated with greater health promoting behaviour. This is consistent with the idea that individuals with a high future orientation are more likely to engage in proactive planning and monitoring of behaviour in an

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effort to achieve desired future goals (Keough et al., 1999). Present orientated time

perspective, on the other hand, is associated with greater health harming behaviour,

consistent with the idea that individuals with a high present orientation are responsive to

immediate pleasures and are influenced more by present situational factors (Keough et al.,

1999). Research by Lavelle and colleagues, (Lavelle, Hammersley, Forsyth, 1991), for

example, showed that, compared to participants drawn from a student population, drug

dependent patients enrolled in a drug treatment program were focused on the present. This

was in contrast to the student sample who were motivated by the future. Moreover, Alvos and

colleagues (Alvos, Gregson, & Ross, 1993) found that, in a clinical sample of current and

past drug users, current drug users had more difficulty conceptualising the future compared to

former drug users. As such, it appears that an individual's particular time orientation can

function as either a vulnerability to health harming behaviour, as in the case of high present

focus, or as a protective factor, such as in the case of high future focus.

This work is of theoretical and practical importance for understanding the factors that

contribute towards drug use. A review of the available literature would be particularly timely

because drug use is causing increasing harm to individuals as well as society. The present

literature review therefore aimed to summarise all the available published studies on the

relationship between TP, as assessed using either the STPI or ZTPI and drug use. For the

purposes of the present review, drug use will encompass both the use of illicit drugs and the

non-medical use of prescription drugs. This decision was taken in light of evidence that non-

medical use of prescription drugs can also have serious detrimental effects for individual

users and society (Fingleton, Watson, Duncan, & Matheson, 2016) and may be driven by

similar factors to those driving illicit drug use (McCabe, West, Schepis, & Teter, 2015). The

review focused both on drug use behaviour, such as the frequency or quantity with which

individuals use drugs, as well as drug use cognitions-cognitive variables related to drug use

such as the way people perceive drugs and drug use. The review will encompass both clinical and non-clinical populations and focused on quantitative studies to provide an understanding of the direction and strength of the relationship. It will aim to answer the following questions:

1   Is there a relationship between time perspective and drug use behaviour?

2   Which time perspective, or combination of time perspectives, are associated with increased drug use behaviour or represent a risk factor for increased drug use?

3   Which time perspective, or combination of time perspectives, are associated with reduced drug use behaviour or represent a protective factor?

4   What is the relationship between time perspective and cognitive variables related to drug use?

Methodology

The Preferred Method for Reporting Systematic Reviews and Meta Analyses (PRISMA) (Moher, Liberati, Tetzlaff, & Altman, 2009) statement and checklist were followed in order to guide the review. A protocol for this review was pre-registered with PROSPERO (CRD42019130972)

Search strategy

The electronic databases PsycINFO, Scopus, Social Sciences Citation Index, MEDLINE, and ScienceDirect were searched with a starting year of 1992, which is the date that the Stanford time perspective inventory was first published. The end date was March 2019 using the following key subject terms, identified from scoping searches: Time perspective OR time perspective inventory OR ZTPI OR STPI OR temporal profile* OR future orient* OR past orient* OR present orient* OR time orientation OR temporal perspective OR temporal orientation OR deviation from balanced time perspective OR DBTP AND substance* OR drug* OR addict* OR narcotic*.

Electronic database email alerts were set up to identify any relevant articles published after the initial electronic database search. The reference lists of eligible papers were manually searched for relevant papers. Additionally, a search of the included studies was carried out using Web of Science and Google Scholar to see if any more recent papers had cited them.

Articles cited in the appendix of a recently published book, *Time perspective theory; Review, research and application* (Stolarski, Fieulaine, & van Beek, 2015), and articles listed on the reference page of the time perspective network website (http://www.timeperspective.net/) were all screened for inclusion. Abstracts without full text that were identified through the literature searches and were relevant were followed up by contacting the authors and asking for full-text copies. We also asked for eligible published research related to the topic.

The reference management program, Mendeley (Version 1.19.4) (Elsevier, 2008), was used to store and categorise articles in accordance with the inclusion and exclusion criteria.

Inclusion and exclusion criteria

To be eligible for inclusion, studies must a), be available in English b), sample participants aged 12 years or over c), measure TP using the Zimbardo time perspective inventory or the Stanford time perspective inventory d), include a measure of drug use behaviour or a measure assessing cognitions related to drug use, or sample participants with a history of drug use or in treatment for drug addiction/dependency e), utilise quantitative methods of data collection and analysis; f), be peer reviewed, primary research.

Studies that did not use the entire ZTPI/STPI but used subscales from these measures were included, as were studies that used an adapted version or a valid translated version of the measures.

While other measures of the perception of time exist, they theoretically measure different aspects of time than TP. As such, studies were excluded if they measured TP with measures other than the ZTPI/STPI. Studies that focussed on substance use more broadly defined (such as alcohol and drug use) or that presented composite data on drug use and other variables (such as alcohol use) were excluded.

Qualitative studies were excluded due to potential difficulties with synthesising evidence using different methodological approaches (Dixon-Woods, Agarwal, Jones, Young, & Sutton, 2005).

Study selection

The process of identifying relevant studies was conducted in two stages. First, the first author (TM) screened the titles and abstracts of articles identified via the search strategy described above. Articles without a clear reference to the phenomena of interest were excluded. Second, the first author reviewed full texts of articles against the inclusion and exclusion criteria. A random sample of studies (20%) were independently reviewed by a second reviewer at both stages of the selection process. There were no disagreements in the decisions made for study inclusion or exclusion.

The search strategy yielded 1012 articles the were screened for eligibility. The application of the inclusion/exclusion criteria resulted in 13 studies that were eligible for synthesis (Figure 1).

Data extraction and synthesis

Data were extracted by the first author (TM) and an independent reviewer. Inconsistencies between reviewers were resolved through discussion with the supervisor (SG). In accordance with Popay et al.'s (2006) protocol for conducting a narrative synthesis in systematic reviews, the extracted data were analysed using a narrative synthesis approach.

Quality appraisal

Studies that were selected for inclusion were subject to quality assessment using the Quality Assessment Tool for Studies of Diverse Design (QATSDD) (Sirriyeh, Lawton, Gardner, & Armitage, 2012). Assessment was carried out by the first author (TM) and by a second independent rater. The QATSDD was designed to assess the quality of studies using a range of different methodological approaches, including quantitative and qualitative, providing a comparable sum score and percentage based on ratings of 0-3 across 16 factors. The 14 factors pertaining to quantitative studies were utilised for the purpose of the present assessment. Agreement between the reviewers was deemed moderate, with a kappa score of 0.77.
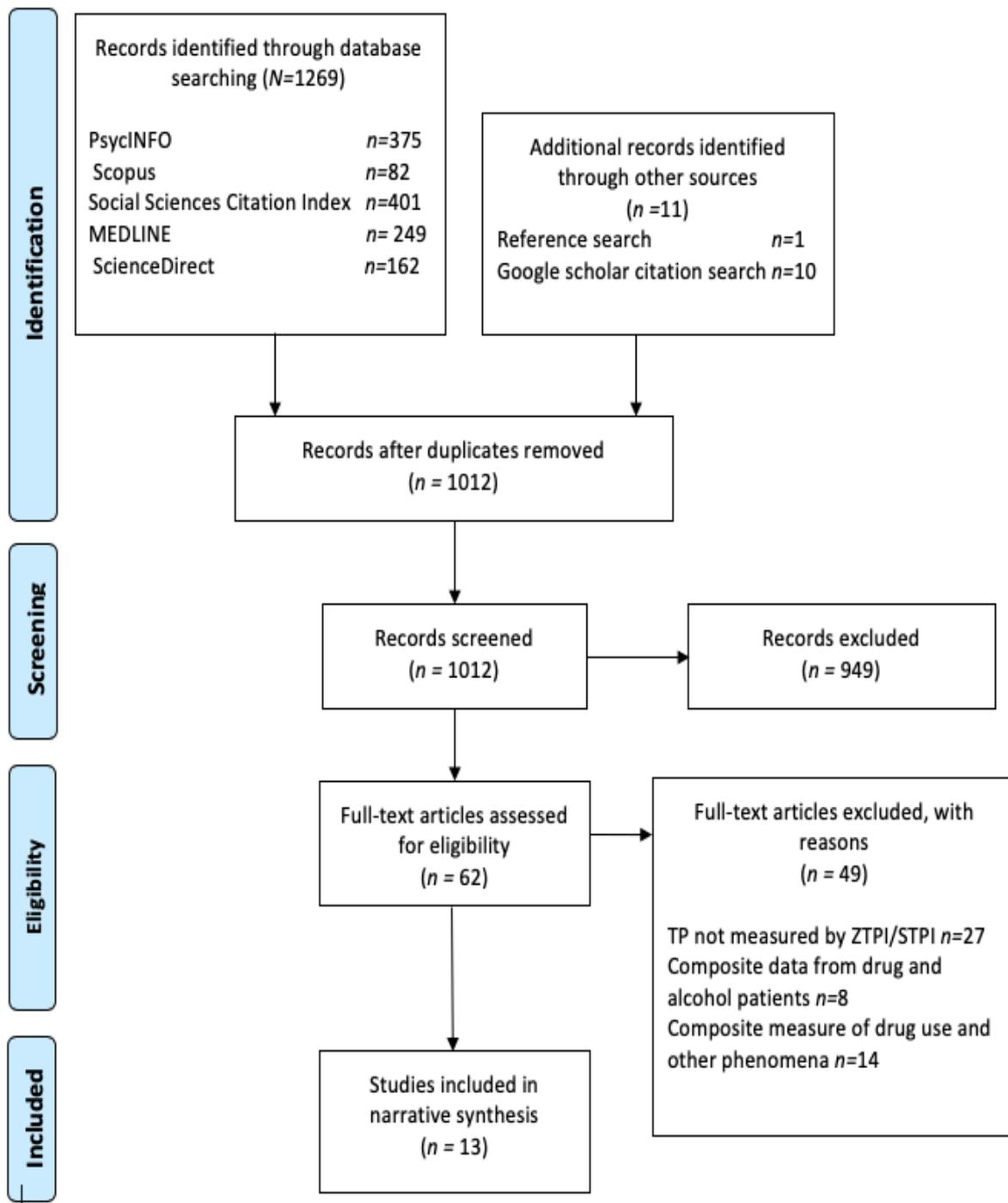
Figure 1

Flow diagram of study selection process

Results

Study characteristics

A summary of the characteristics of the 13 eligible studies is presented in Table 1. The majority of studies were conducted in North America (*n=7*) and Europe (*n=5*) and one study was conducted in Russia. Studies could generally be characterised in terms of the study design, study population, and type of measure used to assess drug use. In terms of study population, studies either recruited from the general population (*n=10*), most frequently including high school students (*n=4*) or undergraduate participants (*n=3*). Others were derived from a clinical sample, namely participants from drug treatments/rehabilitation centres (*n=3*). In terms of drug use measures, studies either exclusively used a measure of drug use behaviour (*n= 5*), such as the quantity or frequency of drug use, or included a measure of drug use behaviour and a measure of drug use cognition (*n=3*), such as perceptions of drug use risks or attitudes towards drug use. No studies focused solely on drug use cognitions.

Six studies used a single-group cross-sectional design, while two studies used a single-group longitudinal design. Three studies used a between-group comparison design, typically comparing drug users with controls, while two studies (Johnson et al., 2010; Klingemann, 2001) employed a mixed single- and between-groups cross-sectional design. The majority of studies focused on illegal 'street drug' use (*n=12*), with four of those studies focusing specifically on cannabis use and one focusing on heroin use. One study focused on the non-medical use of legal prescription drugs.

As per the inclusion criteria, all the studies used the STPI/ZTPI as a measure of TP, with three studies using the STPI and 10 using the ZTPI. Just over half the studies used all of the subscales from the STPI (*n=3*) or ZTPI (*n=4*) while the rest used selected subscales. The future subscale was the most widely used (ZTPI-FTP=9, STPI-FTP=3), followed by the

present-hedonism (ZTPI-PaHTP=7, STPI-PaHTP=3) and present-fatalism subscales (ZTPI-PaFTP=6, STPI-PaFTP=3). The past subscales were less widely used (ZTPI-PaNTP=5, ZTPI-PaPTP=4, STPI-P=3).

Study quality

The quality assessment scores for all included studies, as assessed against the QATSDD, are displayed in Table 1 (see appendix B for the complete quality assessment results). The included studies showed a number of strengths. They were typically grounded in an explicit theoretical framework (TP theory) and the research objectives were clearly stated. The fit between the research question, methods of data collection and data analysis was deemed appropriate across studies. The majority of studies used the standard version of the STPI or ZTPI (*n*=11) while, consistent with the inclusion criteria, two studies used modified versions of the ZTPI-F subscale, which were adapted for the target participants of the particular study. Of these two, Barnett et al. (2013) used a 7-item version of the ZTPI-F subscale and used factor analysis to demonstrate a single factor solution consistent with the original ZTPI-F, while Steiger, Stoddard, and Pierce (2017) demonstrated that their 5-item version of the ZTPI-F subscale had acceptable internal reliability (α=0.72). Where appropriate, studies conducted appropriate statistical assessment of drug use measurement tools. Three studies (Apostolidis, Fieulaine, Simonin et al., 2006; Apostolidis, Fieulaine, & Soulé, 2006; Fieulaine & Martinez, 2012) used factor analysis to investigate the factor structure of their drug use cognition measures, and also presented data on the reliability of the measures, in each case providing data on the internal consistency.

There were a number of consistent methodological weaknesses across the studies. The majority of studies used study-specific, self-report questionnaire measures of drug use behaviour, so that assessment of drug use was somewhat inconsistent across studies. Chavarria, Allan, Moltisanti, and Taylor (2015) was the only study to use a psychometrically

validated measures of drug use behaviour (The inventory of drug use consequences) (Tonigan & Miller, 2002). Steiger, Stoddard, and Pierce (2017) used 2 items adapted from the monitoring the future survey (Bachman, Johnston, & O'Malley, 2014) to assess non-medical use of stimulants and analgesics, but the limited number of items raises concerns over content validity and reliability. Of the studies that sampled participants from drug treatment/rehabilitation centres, none of the studies reported assessment procedures or admission criteria, making comparisons across studies difficult.

None of the studies provided a power calculation or justification of sample size in terms of the analysis undertaken, which could potentially mean that the results presented were under powered. Further, none of the studies addressed sample size or power as a potential limitation. The relatively small sample size of the studies that sampled from clinical populations ($n=22$ to $n=77$) also raises concerns over how representative of the target population these samples are.

Table 1

Summary of study characteristics

Author(s), Year, Country	Study Design	Sample Characteristics	*N*	Time Perspective Measure	Drug use	Drug Use Measure(s)	Summary of Findings	QATSDD Score
1. Apostolidis, Fieulaine, Simonin, & Rolland (2006) France.	Cross-sectional	Undergraduate students (M age=21.8, SD=1.96, 50.5% male)	198	French validated version of the ZTPI (Zimbardo & Boyd, 1999)	Cannabis	Self-report questionnaire assessing frequency and quantity of cannabis use during past 12 months Self-report questionnaire assessing perceptions of risks linked to cannabis use	• Higher future TP is related to less frequent and lower quantity of self-reported cannabis use. • Higher future TP corresponds to lower odds of cannabis use, higher present-hedonism TP corresponds to higher odds. • Higher future TP associated with higher recognition of risks associated with cannabis use relative to perceived benefits while higher present-hedonism associated with lower recognition of risks and greater emphasis of perceived benefits of cannabis use • Higher future TP associated with greater identification of cannabis as a 'hard drug' while higher present-hedonism TP associated with minimising 'hard-drug' image of cannabis. • Future, present-hedonistic and present-fatalistic TPs moderate the relationship between consumption frequency and risk perception.	87%

Author(s), Year, Country	Study Design	Sample Characteristics	N	Time Perspective Measure	Drug use	Drug Use Measure(s)	Summary of Findings	QATSDD Score
2. Apostolidis, Fieulaine, & Soulé (2006) France.	Cross-sectional	High school students (M age=15.6, 46% male)	276	ZTPI-F subscale from French validated version of the ZTPI (Zimbardo & Boyd, 1999).	Cannabis	Self-report questionnaire assessing past cannabis use (yes/no) and frequency of cannabis use during the past 12 months Self-report questionnaire assessing perceptions of cannabis as a drug	• Higher future TP related to lower reported cannabis use. • Higher future TP related to less frequency cannabis use. • Higher future TP was a significant predictor of perceiving cannabis as a drug which, in turn, predicted lower cannabis use.	72%
3. Barnett et al. (2013) U.S.	Longitudinal	High school students Time 1 (M age=16.8, SD=0.9, 58.2% male) Time 2 (M age=16.7, SD=0.9, 57% male)	Time 1: 1310 Time 2: 952	7-item adapted version of the ZTPI-F subscale (Zimbardo & Boyd, 1999)	Cannabis and illicit 'hard drugs'	Self-report questionnaire assessing frequency of cannabis and 'hard drug' use during the past 30 days completed at baseline (Time 1) and repeated one year later (Time 2).	• Increased future TP at baseline negatively predicted cannabis use and hard drug use one year later, controlling for baseline substance use. • No significant relationship between cannabis use or hard drug use at baseline and future TP one year later, while controlling for baseline future TP. • Higher future TP corresponds to reduced odds of cannabis use and hard drug use.	74%
4. Chavarria, Allan, Moltisanti, & Taylor (2015) U.S.	Cross-sectional	Adults from the general population (M age= 33.36, SD= 11.59, 40.9% male)	531	ZTPI-PaNTP, ZTPI-PrHTP, subscales (Zimbardo & Boyd, 1999)	Illicit drugs	Inventory of drug use consequences (InDUC) (Tonigan & Miller, 2002)	• Higher present-hedonistic TP associated with greater illicit drug use consequences. • Higher past-negative TP associated with greater illicit drug use consequences.	77%
5. Daugherty & Brase (2010) U.S.	Cross-sectional	Undergraduate students (M age= 18.99, SD = 1.54, 37% male)	467	ZTPI-PH, ZTPI-PF, and ZPTI-F subscales (Zimbardo & Boyd, 1999)	Illicit drugs	Self-report questionnaire assessing the frequency of drug use during the past 12 months	• Higher future TP associated with less frequent drug use. Higher present-hedonistic and present-fatalistic TP associated with more frequent drug use. • Future, present-hedonism, and present-fatalism TPs simultaneously improved the prediction of the frequency of drug use beyond sex and big five personality traits. • No TP uniquely predicted drug use frequency when controlling for sex and the big five personality traits.	64%

Author(s), Year, Country	Study Design	Sample Characteristics	N	Time Perspective Measure	Drug use	Drug Use Measure(s)	Summary of Findings	QATSDD Score
6. Fieulaine & Martinez (2012) France.	Longitudinal	High school students. Time 1 (M age=16.7, SD=1.42, 46% male) Time 2 (M age=16, SD=1.41, 47% male)	Time 1: 690 Time 2: 664	15-item ZTPI short form (Fieulaine, Apostolidis & Zimbardo, in press)	Cannabis	Self-report questionnaire assessing the frequency of cannabis use over participants lifetime, the past 12 months and the past 30 days (Time 1) and during the past 7 days (Time 2) Self-report questionnaire assessing intention to use cannabis, attitudes towards cannabis use and subjective normalisation beliefs around cannabis use	• Higher future TP negatively predicts intention to use cannabis and subsequent cannabis consumption. • Higher present-hedonistic TP positively predicts intention to use cannabis and subsequent consumption. • Individuals with higher present-hedonistic TP report holding more positive attitudes towards cannabis use. Increased positive attitudes, in turn, predicts higher intention to use cannabis and higher subsequent consumption.	74%
7. Henson, Carey, Carey, & Maisto (2006) U.S.	Cross-sectional	Undergraduate students (M age= 19.3, SD=1.0, 36% males)	1568	ZTPI-PH, ZTPI-PF, and ZTPI-F subscales (Zimbardo & Boyd, 1999)	Illicit drugs	Self-report questionnaire assessing lifetime drug use and drug use over the previous 30 days	• Higher future TP predicts lower lifetime and past month drug use. • Higher present-hedonistic TP predicts higher lifetime and past month drug use. • For women, present-hedonistic TP was a stronger factor in the prediction of lifetime drug use than for men. • Present-fatalistic TP was not significantly predictive of lifetime or past month drug use.	82%
8. Johnson et al. (2010) U.S.	Cross-sectional	Cannabis users from the general population (M age=27.4, SD=9.9, 57% male), Former dependent cannabis users from the general population (M age=29.9 SD=10.8, 57% female) matched controls from the general population (M age=25.9, SD=8.6, 41% male	88 (30 dependent cannabis users, 30 former dependent cannabis users, 22 control participants)	Complete Stanford time perspective inventory (Zimbardo, 1992)	Cannabis	Interview assessing self-reported current or past cannabis use utilising DSM–IV criteria for cannabis dependence. Behavioural measure of cannabis delay discounting	• Group analysis showed differences in present-hedonistic TP, with dependent users>former users>control participants. However, post hoc tests showed these differences were not significant. • In the dependent cannabis user group, higher present-fatalistic TP was related to great cannabis discounting-the tendency to favour a small amount of cannabis immediately rather than a larger amount after a delay.	62%

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Author(s), Year, Country	Study Design	Sample Characteristics	N	Time Perspective Measure	Drug use	Drug Use Measure(s)	Summary of Findings	QATSDD Score
9.Klingemann (2001) Switzerland	Cross-sectional	Adults from the general population (M age 43, SD=16.5, 49% male) Drug clinic patients (M age=29, SD=5.2, 83% male) Drug clinic staff (M age=40, SD=6.7, 65% male)	811 (679 from general population, 77 drug clinic patients, 51 drug clinic staff)	Validated German translated version of Stanford time perspective inventory (Zimbardo, 1992)	Illicit drugs	Clinical sample of drug users recruited from 4 specialised inpatient drug treatment centres (admission criteria not reported) Substance use was not assessed in the control sample	• Drug clinic patients reported higher present-hedonistic TP than drug clinic staff. • Drug clinic patients reported higher past-negative TP compared to participants from the general population, who reported higher past-negative TP compared to drug clinic staff. • Higher present-hedonistic TP and past-positive TP negatively predict treatment optimism.	79%
10. Petry, Bickel, & Arnett (1998) U.S.	Cross-sectional	Dependent heroin users enrolled in an outpatient substance abuse treatment clinic (M age=35, SD=8, 53% male) Control participants from the general population (M age=35, SD=10, 56% male)	93 (34 dependent heroin users, 59 control participants)	Complete Stanford time perspective inventory (Zimbardo, 1992)	Heroin	Clinical sample of dependent drug users recruited from an outpatient substance abuse treatment centre (admission criteria not reported) Control participants self-reported no history of illicit substance use	• Compared to controls, dependent heroin users reported lower future TP. • Dependent heroin users reported higher present-hedonistic and present-fatalistic TP compared to controls. • The two groups did not differ on past TPs.	54%
11.Pluck et al. (2008) U.K.	Cross-sectional	Homeless adults (M age= 33.40 (SD=7.55, 84% male) Domiciled adults from the general population (M age=33.50, SD=10.25, 84% male)	100 (50 homeless participants, 50 control participants)	Complete Zimbardo time perspective inventory (Zimbardo & Boyd, 1999)	Illicit drugs	Interviews assessing homeless participants self-reported frequency of drug use over the previous 12 months. Substance use was not assessed in the control sample	• Homeless drug users reported higher past-negative and present-fatalistic TP and lower past-positive TP compared to controls. • Within the homeless sample, infrequent drug users, regular drug users without the use of heroin or cocaine, and regular cocaine and/or heroin users showed no difference in TP.	67%
12. Steiger, Stoddard, & Pierce (2017) U.S.	Cross-sectional	High school students, (M age = 15.36, SD = 1.21, 50% male).	408	5-item adapted version of the ZTPI-F subscale (Zimbardo & Boyd, 1999)	Prescription drugs (non-medical use)	2-item adapted version of the monitoring the future survey (Bachman, Johnston, & O'Malley, 2014) assessing lifetime non-medical use of stimulants and analgesics.	• Future TP was not associated with the non-medical use of stimulants or analgesics.	72%

Author(s), Year, Country	Study Design	Sample Characteristics	N	Time Perspective Measure	Drug use	Drug Use Measure(s)	Summary of Findings	QATSDD Score
13. Zentsova & Leonov (2013) Russia	Cross-sectional	Russian professional athletes (M age=22) Dependent drug users enrolled at a drug rehabilitation center (M age=29)	211 (87 professional athletes, 124 dependent drug users)	Validated Russian version of the ZPTI (Syrcova & Mitina, 2008)	Illicit drugs	Drug users recruited from an inpatient rehabilitation centre (admission criteria not reported) Professional athletes drug use was not assessed.	• Dependent drug users in treatment reported higher past-negative TP compared to athletes. • Former drug users in remission more than 6 months reported lower past-positive TP compared to athletes. • Former drug users in remission more than one year reported higher future TP compared to athletes. • Dependent drug users in treatment reported higher past-negative, past-positive, present-hedonistic and present-fatalistic TP's and lower future TP compared to formers drug users in remission for over one year.	38%

Notes. ZTPI=Zimbardo time perspective inventory, STPI=Stanford time perspective inventory, STPI-P= STPI past subscale, STPI-PH=STPI present-hedonism subscale, STPI-PF= STPI present-fatalism subscale, STPI-F=STPI future Subscale, PaNTP= ZTPI past-negative subscale, PaPTP=ZTPI-past-positive subscale, PrHTP=ZTPI present-hedonism subscale, PrFTP=ZTPI present-fatalism subscale, FTP=ZTPI future subscale

Time perspective and drug use behaviour

      Cross-sectional, single-group correlational results. Seven studies used a single-group, cross-sectional design to investigate the relationship between TP and drug use behaviour (Apostolidis, Fieulaine, Simonin, et al., 2006; Apostolidis, Fieulaine, & Soulé, 2006; Chavarria et al., 2015; Daugherty & Brase, 2010; Henson et al., 2006; Johnson et al., 2010; Steiger et al., 2017). Studies recruited high school students (*n=276* to *n=408*) (Apostolidis, Fieulaine, & Soulé, 2006; Steiger et al., 2017), undergraduates (*n=198* to *n=1568*) (Apostolidis, Fieulaine, Simonin, et al., 2006; Daugherty & Brase, 2010; Henson et al., 2006), drug using adults from the general population (Chavarria et al., 2015) (*n=531*) and dependent cannabis users (Johnson et al., 2010) (*n=88*).

      Results were generally consistent with past research on health harming and health protecting behaviours (e.g. MacKillop, Anderson, Castelda, Mattson, & Donovick, 2006; Zimbardo, Keough, & Boyd, 1997), suggesting that an increased future TP was associated with reduced drug use, while an increased present TP was related to increased drug use. Daugherty and Brase (2010) found that increased future TP was significantly correlated with more frequent illicit drug use in a sample of undergraduates, while Apostolidis, Fieulaine, Simonin, et al. (2006) reported that higher future TP corresponded with lower odds of self-reported cannabis use in an undergraduate sample. Apostolidis, Fieulaine, and Soulé (2006) reported that, controlling for age and sex, high school students reporting higher future FP were less likely to use cannabis and, of those who did report using cannabis, having a higher future TP was predictive of less frequent use. Likewise, Apostolidis, Fieulaine, Simonin, et al. (2006) and Henson et al. (2006) both found that, in undergraduate samples, increased future TP predicted lower frequency of cannabis and illicit drug use, respectively, while increased future TP also predicted lower quantity of cannabis use (Apostolidis, Fieulaine, Simonin, et al., 2006). Steiger et al. (2017), on the other hand, found that future TP was not a

significant predictor of non-medical use of prescription stimulants or analgesics in a sample of adolescents, suggesting that increased future TP might not be protective against all types of drug use.

In terms of present TP, results suggested that present-hedonism and, to a lesser extent, present-fatalism were potential risks factors for increased drug use. Daugherty and Brase, (2010) found that, in a sample of undergraduates, both increased present-hedonism and present-fatalism were shown to correlate with more frequent illicit drug use, while higher present-hedonistic TP was related to higher odds of self-reported cannabis use (Apostolidis, Fieulaine, Simonin, et al., 2006). Higher present-hedonistic TP, but not present-fatalism, was found to predict more frequent lifetime and past month illicit drug use in a sample of undergraduates (Henson et al., 2006). Further, for female students, higher present-hedonism was a stronger predictor of lifetime drug use when compared to male students, suggesting that women with a high propensity towards impulsivity, immediate-gratification and novelty-seeking, which are associated with high present-hedonism, are particularly vulnerable to illicit drug use (Henson et al., 2006).

Furthermore, Chavarria et al. (2015), sampling from an adult population, found that increased present-hedonistic TP predicted greater drug use consequences, suggesting that not only was present-hedonism associated with increased drug use, but also increased negative physical and psychological consequences of using drugs. However, the researchers did not control for drug use in their analysis, suggesting that the increased negative consequences of drug use could potentially be a function of increased drug use rather than increased present-hedonism. Finally, Johnson et al. (2010) found that, in non-clinical sample of adult cannabis users, higher rates of delay discounting (i.e., favouring smaller immediate amounts of cannabis, over larger delayed amounts) was correlated with higher present-fatalism. The authors explain this finding by suggesting that cannabis users with high present-fatalism are

more likely to favour immediate rewards over delayed rewards as they feel they have little control or power over their future (Johnson et al., 2010).

Interestingly, Daugherty and Brase (2010) found that, while controlling for sex and the big five personality traits, which are known predictors of drug use (e.g Terracciano, Löckenhoff, Crum, Bienvenu, & Costa, 2008), present-hedonism, present-fatalism, and future TPs simultaneously predicted increased frequency of illicit drug use. However, none of these TPs uniquely predicted increased drug use over and above sex and the big five, suggesting that other personality level variables might play a more significant role in drug use than TP.

Evidence for the role of past TPs in drug use was much weaker, although this is partly due to the fact that the past subscales of the STPI and ZTPI were less widely used in single-group studies. Both past-positive and past-negative TPs were not found to be significantly related to frequency or quantity of drug use (e.g. Apostolidis, Fieulaine, Simonin, et al., 2006) but Chavarria et al. (2015) found that, using a sample of adults from the general population, increased past-negative TP was associated with greater negative drug use consequences.

Longitudinal, single-group correlational results. Two studies used a longitudinal, single-group correlational design to assess the relationship between TP and drug use behaviour (Barnett et al., 2013; Fieulaine & Martinez, 2012). Both studies recruited high school students. In Bennett et al. (2013), baseline drug use was assessed at time 1 by asking students to self-report the frequency of 'hard drug' and cannabis use over the previous 30 days. In contrast, Fieulaine and Martinez (2012) assessed frequency of cannabis use over the past 12 months. Barnett et al. (2013) showed that, controlling for baseline 'hard drug' and cannabis use, increased future TP at baseline negatively predicted cannabis use and 'hard drug' use one year later. Results suggested that a one unit increase in future TP resulted in a 15% decrease in the likelihood of using cannabis, and a 30% decrease in the likelihood of

using 'hard drugs'. These results suggest that, for young people, increased future TP might be more protective against the use of 'hard drugs' compared to cannabis, although it was protective in both cases.

Similarly, Fieulaine and Martinez (2012) showed that students with higher baseline future TP were less likely to have used cannabis 7 days later. Additionally, students with higher baseline present-hedonistic TP were more like to report using cannabis one week later.

Further, results showed that there was no significant relationship between baseline cannabis use or hard drug use and future TP one year later, while controlling for baseline future TP (Bennett et al., 2013). As such, results from the longitudinal, single-group studies largely parallel those of the cross-sectional studies reported above, adding weight to the notion that higher future TP functions as a protective factor for drug use, albeit with only high school samples of adolescents. Additionally, results suggest that, over a 12-month period, increased cannabis use does not appear to have a deleterious impact on individuals future TP (Fieulaine & Martinez, 2012). Thus, the direction of causality seems to be unidirectional.

Cross-sectional, between-groups results. Five studies used a between-groups, cross-sectional design (Johnson et al., 2010; Klingemann, 2001; Petry, Bickel, & Arnett, 1998; Pluck et al., 2008; Zentsova & Leonov, 2013) to assess the association between TP and drug use behaviour. These studies typically recruited currently using drug users to form a 'dependent drug user' group and had one or more comparison groups. There was some variability in the composition of the 'drug user' groups. Three studies recruited a clinical sample of dependent drug users from drug rehabilitation/treatment centres (Klingemann, 2001; Petry et al., 1998; Zentsova & Leonov, 2013), while one study (Johnson et al., 2010) recruited adult drug users from the general population. Pluck et al. (2008), alternatively, recruited a non-clinical sample of homeless participants with a history of drug use. The

composition of the comparison groups also varied across studies. Johnson et al. (2010), Klingemann (2001), Petry et al. (1998), and Pluck et al. (2008) all recruited participants from the general population to form a 'control' comparison group, while Johnson et al. (2010) also recruited former dependent drug users to form a comparison group. Klingemann (2001) recruited staff working at the same drug rehabilitation/treatment centres as the 'drug user' group. Zentsova and Leonov (2013), alternatively, recruited Russian professional athletes to act as the 'control' comparison group, as well as two groups of former drug users who had 'been in remission for more than 6 months' or had 'been in remission for more than one year'.

Evidence of drug use was assessed in a variety of ways. Johnson et al. (2010) used clinical interview with their 'drug user' group to assess cannabis dependence based on DSM-IV(APA, 2000) diagnostic criteria while Pluck et al. (2008) had homeless participants self-report the frequency of illicit drug use over the previous 12 months. The clinical samples recruited from rehabilitation/treatment centres had a diagnosis of illicit drug (Klingemann, 2001; Zentsova & Leonov, 2013) or heroin (Petry et al., 1998) dependence, although diagnostic and admission criteria were not reported in any of the studies. Additionally, only two studies (Johnson et al., 2010; Pluck et al., 2008) assessed drug use in the control groups.

As opposed to the single-group studies reported above, which typically focused on future and present TPs, the cross-sectional between-group studies reported here all measured past, present and future time perspective, although three studies used the STPI and two used the ZTPI.

Support for the notion of increased future TP functioning as a protective factor against drug use was not as consistent as in the single-group studies. Petry et al. (1998) demonstrated that heroin dependent patients had significantly lower future TP compared to controls, and Zentsova and Leonov (2013) found that former drug using patients who had been in

remission for more than one-year had significantly higher future TP compared to patients who had just started treatment. These results suggest that successful treatment for drug use might be associated with increasing future TP. However, Klingemann (2001) found no difference in future TP between drug dependent patients, drug clinic staff and participants from the general population, and Pluck et al. (2008) found no difference between homeless drug users and controls.

As above, there is mixed evidence to support the notion of increased present TP as a risk factor for drug use. Recruiting from clinical samples of dependant drug users, Petry et al. (1998) found that heroin dependent patients showed significantly higher present-hedonistic and present-fatalistic TP compared to controls. Yet, Klingemann (2001) found that drug clinic patients demonstrated significantly higher present-hedonism, but not present-fatalism, compared to the drug clinic staff.

Pluck et al. (2008), however, using a non-clinical sample, found the opposite relationship: homeless drug users showed higher present-fatalism compared to controls but no significant difference on present-hedonism. Additionally, when the homeless participants were divided into three groups, based on increasing severity of drug use, the authors found no significant differences in TP, although present-fatalism was approaching significance. Additionally, Johnson et al. (2010), found no significant difference in present-hedonistic or present-fatalistic TP between a non-clinical group of drug users, former drug users, and controls. Yet, they found a trend for drug users to report higher present-hedonistic TP than former drug users who, in turn, showed higher present-hedonistic TP than controls.

There was more consistent evidence for the role of past TPs in drug use compared to the single-group studies reported above, although this could partly be a function of the fact that past TPs wer measured in all the between-group studies reported here. Results typically suggest that increased past-negative TP is related to increased drug use. For example, a non-

clinical sample of homeless drug users were shown to have significantly higher past-negative TP compared to controls (Pluck et al., 2008). Additionally, drug clinic patients were shown to have higher past-negative TP compared to clinic staff and the general population (Klingemann, 2001). Similarly, dependent drug patients in treatment demonstrated higher past-negative TP compared to professional athletes (Zentsova & Leonov, 2013). There was some evidence to suggest that lower past-positive TP was associated with increased drug use and that increased past-positive TP was related to decreased drug use. For example, a non-clinical sample of homeless drug users were shown to have significantly lower past-positive TP compared to controls (Pluck et al., 2008), while in a clinical sample, former drug dependent patients in remission for more than 6 months showed lower past-positive TP compared to athletes, while those in remission for more than one-year showed higher past-positive TP, suggesting that the recovery process is associated with increasing past-positive TP (Zentsova & Leonov, 2013).

TP as a mediator in drug use behaviour

As well as exploring the direct link between past-positive and present-hedonistic TPs and negative drug use consequences, Chavarria et al. (2015) also investigated the indirect effect of present-negative TP on drug use consequences via present-hedonism. They found that increased past-negative TP was related to increased present-hedonism which, in turn, was related to increased negative consequences of drug use. The authors explain this finding by suggesting that individuals with high past-negative TP might develop a strong present-hedonistic orientation as a way to compensate for the negative cognitive and affective consequences associated with a high past-negative TP. High present-hedonism, in turn, they argue, renders individuals vulnerable to increased drug use and negative drug use consequences (Chavarria et al., 2015). However, this finding was only established cross-sectionally, and additional, longitudinal, research is needed to explore this hypothesis further.

Time perspective and drug use cognitions

  Cross-sectional, single-group correlational results. Four studies used a single-group, cross-sectional design to investigate the relationship between TP and drug-use cognitions (Apostolidis, Fieulaine, Simonin, et al., 2006; Apostolidis, Fieulaine, & Soulé, 2006; Fieulaine & Martinez, 2012; Klingemann, 2001). Three studies focused on young people, recruiting high school students (*n*=2) (Apostolidis, Fieulaine, & Soulé, 2006; Fieulaine & Martinez, 2012) and undergraduates (*n*=1) (Apostolidis, Fieulaine, Simonin, et al., 2006) while one study (Klingemann, 2001) recruited a sample of drug dependent patients in treatment. Sample sizes ranged from *n*=77 to *n*=690. Three studies investigated cognitions specifically related to cannabis use (Apostolidis, Fieulaine, Simonin, et al., 2006; Apostolidis, Fieulaine, & Soulé, 2006; Fieulaine & Martinez, 2012) while Klingemann (2001) focused on patients' attitudes towards treatment.

  There was consistent evidence to support the role of future TP as a protective factor, suggesting that drug-related cognition may play an important role in mitigating against the initiation and maintenance of drug use. Results suggests that young people with higher future TP were more likely to perceive cannabis as a drug (Apostolidis, Fieulaine, & Soulé, 2006), to associate cannabis use with 'hard drug' use (such as cocaine or heroin) (Apostolidis, Fieulaine, Simonin, et al., 2006) and to perceive the use of cannabis as risky and dangerous (Apostolidis, Fieulaine, Simonin, et al., 2006). Additionally, increased future TP was shown to be related to increased negative attitudes towards cannabis use and a rejection of the perceived 'normalisation' of cannabis use (Fieulaine & Martinez, 2012). Significantly, high school students with higher future TP reported lower intention to use cannabis (Fieulaine & Martinez, 2012).

  Results are also consistent with the idea that increased present-hedonism is a risk factors for drug use. Undergraduates with increased present-hedonistic TP were more likely

to emphasise the perceived benefits of cannabis use, while rejecting the 'hard-drug' image, a cognitive strategy the researchers called 'risk relativisation' (Apostolidis, Fieulaine, Simonin, et al., 2006). High school students higher in present-hedonism were also more likely to hold positive views about cannabis use (Fieulaine & Martinez, 2012) and to see cannabis use as 'normalised' (Fieulaine & Martinez, 2012). High school students with higher present-hedonism were also more likely to report higher intention to use cannabis (Fieulaine & Martinez, 2012). Dependent drug users in treatment with higher present-hedonism were found to be less optimistic about treatment success, suggesting that individuals who focus on immediate pleasure and gratification are less optimistic about recovery (Klingemann, 2001). Interestingly, individuals high in present-fatalism were found to be more similar to those with high future TP, emphasising the perceived risks of cannabis use rather than the perceived benefits (Apostolidis, Fieulaine, Simonin, et al., 2006).

High school students with higher past-positive TP were more likely to report negative attitudes toward cannabis use and reported lower intention to use cannabis (Fieulaine & Martinez, 2012) while undergraduates with higher past-negative TP were more likely to emphasise the perceived benefits of cannabis use while downplaying the risk (Apostolidis, Fieulaine, Simonin, et al., 2006). Interestingly, and contrary to what might be expected, drug dependent patients with increased past-positive TP were shown to be less optimistic about treatment. The author interpreted this to mean that individuals who view their past use of drugs positively are less likely to want to change their future drug use (Klingemann, 2001).

Time perspective and drug use cognitions as mediators/moderators.

Three of the four studies reported in the previous section also employed mediation or moderation analysis. Two studies investigated the role of cognitive factors as mediators of the relationship between TP and drug use behaviour (Apostolidis, Fieulaine, & Soulé, 2006), or behaviour and drug use intention (Fieulaine & Martinez, 2012), while one study

investigated the moderating role of TP in the relationship between drug use behaviour and perceptions of risks around drug use (Apostolidis, Fieulaine, Simonin, et al., 2006). All three studies focused on young people, recruiting high school students (*n=2*) (Apostolidis, Fieulaine, & Soulé, 2006; Fieulaine & Martinez, 2012) and undergraduates (*n=1*) (Apostolidis, Fieulaine, Simonin, et al., 2006). Sample sizes ranged from *n=198* to *n=690*. All three studies focused on cannabis use.

Results from Apostolidis, Fieulaine, and Soulé (2006) found that, in a sample of high school students, higher future TP was associated with higher drug orientation perception (i.e., the extent to which individuals identify cannabis as a 'hard drug') which, in turn, was related to less frequent cannabis use. As such, the authors argue that higher future TP is likely to discourage individuals from *initiating* cannabis use as they are more likely to associate cannabis use with other, more risky, drugs such as cocaine and heroin, thereby discouraging them from trying cannabis. However, for students who are already using cannabis in large quantities, as future TP increases, so too does the propensity to emphasise the perceived benefits of cannabis use and to minimise the perceived risks (Apostolidis, Fieulaine, Simonin, et al., 2006). As such, for heavy cannabis users, having higher future TP may serve to *maintain* cannabis use as they are more likely to perceive their cannabis use, on balance, as positive and beneficial.

Conversely, heavy cannabis users who also reported high present-hedonism or present-fatalism were more likely to emphasise the potential risks of cannabis use and to minimise the perceived benefits, thereby perceiving cannabis use, on balance, as negative and dangerous (Apostolidis, Fieulaine, Simonin, et al., 2006). It would appear possible that a negative and risky perception of cannabis use could potentially prompt heavy users to reduce their cannabis use over time, however, additional, longitudinal research would be needed to investigate this hypothesis further.

Finally, results from Fieulaine and Martinez (2012) found that the link between increased present-hedonism and both increased intention to use cannabis and subsequent cannabis use, was mediated by increased positive attitudes toward cannabis use and increased perceived normalisation of cannabis use. As such, results suggest that increased present-hedonism has a significant effect of increasing positive attitudes towards cannabis use. Increased positive attitudes, in turn, increases intention to use cannabis, which subsequently increases self-reported cannabis use over the next 7 days (Fieulaine & Martinez, 2012). Increased future TP, on the other hand, remained a significant direct predictor of intention to use cannabis, even when testing for the mediating role of attitudes towards cannabis use and perceived normalisation beliefs. Intention, however, was shown to mediate the relationship between future TP and cannabis use, suggesting that individuals with high future TP are likely to report lower intention to use cannabis which, in turn, leads to lower reported use of cannabis over the subsequent 7 days (Fieulaine & Martinez, 2012).

Discussion

The main aim of the present literature review was, firstly, to investigate whether there is evidence of a relationship between time perspective, the process whereby everyday experiences are filtered through, and organised by, the temporal categories of past, present, and future, and the illicit use of 'street' and prescription drugs. Evidence from a range of studies, using a range of different designs, and recruiting from a range of different samples suggests that there is an emerging evidence base to support a link between TP and drug use.

Given this link, the second aim of the review was to investigate which TP, or combination of TP's, were associated with reduced drug use, or function as a protective factor against drug use, and which TP, or combination of TP's, were associated with increased drug use, or function as a risk factor. Results suggest that individuals with higher future TP, which is associated with foregoing present moment enjoyment in order to achieve

long term goals (Zimbardo & Boyd, 1999), are less likely to use cannabis and other illicit drugs (Apostolidis, Fieulaine, & Soulé, 2006), and of those who do use these substances, to use them less frequently and in lower quantities (Apostolidis, Fieulaine, Simonin, et al., 2006). Importantly, evidence from two longitudinal studies suggests that increased future TP might play a casual role in reduced drug use (Barnett et al., 2013; Fieulaine & Martinez, 2012), and that increased future TP might be particularly protective against 'hard' drug use, such as cocaine and ecstasy, compared to cannabis use (Barnett et al., 2013).

However, increased future TP was not found to predict increased non-medical use of prescription analgesic or stimulant drugs, suggesting that the protective role might not translate to all drug types (Steiger et al., 2017). Furthermore, increased future TP was not found to predict illicit drug use when controlling for the big five personality traits (Daugherty & Brase, 2010), suggesting that future TP might not add any explanatory value over and above personality variables such as such openness, conscientiousness, extraversion, agreeableness and neuroticism. Additionally, these studies tended to be focused on drug use in young people, specifically high school students and undergraduates, and while young people are disproportionally at risk of using illicit drugs, it is unclear whether these results generalise to the wider population.

While increased future TP appears to function as the principal protective factor against drug use, there was evidence from both single-group and between-group studies, using clinical and non-clinical samples, to suggest that all three TP's, past, present and future, might function as significant risk factors for increased drug use. These results suggest the possibility that increased present TP might relate to increased drug taking via two distinct pathways. The first pathway, associated with high present-hedonism, involves individuals using drugs primarily with the goal of stimulation-seeking and increasing positive affect and arousal levels. The second pathway, associated with high present-fatalism, involves drug use

primarily with the goal of reducing negative affect associated with a sense of hopelessness, helplessness, and a lack of control over the present and future. However, as with future TP, the relationship between drug use and both present-hedonism and present-fatalism was non-significant when controlling for sex and the big five personality traits, suggesting that increased present TP might not play a significant role in drug use when other personality variables are taken into account (Daugherty & Brase, 2010).

Finally, there was limited to evidence to suggest that past TPs might function as a risk factor for increased drug use. Increased past-negative TP, which is associated with a negative view of the past, depression and, in some case, past experiences of trauma (Zimbardo & Boyd, 1999), was found to be higher in both clinical and non-clinical samples of drug users (Klingemann, 2001; Pluck et al., 2008) compared to controls. As with increased present-fatalism, it is possible that individuals with high past-negative TP might use drugs as a way of coping with low mood or the experience of past traumas. Homeless drug users also reported lower past-positive, which is associated with the ability to construct or reframe personal experiences in a positive way (Zimbardo & Boyd, 1999), compared to controls (Pluck et al., 2008).

Taken together, results investigating the direct link between TP and drug use behaviour provide emerging evidence to support the notion of increased future TP as protective against drug use. While there was some, albeit limited, evidence to support the link between low future, low past-positive, and high past-negative TP's as risk factors for increased drug use, results from the present review suggest that increased present TP was most consistently associated with increased illicit drug use. This is perhaps not surprising, and Zimbardo suggests that individuals with high present-hedonism, combined with high present-fatalism, instantiate the 'rebel without a cause' mentality- living to enjoy the present but seeing little need to consider the future or make efforts to manage or avoid risks

(Zimbardo & Boyd, 2008). However, for some individuals, the desire for immediate gratification and pleasure might be the primary motivation for drug taking, while in others it might be as a means of coping with negative emotions.

As might be expected, results from the present review appear to suggest that increased drug use in adolescence and early adulthood is particularly associated with increased present-hedonism. This is perhaps not surprising, given that adolescence is a time of rapid development in executive functioning, including impulse control, cognitive flexibility, and emotion regulation (Poon, 2018). Increased present-hedonism also appears to be a prominent feature of adult drug users receiving treatment for drug dependence, consistent with research findings that drug addiction is associated executive functioning deficits (Verdejo-García, Bechara, Recknor, & Pérez-García, 2006), but was not typically associated with increased drug use in community dwelling adults. In contrast, increased present-fatalism appears to be more of a feature of adult drug users compared to adolescents.

Findings from the present review are generally consistent with the extant literature investigating the relationship between time perspective and other risky behaviours. As in the present review, increased future time perspective is consistently related to health protecting behaviours, including the fact that individuals high in future time perspective are more likely to practice safe sex (Rothspan & Read, 1996) and eat healthy foods more often (Zimbardo & Boyd, 1999) than individuals lower in future time perspective. Individuals high in future time perspective are also likely to avoid behaviours associated with negative future consequences, for example they report drinking less alcohol (Keough, Zimbardo, & Boyd, 1999) and driving at slower speeds (Zimbardo, Keough, & Boyd, 1997). Similarly, findings from the present review are consistent with evidence from the wider literature on time perspective which suggests that individuals high in present time perspective are more likely to engage in health-risk behaviours. For example, individuals high in both present-fatalism and -hedonism are

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less likely to practice safe sex (Rothspan & Read 1996), are more likely to use alcohol (Keough, Zimbardo, & Boyd, 1999), and are more likely to take risks while driving (Zimbardo, Keough, & Boyd, 1997).

As with drug use behaviours, work examining the relationship between time perspective and health behaviour suggests individuals high in present-fatalism are likely to engage in risky behaviours for different reasons than those high in present-hedonism. For example, Zimbardo suggests that individuals high in present-hedonism have unsafe sex because they engage in such pleasurable behaviours 'with reckless abandon and mindless spontaneity' (Boyd & Zimbardo, 2005, p. 95). In contrast, individuals high in present-fatalism may have unsafe sex because they do not believe that practicing safe sex will make any difference to the future consequences that they experience (Boyd & Zimbardo, 2005). As such, findings from the present review add support to the notion that increased present-hedonism and present-fatalism function as distinct pathways for health risking behaviours.

The final aim of the present review was to investigate if, and how, TP is related to drug use cognitions, the ways that individuals think about drugs and drug use, and whether this relationship is related to increased or decreased drug use. Increased future TP, and to some extent increased past-positive TP, appear to be associated with cognitions that reduce the likelihood of cannabis use. Increased present-hedonism, and to some extent, past-negative TPs, conversely, appear to be associated with cognitions that increase the likelihood of cannabis use.

Findings therefore appear to support the idea that individuals with higher future TP are more likely to hold negative views about drug use, and are therefore less likely to use drugs, while individuals with higher present TP are more likely to hold positive views about drug use, and are therefore more likely to use drugs. However, results from Apostolidis, Fieulaine, Simonin, et al. (2006) suggest that this conclusion might be overly simplistic and

that the relationship between TP and drug use might be more nuanced and multifaceted. Notably, they found that heavy users of cannabis who reported high future TP were more likely to minimise the risks of cannabis use and emphasise the perceived benefits. As such, it appears that, in certain circumstances, high future TP can actually serve to increase the risk of continued drug use by promoting positive perceptions of drug taking, thereby reversing the putative protective role of increased future TP. Furthermore, they found that heavy users of cannabis who reported high present TP were more likely to emphasise the risks of cannabis use and minimise the perceived benefits. Likewise, under certain circumstances, it would appear that increased present TP might actually promote a negative view of drug use and therefore motivate individuals to reduce their drug use over time. As such, it would appear that further research is needed to investigate the potentially complex interaction of cognitive and behavioural factors that link TP to drug use.

Clinical implications

Findings from the present review suggest that individuals who use drugs tend to show a significant 'time bias' towards the present. Research into the clinical applications of TP theory suggests that clinical interventions should aim to help clients develop a more balanced TP, with the ultimate goal of developing the client's ability to move more flexibility and fluidly between different TP's (Sword, Sword, Brunskill, & Zimbardo, 2014). As such, it would appear that interventions with drug users should incorporate strategies and techniques aimed at developing increased future orientation as a means to counteract an overemphasis on the present. However, taking into account the findings from Apostolidis, Fieulaine, Simonin, et al. (2006), efforts at increasing future TP in heavy drug users might actually prove to be counterproductive, promoting them to minimize the dangers associated with drug use and emphasise the perceived benefits. As such, it would appear that assessment and formulation of an individual's TP should be incorporated within a wider formulation of drug use, which

also includes factors such as the individual's thoughts and beliefs around drugs and drug use. Findings from Klingemann (2001) also highlight the importance of considering the influence of TP on treatment optimism. It would appear that individuals with high past-positive and present-hedonistic TP are less optimistic at treatment and recovery. Klingemann (2001) suggests that this is because these individuals view their drug use in a positive way. As such, interventions aimed at helping drug users consider the negative aspects of drug use might be beneficial in helping develop treatment engagement and optimism.

Limitations and future research

The papers included in the present review had a number of limitations. First, the majority of papers ($n=11$) employed a cross-sectional design, which precludes the analysis of the causal connection between TP and drug use. Further longitudinal and experimental studies are therefore needed. Second, while the cross-sectional single-group studies, longitudinal studies, and drug cognition studies tended to have large sample sizes, suggesting the findings are likely to be fairly robust, these studies tended to draw from a fairly narrow sample of participants, namely adolescent high school students and undergraduates from the Western education system. They also predominately focused on cannabis use. As such, findings are likely to be reflective of Western, white, educated young people who predominately participate in 'experimental' cannabis use. While young people are indeed at greater risk of drug use, caution must be taken when generalising the results beyond the present sample, and to 'harder' drugs such as cocaine and heroin. Further studies recruiting from a wider population are therefore needed. Third, except for Daugherty and Brase (2010) studies typically failed to control for known predictors of drug use in their analysis. Importantly, Daugherty and Brase (2010) found that no TP uniquely predicted drug use when controlling for sex and the big five personality traits. Future studies should therefore aim to

control for other predictor variables that might influence drug use in order to establish a more accurate picture of the extent that TP is related to drug use.

Limitations of the review

While the present review was situated within the broader field of substance use and TP, it can be noted that the review focused more narrowly on drug use, and excluded other potentially important, health damaging substances, such as alcohol and tobacco (Fieulaine & Martinez, 2010). The review also focused on a specific model of TP as conceptualised by Zimbardo and colleagues (Zimbardo & Boyd, 1999). While there are evidently some differences between drug use and alcohol and tobacco use, not least the fact that the former is illegal and the later legal, some researchers suggest that drug use, alcohol use, and tobacco use can be subsumed under a general 'substance use' factor (e.g. Bentler & Newcomb, 1986). As such, further reviews could feasibly incorporate studies investigating substance use more widely conceived in order to further the understanding of the relationship between TP and the use of substances. Likewise, while Zimbardo's model of TP is arguably the most widely used, and the ZTPI the most widely researched measure, other models and measures do exist (e.g. Hall & Fong, 2007; Strathman, Gleicher, Boninger, & Edwards, 1994). Future reviews might therefore benefit from expanding the scope of TP to incorporate some of these other approaches to conceptualising and measuring the psychological construction of time.

Conclusion

Results from the present view provide emerging evidence to suggest that increased future TP is related to reduced drug use and that increased present TP is related to increased drug use. However, further longitudinal research, using a more varied sample of participants, and taking into account other known predictors of drug use, is needed to establish the causal role of TP in drug use.

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Chapter Two: Empirical Paper

Time perspective and aggression: Investigating the deviation from a balanced time perspective as a predictor of reactive and proactive aggression and impulsive and premeditated aggression[1]

Word Count: 6727

(exc. references)

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[1] Article prepared for submission to Aggressive Behavior for peer review. Please see appendix A for a copy of the journal guidelines for authors.

Abstract

Research suggests that time perspective, the extent to which individuals focus on the past, present, and future, might play a significant role in predicting aggression. However, research in this area has typically conceptualised and measured aggression as a unitary construct. No research has, to date, considered the relationship between time perspective and clinically important subtypes of aggression: reactive-proactive and impulsive-premeditated . The present study examined whether reporting an increased deviation from a balanced time perspective, reflecting the extent to which individuals can cognitively switch between past, present and future time perspectives, predicts increased reactive and proactive aggression, and impulsive and premeditated aggression. A sample of 389 adults completed measures of aggression, time perspective and emotion regulation. As expected, proactive and premeditated aggression, which are characterised by the planned use of aggression, were not associated with an increased deviation from a balanced time perspective, suggesting that these subtypes of aggression are not associated with difficulty switching between past, present and future time perspectives. Reactive and impulsive aggression, which are characterised by unplanned, impulsive aggressive outbursts, were found to be associated with an increased deviation from a balanced time perspective, suggesting that these aggressive subtypes are associated with increased difficulties switching between time perspectives. Contrary to expectations, however, an increased deviation from a balanced time perspective was not clinically predictive of increased reactive or impulsive aggression when controlling for a range of emotion regulation abilities. Clinical implications and areas for future research are discussed in relation to the study findings.

Keywords: time perspective, deviation from a balanced time perspective, impulsive-premeditated aggression, reactive-proactive aggression, emotion regulation.

Aggressive behavior is a complex social and public health problem (Kazdin, 2011). While aggression has traditionally been considered a unitary construct, research has shown that it is a multifaceted phenomenon, and researchers have identified a variety of methods of defining and classifying aggression (Babcock, Tharp, Sharp, Heppner, & Stanford, 2014). One of the most researched methods of classification defines two subtypes. The first subtype, which has been referred to as reactive or impulsive aggression, is considered to be a thoughtless, unplanned and impulsive response to a perceived provocation, often driven by anger, and intended to harm the victim (Allen, Anderson, & Bushman, 2018). The second subtype, which has been called proactive or premeditated, refers to a planned aggressive or violent act, with the principal aim of achieving some goal or reward other than harming the victim (Berkowitz, 1993).

Research suggests that there are a number of individual differences that underly and distinguish these two forms of aggression. Much of the research investigating these differences has focused on emotion regulation processes (Roberton, Daffern, & Bucks, 2012), the capacity to adaptively modulate emotion in order to meet situational demands and personal goals (Karoly, 1993). Research has demonstrated, for example, that reactive and impulsive aggression are associated with the under-regulation of anger, low frustration tolerance, and with difficulties inhibiting impulsive responses (Berkowitz, 1989) while proactive and premeditated aggression are not typically associated with significant difficulties with emotion regulation. Rather, proactive and premeditated aggression have been shown to be related to callous-unemotional traits (Cornell et al., 1996).

Cognitive processes are also important to understanding aggression, and much of this research has been conducted from a social psychological perspective. Research from a social-information processing standpoint, for example, suggests that reactive and impulsive aggression, but not proactive or premeditated aggression, are typically associated with a

hostile attribution bias (Crick & Dodge, 1996). Proactive and premeditated aggression, on the other hand, are often explained through the lens of social-learning theory (Bandura, 1978), suggesting that these types of aggression are learned behaviours that are reinforced through the acquisition of rewards that result from repeated acts of aggression, such as elevated status amongst peers (Swogger, Walsh, Christie, Priddy, & Conner, 2015).

Although research into emotion regulation and social psychological processes has helped advance the understanding of aggressive behaviour, less is known about the thinking styles that underlie aggression, particularly regarding the cognitive processes that motivate decision-making processes in different types of aggression. This is significant given that a better understanding of cognitive processes could help improve interventions based on cognitive-behavioural principles (McGuire, 2008), which form the basis of many anger management treatment programmes. Time perspective theory (Zimbardo & Boyd, 1999) has been relatively neglected in the study of aggression, but could provide a means to better understand the cognitive and decision-making processes of people who present with different types of aggression.

According to Zimbardo and Boyd (1999), time perspective (TP) is a cognitive-motivational construct related to the extent to which individuals focus on their past, present, and future. Differences in the degree to which individuals focus on these three temporal dimensions is said to have a significant impact on mood, cognition and, ultimately, behaviour (Drake, Duncan, Sutherland, Abernethy, & Henry, 2008). For example, individuals with a high present focus tend to engage in more risky behaviour (Boyd & Zimbardo, 2005), while individuals who focus more on the future tend to engage in more health-promoting behaviours like exercise (Guthrie, Lessl, Ochi, & Ward, 2013) and health eating (Daugherty & Brase, 2010).

Zimbardo and Boyd (1999) empirically distinguished five dimensions that can be used to describe an individual's TP: Past-positive (PaPTP) (having a sentimental, nostalgic view of one's past), past-negative (PaNTP) (recalling one's past as negative and distressful), present-hedonistic (PrHTP) (enjoying immediate pleasures and impulsive risk-taking, with little regard for the future consequences of one's behaviour), present-fatalistic (PrFTP) (having a helpless and hopeless attitude towards life and lacking a sense of personal control over the future), and future (FTP) (striving for future goals and a willingness to forgo immediate gratification for future rewards). The Zimbardo time perspective inventory (ZTPI) (Zimbardo & Boyd, 1999) was developed as a self-report measure to assess individual differences in these five temporal dimensions.

The concept of a balanced time perspective is one area of TP research that has attracted significant research attention (Stolarski, Wiberg, & Osin, 2015). Individuals with a balanced time perspective are able to flexibly and fluidly switch between the different time dimensions, depending on current situational demand, available resources, and their goals and values (Boniwell et al., 2010). Conversely, individuals with an unbalanced TP show a significant and habitual cognitive bias towards one, or more, temporal dimensions. Research suggests that the habitual over- or underuse of any TP can become maladaptive and is associated with a range of adverse physical and psychological outcomes (Boyd & Zimbardo, 2005).

Stolarski and colleagues (e.g. Zhang, Howell, & Stolarski, 2013) developed the deviation from a balanced time perspective (DBTP) coefficient as a method to determine the presence of temporal biases in individuals' TPs. The DBTP coefficient is a measure of fit between individuals' TP and the supposed optimal TP profile proposed by Zimbardo and Boyd (Zimbardo & Boyd, 2008) (operationalised in terms of the ZPTI as moderate-to-high scores on the past-positive, present-hedonsim, and future TPs, and low scores on the past-

negative and present-fatalism TPs). Individuals who report a greater deviation from the

theoretical ideal TP profile are described as having an unbalanced TP. An unbalanced TP has

been shown to be predictive of a number of risky behaviours, including substance abuse

(Keough, Zimbardo, & Boyd, 1999), risky driving (Zimbardo, Keough, & Boyd, 1997), and

pathological gambling (MacKillop, Anderson, Castelda, Mattson, & Donovick, 2006).

The observed link between TP and a range of risky behaviours that often co-occur

with aggression suggests that TP might also play a role in aggressive behaviour. While

research into this area is limited, a recent study by Strobel and colleagues (Strobel et al.,

2014) suggests that aggression is associated with high present-hedonism and low future TP,

while Stolarski and colleagues (Stolarski, Zajenkowski, & Zajenkowska, 2016) found

individuals scoring high on past-negative, present-fatalistic, and present-hedonistic subscales

of the ZTPI were more prone to increased anger and aggressive behavior. Although there are

limitations of these studies, for example the conceptualization and measurement of

aggression as a unitary construct, research into aggression and TP seems to suggest that, as

with other risky behaviours (e.g. Keough et al., 1999), increased aggression is associated with

a significant bias towards the present TPs.

To date, however, no studies have investigated the relationship between TP and

reactive-proactive aggression and impulsive-premeditated aggression subtypes. As such, little

is known about how individual differences in TP might relate to reactive and impulsive

aggression on the one hand, and proactive and premeditated aggression on the other. This is

notable given that the distinction between reactive and proactive aggression, and impulsive

and premeditated aggression, is of clinical importance for the purposes of assessment,

formulation, and intervention.

The present study therefore aimed to investigate the relationship of TP with reactive

and proactive, and impulsive and premeditated aggression. It aimed to investigate whether a

greater deviation from a balanced TP, that is, the degree to which individuals can flexibly switch between time perspectives, is differentially related to reactive and proactive aggression, and impulsive and premeditated aggression. As there is some disagreement between researchers as to whether reactive and impulsive aggression, and proactive and premediated aggression, represent overlapping constructs (e.g. Babcock et al., 2014), the study utilised two measures of aggression, the reactive-proactive aggression questionnaire (RPQ) (Raine et al., 2006) and the impulsive-premeditated aggression scale (IPAS) (Stanford et al., 2003). A review by Babcock and colleagues (Babcock et al., 2014) into the similarity and differences between reactive-proactive and impulsive-premeditated bimodal classifications suggest that these two measures might be tapping into different aspects of aggressive behaviour. They argue that the IPAS focuses more on 'aggressive states', capturing what happens in the moment of the aggressive behavior, whereas the RPQ taps into 'aggressive traits', emphasising the characteristics of the perpetrator (Babcock et al., 2014).

In order to better understand the unique contribution of TP to reactive-proactive and impulsive-premeditated aggression, the study also controled for individual differences in emotion regulation abilities. Following a review by Roberton and colleagues (Roberton et al., 2012), which suggests that increased aggression is associated with deficits in emotional awareness and acceptance, and diminished proficiency in the use of emotion regulation strategies, the study employed measures that capture individual differences in these constructs. Specifically, the study utilised the emotion regulation questionnaire (ERQ) (Gross & John, 2003) as a measure of cognitive reappraisal, the capacity to reinterprets an event in order to change its emotional impact, and expressive suppression, the degree to which individuals inhibit emotional expression, and the difficulties in emotion regulation scale (DERS) (Gratz & Roemer, 2004), which captures deficits in a range of constructs related to adaptive emotion regulation.

As reactive and impulsive aggression are characterized by the impulsive, unplanned perpetration of aggressive acts, it is hypothesized that, controlling for emotion regulation abilities, increased reactive and impulsive aggression will be associated with a greater deviation from a balanced TP, as measured by the DBTP coefficient. In line with past research (e.g. Stolarski et al., 2016), it is anticipated that this unbalanced TP will principally be associated with the overuse of the present TP's, consistent with the impulsive nature of this type of aggression, and the underuse of the future TP, consistent with a lack of planning and forethought. Furthermore, controlling for a range of emotion abilities, it is anticipated that an increased deviation from a balanced TP will account for a significant amount of the variability in reactive and impulsive aggression.

Proactive and premeditated aggression, on the other hand, are characterised by the planned and calculated use of aggression, with the aim of achieving some goal or reward. Given that a key feature of proactive-premeditated aggression is planning, it is expected that proactive-premeditated aggression will not be associated with a significant deviation from a balanced TP, suggesting a greater ability to cognitively switch between the present temporal dimension and the future dimension. It is therefore hypothesized that, in contrast to reactive and impulsive aggression, an increased deviation from a balanced TP will not be predictive of increased proactive and premeditated aggression.

Methods

Participants

A total of 389 participants, who were aged 18 years and over, completed an online survey between March 2019 and June 2019. The sample was an international convenience sample of non-clinical community dwelling adults recruited using a virtual snowballing method. The average age in the sample was 29.9 (SD=11.3), and ages ranged from 18 to 67 years. The sample self-identified as 82.8% White, 4.2% Asian, 1.8% Black, 2.6% Chinese, 4.5% Mixed

and 2.8% Other, while 1.5% preferred not to state their ethnicity. The sample was composed

of 64% ($n = 249$) women. Participants were given the option to self-define their gender. No

participants selected this option. Apriori power analysis using G*Power 3 (Faul, Erdfelder,

Lang, & Buchner, 2007) indicated a sample size of at least 395 participants would be

required to reach .80 power, based on 4 predictors, to detect a small effect size, in accordance

with Cohen's (1988) guidelines for behavioural sciences (see Appendix D).

Measures

Zimbardo time perspective inventory. Time perspective was measured using the

Zimbardo time perspective inventory (Zimbardo & Boyd, 1999) (see Appendix C). The 56-

item ZTPI is a self-report measure consisting of five subscales designed to identify an

individual's time perspective: Past-negative (e.g. 'I think about the bad things that have

happened to me in the past'); past-positive (e.g. 'Happy memories of good times spring

readily to mind'); present-hedonistic (e.g. 'It is important to put excitement in my life');

present-fatalistic (e.g. 'Since whatever will be will be, it doesn't really matter what I do');

and future (e.g. 'I complete projects on time by making steady progress'). Each item is on a

five-point Likert scale ranging from 1 (very uncharacteristic) to 5 (very characteristic).

Higher scores reflect a stronger orientation toward a particular time perspective. Research has

provided convergent and discriminant evidence for the validity of the ZTPI and it

demonstrates acceptable test-retest reliability (Zimbardo and Boyd, 1999). In the present

study internal consistency was acceptable for the past-positive ($\alpha = 0.79$), present-hedonism

($\alpha = 0.79$), present-fatalistic ($\alpha = 0.76$), and future subscales ($\alpha = 0.75$) and good for the past-

negative ($\alpha = 0.86$) subscale.

Deviation from a balanced time perspective coefficient. Based on the work of

Stolarski and colleagues (e.g. Zhang et al., 2013), a deviation from a balanced TP coefficient

(DBTP) score can be calculated for each participant. The DBTP coefficient measures the

difference between an individual's empirically derived TP (e) and Zimbardo and Boyd's (2008) proposed ideal scores (o), on each of the five ZTPI subscales. Zimbardo and Boyd (2008) define optimal scores as 1.95 for the past-negative subscale, 4.60 for the past-positive subscale, 1.50 for the present-fatalism subscale, 3.90 for the present-hedonism subscale and 4.0 for the future subscale. Differential subscale scores are combined following the equation below to yield a DBTP coefficient score for each participant. A DBTP coefficient score close to zero indicates a more balanced TP, while a larger positive score indicates an increasingly unbalanced TP.

$$DBTP = \sqrt{\begin{array}{c}(oPaNTP - ePaNTP)^2 + (oPaPTP - ePaPTP)^2 + (oPrHTP - ePrHTP)^2 + \\ (oPrFTP - ePrFTP)^2 + (oFTP - eFTP)^2\end{array}}$$

Impulsive and premeditated aggression scale. Impulsive and premeditated aggression were measured using the impulsive-premeditated aggression scales (IPAS) (Stanford et al., 2003) (see Appendix C). The IPAS is a 30-item self-report questionnaire that consist of statements relating to participants' general perceptions about acts of aggression that they have perpetrated using 5- point Likert scale, with responses ranging from strongly disagree (1) to strongly agree (5). Ten of the items measure impulsive aggression (e.g., 'When angry I reacted without thinking') and eight measure premeditated aggression (e.g., 'I planned when and where my anger was expressed'). The measure has been used to assess acts of aggression over the past 6 months or over a participant's lifetime (Swogger et al., 2015). The present study assessed participants' lifetime aggression. Internal consistency was acceptable for both subscales in the present study (impulsive aggression, α=.76; premeditated aggression, α=78).

Reactive and proactive aggression questionnaire. Reactive and proactive aggression was measured using the reactive-proactive aggression questionnaire (RPQ) (Raine

et al., 2006) (see Appendix C). The RPQ is a self-report measure that consists of 23 items: 11

items which measure reactive aggression (e.g. 'Gotten angry when frustrated') and 12 items

which measure proactive aggression (e.g. 'Carried a weapon to use in a fight'). The items are

rated on a 3-point Likert-scale, 0 (never), 1 (sometimes), or 2 (often) and are designed to tap

into the motivational and situational context for the acts. The measure was originally

developed for use with children and adolescents. More recently, the RPQ has been used to

assess reactive and proactive aggressive behaviour in adults (Cima, Raine, Meesters, &

Popma, 2013; Lobbestael, Cima, & Arntz, 2013). In the present study, the proactive (α=.85)

and reactive (α=.82) subscales showed good internal consistency.

Emotion regulation questionnaire. The use of different strategies for regulating

emotions was assessed using the emotion regulation questionnaire (Gross & John, 2003) (see

Appendix C). The ERQ is a 10-item measure of emotion regulation, comprising independent,

but correlated, factors of cognitive reappraisal (six items) (e.g., 'When I want to feel less

negative emotion, such as sadness or anger, I change what I'm thinking about') and

expressive suppression (four items) (e.g., 'I control my emotions by not expressing them').

For each item, participants respond on a 7-point Likert scale (1 = strongly disagree, 7 =

strongly agree). The suppression subscale demonstrated adequate internal consistency (α

=.77) while the cognitive reappraisal subscale showed good internal consistency (α=.82).

Research has shown the ERQ to have good test-retest reliability (r = .69) (Gross & John,

2003).

Difficulties in emotion regulation scale. Difficulties in regulating emotions were

assessed using the difficulties in emotion regulation scale (Gratz & Roemer, 2004) (see

Appendix C). The DERS measures emotion regulation using 36 items with a five-point Likert

scale ranging from 'almost never' (1) to 'almost always' (5). It yields a total score of overall

difficulties, with higher scores reflecting greater difficulties, in addition to six subscales

designed to measure different constructs related to emotion regulation: Non-acceptance of emotional response, reflecting a tendency to experience further, or secondary, negative emotions in responses to initial, or primary, negative emotions, difficulties engaging in goal-directed behaviour, which reflects difficulties attending to, and achieving tasks when experiencing negative emotions, lack of emotional awareness, reflecting difficulties focusing on and acknowledging negative emotions, impulse control, reflecting difficulties controlling behaviour when experiencing negative emotions, limited access to emotion regulation strategies, reflecting a low belief in the ability to regulate emotions effectively, once upset, and emotional clarity, reflecting the extent to which individuals understand the emotions they are experiencing. DERS has a test–retest value of r=.88 (Gratz & Roemer, 2004) and the internal consistency of the scale was excellent in the present study (α=.94). The present study will utilise the DERS total score only.

Procedure

An online survey was created using Qualtrics software (QualtricsXM, 2019), which was distributed online via social media, utilising a 'virtual' snowball sampling method. All participants provided informed consent (see Appendix F), and participation was voluntary. Participants completed all the study measures, which were randomly presented across participants. Participants were then debriefed (see Appendix F) and offered the opportunity to enter into a prize draw to win an Amazon voucher worth £50 or £25.

Design and Ethics

The study was a web-based survey using a cross-sectional design. The study received ethical approval from the University of Liverpool Committee on Research Ethics (see Appendix E) and adhered to the British Psychological Society (BPS) code of human research ethics (British Psychological Society, 2010) and ethics guidelines for internet-mediated research (British Psychological Society, 2013)**.**

Statistical Analyses

Data were analysed with Jamovi (Version 1.0) (The Jamovi Project, 2019; R Core Team, 2018), using the module GAMLj: General analyses for linear models (Version 1.0) (Gallucci, 2019). Pearson product-moment correlations were used to investigate the relationships between the study measures. Where there was a significant correlation between the two subscales of the IPAS or the RPQ (e.g., between IPAS impulsive and premeditated or RPQ reactive and proactive) Pearson standardized residuals were generated. This method allows for an examination of the correlates of one subtype of aggression independent of the other, for example 'pure' proactive aggression, independent of the effects of reactive aggression, and of 'pure' reactive aggression, independent of proactive aggression.

Hierarchical multiple regression was used to investigate the relationship of the deviation from a balanced time perspective coefficient with IPAS impulsive, IPAS premediated, and RPQ reactive subscales, controlling for emotion regulation. Scores were entered as the mean item-level score for each scale or subscale. As the RPQ proactive subscale was highly positively skewed (towards zero) and over-dispersed (see Appendix G), a negative binomial regression analysis was conducted. This statistic corrects for data conforming to this distribution (Browne & Cudeck, 1992). Table 1 summarizes the variables entered at each step of the model.

Table 1

Summary of the predictor variables entered into hierarchical multiple regression models predicting reactive, impulsive and premeditated aggression.

Outcome variable	Predictor variable(s)		
	Step 1	Step 2	Step 3
RPQ reactive	RPQ proactive	ERQ suppression ERQ reappraisal DERS total	DBTP coefficient
IPAS impulsive	ERQ suppression ERQ reappraisal DERS total	DBTP coefficient	
IPAS premeditated	ERQ suppression ERQ reappraisal DERS total	DBTP coefficient	

Note: RPQ= Reactive-proactive aggression questionnaire; IPAS=Impulsive-premeditated aggression scale; ERQ=Emotion regulation questionnaire; DERS= Difficulties in emotion regulation scale; DBTP=Deviation from a balanced time perspective.

For the two models predicting IPAS impulsive and premeditated subscale scores, emotion regulation scale scores (ERQ suppression, ERQ reappraisal, DERS total) were entered into the model first, followed by DBPT coefficient scores. For the model utilising the RPQ reactive subscale as the dependent variable, raw RPQ proactive scores were entered into the model first, in order to control for the shared variance of these subscales, followed by emotion regulation scale scores, and then DBTP coefficient scores.

Finally, for the model predicting RPQ proactive, RPQ proactive total subscale scores were used as the outcome variable. As shown in Table 2, an initial model including RPQ reactive total subscale scores was calculated, taking note of the Akaike's Information Criteria (AIC) value as a measure of model fit (with scores closer to 1 indicating a better, more parsimonious model). A second model, incorporating reactive aggression and emotion regulation (ERQ suppression, ERQ reappraisal, DERS total) was then calculated, followed by a final model incorporating the DBTP coefficient, taking note of changes in the AIC value between models.

Table 2
Summary of the predictor variables entered into the negative binomial regression models predicting proactive aggression.

Outcome variable	Predictor variable(s)		
	Model 1	Model 2	Model 3
RPQ proactive	RPQ reactive	RPQ reactive	DBTP coefficient
		ERQ suppression	RPQ reactive
		ERQ reappraisal	ERQ suppression
		DERS total	ERQ reappraisal
			DERS total

Note: RPQ= Reactive-proactive aggression questionnaire; IPAS=Impulsive-premeditated aggression scale; ERQ=Emotion regulation questionnaire; DERS= Difficulties in emotion regulation scale; DBTP=Deviation from a balanced time perspective.

Results

First we examined mean and standard deviation scores for the aggression subscale measures. IPAS and RPQ scores from the present sample were then compared with IPAS and RPQ scores from an alternative non-clinical community sample reported by Teten Tharp et al. (2011). As can be seen from Table 3 below, scores from the present sample were comparable with scores reported by Teten Tharp et al. (2011).

Table 3
Mean and SD aggression subscales scores from the present sample and Teten Tharp et al. (2011) sample.

	IPAS Impulsive	IPAS Premeditated	RPQ Reactive	RPQ Proactive
Present sample	29.71(6.43)	21.12(5.80)	7.61(3.87)	1.86(2.92)
Teten Tharp et al. sample	27.23(5.62)	21.72(5.41)	7.12(3.51)	1.24(1.81)

Zero-order Correlations

Aggression subscales. The raw impulsive and premeditated subscales of the IPAS were very weakly correlated, while the raw reactive and proactive subscales of the RPQ were moderately correlated (Table 4). Correlations between raw IPAS and raw RPQ subscales were all positive, ranging from $r=0.01$ to $r=0.50$, with the exception of the correlation between raw IPAS premeditated and raw RPQ reactive scores, which was non-significant.

Because the RPQ reactive and proactive subscales were significantly correlated, Pearson standardized residuals were generated for these subscales.

Aggression and emotion regulation. Higher reported levels of RPQ reactive aggression (raw and standardised) and IPAS impulsive aggression were associated with reduced use of cognitive reappraisal as a strategy for emotion regulation, and with increased difficulties in emotion regulation (Table 5). Higher reported levels of RPQ reactive aggression (raw and standardised) and IPAS impulsive aggression were unrelated to the use of expressive suppression. Conversely, higher reported levels of 'pure' RPQ proactive and IPAS premeditated aggression were unrelated to difficulties in emotion regulation or the use of cognitive reappraisal, but were both associated with increased use of emotion suppression.

Aggression and time perspective. As can be seen from Table 6, higher reported levels of RPQ reactive aggression (raw and standardised) and IPAS impulsive aggression were associated with more negative views of the past, as measured by the ZTPI past-negative subscale, a greater focus on immediate, present-moment pleasure, as measured by the ZTPI present-hedonism subscale, and a greater sense of helplessness and hopelessness about the future and life, as measured by the ZTPI present-fatalism subscale. Additionally, higher reported levels of IPAS impulsive aggression was associated with a lack of positive thoughts and memories about the past, as measured by the ZTPI past-positive subscale. While the raw RPQ reactive subscale was negatively correlated with the ZTPI future subscale, suggesting a reduced focus on the future, contrary to expectation, both the IPAS impulsive and standardised RPQ reactive subscales were not significantly correlated with the ZTPI future subscale, suggesting that 'pure' reactive aggression, and impulsive aggression, are not associated with any significant deficits in planning for the future, or striving for future goals and rewards.

IPAS premeditated aggression, and 'pure' RPQ proactive aggression were not significantly related to any of the ZTPI subscales, with the exception that, contrary to expectations, higher reported levels of 'pure' RPQ proactive aggression were weakly related

to increased difficulties with future directed thinking and behaviour. This was surprising given the element of planning required for acts of premeditated aggression. Raw RPQ proactive aggression scores, on the other hand, were more consistent with the temporal profile shown by RPQ reactive and IPAS impulsive aggression, with increased RPQ proactive aggression associated with increased negative and reduced positive attitudes towards the past, an increased fatalistic outlook on life, and with difficulties planning for, and acting towards, future goals.

Aggression and DBTP. Results showed that higher reported levels of RPQ reactive aggression (raw and standardised) and IPAS impulsive aggression were positively associated with the DBTP coefficient, suggesting that increased reactive and impulsive aggression are associated with a greater deviation from the ideal, balanced time perspective (Table 5). Conversely, the IPAS premeditated subscale and standardised RPQ proactive subscale were not related to the DBTP coefficient, suggesting that 'pure' proactive aggression, and premeditated aggression, are not associated with a significant deviation from the ideal, balanced time perspective.

Table 4

Means, SDs, and Pearson correlations among reactive-proactive questionnaire (RPQ) and impulsive-premeditated aggression scale (IPAS) subscales.

| | Mean (SD) | IPAS Subscales | | RPQ Subscales | | | |
| | | | | Raw | | Standardised Residuals | |
		Impulsive	Premeditated	Reactive	Proactive	Reactive	Proactive
IPAS impulsive	29.70 (6.43)	—					
IPAS premeditated	21.12 (5.80)	-.11*	—				
RPQ raw reactive	7.61 (3.87)	.50***	.10	—			
RPQ raw proactive	1.86 (2.92)	.17***	.26***	.51***	—		
RPQ standardised reactive	0.00 (1.00)	.48***	-.04	.86***	.00	—	
RPQ standardised proactive	0.00 (1.00)	-.10*	.24***	.00	.86***	.51***	—

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

Table 5

Means, SDs, and Pearson correlations among aggression, emotion regulation, and time perspective measures.

| | Mean (SD) | IPAS Subscales | | RPQ Subscales | | | |
| | | | | Raw | | Standardised residuals | |
		Impulsive	Premeditated	Reactive	Proactive	Reactive	Proactive
ERQ reappraisal	4.80 (1.06)	-.21***	.07	-.13**	-.01	-.15***	.07
ERQ suppression	3.78 (1.30)	.00	.19***	.03	.13*	-.05	.14**
DERS total	2.44 (0.63)	.41***	.05	.37***	.25***	.29***	.07
ZTPI-past-negative	3.03 (0.80)	.32***	.01	.31***	.13*	.28***	-.04
ZTPI-past-positive	3.55 (0.67)	-.12*	.01	-.09	-.10*	-.05	-.06
ZTPI-present-hedonism	3.24 (0.52)	.12*	.08	.20***	.10	.17***	-.01
ZTPI-present-fatalism	2.56 (0.64)	.25***	.10	.30***	.22***	.22***	.08
ZTPI-future	3.56 (0.53)	-.01	-.20	-.10*	-.14**	-.03	-.11*
DBTP coefficient	2.34 (0.79)	.25***	.01	.29***	.18***	.23***	.03

Note. ERQ=Emotion regulation questionnaire; DERS=Difficulties in emotion regulation questionnaire; ZTPI=Zimbardo time perspective inventory; DBTP=Deviation from a balanced time perspective.
* p < .05, ** p < .01, *** p < .001

Incremental Validity of the DBTP Coefficient

Three hierarchical multiple regressions were performed in order to investigate he incremental validity of the DBTP coefficient as a predictor of RPQ reactive, IPAS impulsive and IPAS premeditated aggression, over and above emotion regulation and, in the case of reactive aggression, RPQ proactive aggression. The full models were statistically significant and predicted approximately 35%, 18% and 5% of the variance in reactive (R^2 = .35, $F(5,383)$ = 41.50, $p < .001$), impulsive (R^2 = .18, $F(4,384)$ = 21.40, $p < .001$), and premeditated (R^2 = .05, $F(4,384)$ = 4.73, $p < .001$) aggression, respectively.

RPQ Proactive aggression accounted for approximately 26% of the variance in RPQ reactive aggression (Table 6, model 1). After controlling for proactive aggression, reported use of cognitive reappraisal and expressive suppression, and difficulties in emotion regulation, led to a significant increase in R^2, accounting for an additional 8% of the variance in reactive aggression (Table 6, model 2). The addition of the DBTP coefficient to the prediction of RPQ reactive aggression (Table 6, model 3) led to a small (1.2%) but statistically significant increase in R^2.

Table 6
Summary of hierarchical multiple regression predicting reactive aggression

Model	Predictors	B	SE	t	p	Beta	R^2
Model 1							0.26
	RPQ proactive	**0.68**	0.06	11.7	<.001	0.51	
Model 2							0.34
	RPQ proactive	**0.60**	0.06	10.49	<.001	0.45	
	ERQ reappraisal	0.05	0.18	0.26	0.79	0.013	
	ERQ suppression	**-0.34**	0.13	-2.59	0.01	-0.11	
	DERS total	**1.83**	0.32	5.81	<.001	0.30	
Model 3							0.35
	RPQ proactive	**0.59**	0.06	10.38	<.001	0.45	
	ERQ reappraisal	0.12	0.18	0.66	0.51	0.03	
	ERQ suppression	**-0.41**	0.13	-3.13	0.01	-0.14	
	DERS total	**1.52**	0.33	4.54	<.001	0.25	
	DBTP coefficient	**0.65**	0.24	2.67	0.01	0.13	

Note: RPQ= Reactive-proactive aggression questionnaire; ERQ=Emotion regulation questionnaire; DERS= Difficulties in emotion regulation scale; DBTP=Deviation from a balanced time perspective.

The use of reappraisal and expressive suppression, and difficulties in emotion regulation, accounted for approximately 18% of the variance in reported levels of IPAS impulsive aggression (Table 7, model 1). The addition of the DBTP coefficient (Table 7, model 2) did not result in a significant increase in R^2, suggesting that there was no significant effect of DBTP on IPAS impulsive aggression.

Table 7
Summary of hierarchical multiple regression predicting impulsive aggression

Model	Predictors	B	SE	t	p	Beta	R^2
Model 1							0.18
	ERQ reappraisal	-0.00	0.03	-0.11	.91	-0.01	
	ERQ suppression	**-0.06**	0.02	-2.40	.02	-0.12	
	DERS total	**0.44**	0.06	7.84	<.001	0.43	
Model 2							0.18
	ERQ reappraisal	0.00	0.03	0.12	0.90	0.01	
	ERQ suppression	**-0.07**	0.02	-2.70	0.01	-0.13	
	DERS total	**0.41**	0.06	6.67	<.001	0.40	
	DBTP coefficient	0.07	0.05	1.62	0.11	0.09	

Note: ERQ=Emotion regulation questionnaire; DERS= Difficulties in emotion regulation scale; DBTP=Deviation from a balanced time perspective.

The use of cognitive reappraisal and expressive suppression, and difficulties in emotion regulation, accounted for a small (4%) but significant increase in the variance in IPAS Premediated aggression (Table 8, model 1). The addition of the DBTP coefficient (Table 8, model 2) did not result in a significant increase in R^2, suggesting that there was no significant effect of DBTP on IPAS premeditated aggression.

Table 8
Summary of hierarchical multiple regression predicting premeditated aggression

Model	Predictors	B	SE	t	p	Beta	R^2
Model 1							0.04
	ERQ reappraisal	0.06	0.04	1.65	.10	0.09	
	ERQ suppression	**0.10**	0.03	3.48	<.001	0.18	
	DERS total	0.05	0.07	0.74	.46	0.04	
Model 2							0.05
	ERQ reappraisal	0.06	0.04	1.49	.14	0.09	
	ERQ suppression	**0.11**	0.03	3.61	<.001	0.19	
	DERS total	0.08	0.07	1.05	.29	0.07	
	DBTP coefficient	-0.05	0.06	-0.99	.32	-0.06	

Note: ERQ=Emotion regulation questionnaire; DERS= Difficulties in emotion regulation scale; DBTP=Deviation from a balanced time perspective.

The effects of RPQ reactive aggression, the use of cognitive reappraisal and expressive suppression, difficulties in emotion regulation, and DBTP on RPQ proactive aggression were analysed using negative binomial regression. Chi-square likelihood ratio as a measure of model fit suggested that the full model was a better fit than the intercept only model, $\chi^2(5) = 154.582$, $p < .001$. As can be seen from Table 9 (model 2), greater reported use of cognitive reappraisal and expressive suppression were associated with increased reports of RPQ proactive aggression, while there was no effect of difficulties in emotion regulation on RPQ proactive aggression. The addition of the DBTP coefficient in the full model (model 3) resulted in a larger AIC value when compared to the model incorporating raw RPQ reactive subscale scores and emotion regulation (model 2), suggesting that the addition of the DBTP coefficient resulted in a worse fitting, less parsimonious model. In this model there was no significant effect of DBTP on RPQ proactive aggression.

Table 9

Summary of negative binomial regression predicting proactive aggression

Model	Predictors	*B*	*SE*	*Exp(B)*	*z*	*p*	*AIC*
Model 1							1289.03
	RPQ reactive	**0.21**	0.02	1.23	12.92	<.001	
Model 2							1280.82
	RPQ reactive	**0.19**	0.02	1.33	11.28	<.001	
	ERQ reappraisal	**0.15**	0.07	1.21	2.12	.03	
	ERQ suppression	**0.12**	0.05	1.16	2.27	.02	
	DERS total	0.25	0.13	1.28	1.93	.06	
Model 3							1282.79
	RPQ reactive	**0.19**	0.02	1.22	11.13	<.001	
	ERQ reappraisal	**0.14**	0.07	1.16	2.07	.04	
	ERQ suppression	**0.12**	0.05	1.12	2.26	.02	
	DERS total	0.26	0.14	1.30	1.90	.06	
	DBTP coefficient	-0.02	0.10	0.98	-0.21	.84	

Note: RPQ= Reactive-proactive aggression questionnaire; ERQ=Emotion regulation questionnaire; DERS= Difficulties in emotion regulation scale; DBTP=Deviation from a balanced time perspective.

Discussion

The present study aimed to be the first to investigate the relationship of TP, the extent to which individuals focus on their past, present and, future, with two widely recognized frameworks for conceptualizing aggression: reactive-proactive and impulsive-premeditated.

As expected, an increased deviation from a balanced TP, reflecting a more unbalanced TP, was not significantly correlated with 'pure' proactive and premeditated aggression, the planned, goal-directed use of aggression. Further, controlling for emotion regulation abilities, an increased deviation from a balanced TP was not predictive of increased proactive and premeditated aggression. Results are therefore consistent with the hypothesis that 'pure' proactive aggression, that is proactive aggression independent of the effects of reactive aggression, and premeditated aggression are not associated with an unbalanced TP, and that these subtypes of aggression are not related to difficulties switching between time perspectives. Consistent with previous research, which has shown that a balanced TP is associated with greater goal directed planning and behavior (e.g. Mooney, Earl, Mooney, & Bateman, 2017), results from the present study suggest that a more balanced TP might play a role in the planned, goal-direct use of aggression.

As expected, an increased deviation from a balanced TP was positively correlated with increased reactive and impulsive aggression, the unplanned, uncontrolled, emotion-driven act of aggression. Results therefore suggest that increased reactive and impulsive aggression are associated with an increasingly unbalanced TP, and that these subtypes of aggression are related to increased difficulties switching between time perspectives. Additionally, controlling for a range of emotion regulation abilities and strategies, an increased deviation from balanced TP was found to predict increased reactive aggression. However, this relationship only accounted for a small increase in the variance of reactive aggression and, following Ferguson's (2009) guidelines for interpreting effect sizes, it would

appear that this result does not represent a clinically significant effect. Additionally, an increased deviation from a balanced TP was not found to predict increased impulsive aggression, over and above emotion regulation abilities.

As expected, reactive and impulsive aggression were associated with a temporal bias towards the present TPs, particularly the present-fatalism dimension. As this TP is associated with a chronic sense of a lack of control over one's life and with increased feelings of frustration (Zimbardo & Boyd, 1999), this finding appears consistent with Berkowitz's (Berkowitz, 1989) frustration-aggression hypothesis, which posits that increased frustration predisposes individuals to acts of aggression. Similarly, increased reactive and impulsive aggression were associated with an increased focus on negative aspects of the past This result is consistent with research findings that experiencing trauma and negative life events is associated with increased aggressive behaviour (e.g. Sansone, Leung, &Wiederman, 2012).

Interestingly, and contrary to expectation, increased reactive and impulsive aggression were not associated with reduced focus on the future TP, suggesting reactive and impulsive aggression are not related to reduced tendency to think about the future. This is a suprising finding given that these types of aggression are usually characterized by a lack of planning and forethought.

In line with past research, emotion regulation abilities and strategies were shown to play an important role in differentially predicting aggression subtypes. As expected, increased difficulties with emotion regulation, and reduced expressive suppression, were shown to be significant predictors of reactive and impulsive aggression. Consistent with past research (e.g. Novaco, 2011), results therefore suggest that individuals who report difficulty inhibiting emotional reactions, have difficulty accepting their emotions, and who have limited emotion regulation strategies are more prone to reactive and impulsive aggression.

One possible interpretation of these findings is that individuals high in reactive and impulsive aggression are, in general, able to adaptively switch between the present and future TPs. However, when they are exposed to situations that potentially evoke strong emotions, such as a perceived provocation, they have difficulty regulating their emotions in the moment. As such, when experiencing strong emotions, individuals high in reactive and impulsive aggression have difficulty 'disengaging' from the present, emotionally salient, TP in order to think about the future, including the potential negative consequences of aggressive behavior, despite the fact that, under conditions of low emotional arousal, they are normally capable of adaptively switching between the present and future. Further research will be needed to explore this hypothesis.

In contrast, increased use of expressive suppression was found to be predictive of increased proactive and premeditated aggression. Results from the present study are therefore consistent with findings that proactive and premeditated aggression are associated with blunted affect (Raine et al., 2006) and reduced emotional reactivity (Marsee & Frick, 2007) and suggest that proactive and premediated aggression are associated with the capacity to suppress anger, and inhibit impulsive, anger-driven, aggressive behaviors (Ramírez & Andreu, 2006). As such, results suggest that an increased propensity to engage in planned and calculated aggression is, partly, predicated on the ability to suppress the tendency to engage in reactive/impulsive aggression.

Interestingly, increased use of cognitive reappraisal as an emotion regulation strategy was found to predict increased proactive, but not, premeditated aggression. This is a surprising result given that reappraisal, the capacity to cognitively reframe an event to change its emotional impact, is generally considered to be an adaptive emotion regulation strategy and is not usually associated with increased aggression (Roberton et al., 2012). Consistent with findings that proactive aggression is associated with callous-unemotional and anti-social

traits (Babcock et al., 2014), one possible explanation for this finding is that individuals reporting increased proactive aggression might cognitively reframe their acts of aggression in order to minimize the distress they cause to their victims (e.g. the victim is 'getting what they deserve').

In addition to the limitations that affect cross-sectional studies (Setia, 2016) relying on self-report data (Paulhus & Vazire, 2005), four main limitation of the present study need to be discussed. First, the present study recruited from a non-clinical sample of adults. While scores on both the IPAS and RPQ were comparable with other non-clinical samples, for example Teten Tharp et al. (2011), it is unclear whether findings from the study generalize to adults with clinically significant levels of anger, aggression and violence.

Second, the sample in the present study was biased toward females (64% female). Research suggests that women tend to be less aggressive than men and tend to engage in more indirect forms of aggression, particularly relational aggression (Denson, O'Dean, Blake, & Beames, 2016). However, a meta-analytic review by Card and colleagues (Card, Stucky, Sawalani, & Little, 2008) suggests that there is a substantial intercorrelation among overt and relational forms of aggression. Further, studies investigating gender differences in reactive and proactive overt and relational aggression have shown a high degree of measurement invariance (e.g. Marsee et al., 2011), suggesting that these constructs are similar for men and women. Additionally, while the IPAS and RPQ tend to focus more on direct physical aggression, it is also important to note that both the IPAS and RPQ have been validated in non-clinical adult samples of both male and female participants (e.g. Cima, Raine, Meesters, & Popma, 2013; Haden, Scarpa, & Stanford, 2008).

Third, due to the high correlation between RPQ reactive and proactive subscales scores, Pearson standardized residuals were generated for these subscales. While this helped to separate out the relationship between TP and 'pure' reactive aggression, and TP with

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'pure' proactive aggression, this distinction is rather artificial (Raine et al., 2006). Results should therefore be interpreted in the context of the fact that aggressive behaviours may be characterised by elements of both reactive and proactive aggression. Finally, the deviation from a balanced TP concept has been subject to theoretical and methodological criticisms. For example, critics suggests that it is based on an overtly Westernized conceptualization of an optimal TP profile, thereby limiting the cross-cultural utility of the model, while empirical research has often failed to find evidence supporting the existence of a balanced TP profile in a range of samples, raising concerns over it clinical utility (McKay et al., 2018). Furthermore, it should be noted that the DBTP coefficient calculation only measures the magnitude of difference between an individual's empirically derived TP and the ideal values identified by Zimbardo and Boyd. As such, the DBTP coefficient is unable to measure whether an individual's TP scores are higher or lower than the ideal values, and it is consequently possible that individuals with vastly different TP profiles can have identical DBTP scores (McKay et al., 2018).

Despite the above limitations, results from the present study suggest a number of avenues for potential intervention with aggressive individuals. Given that emotion regulation difficulties were found to significantly predict reactive and impulsive aggression, while an unbalanced TP was not found to be clinically related to increased reactive and impulsive aggression, it would appear that individuals presenting with these subtypes of aggression would principally benefit from interventions aimed at developing a greater capacity to adaptively regulate emotions. Acceptance- and mindfulness-based interventions might prove effective with this subgroup of aggressors, given that they focus on developing awareness and acceptance of emotions from a non-judgmental, non-reactive stance (Gratz & Tull, 2010). Research also suggests that mindfulness-based interventions increase cognitive flexibility, facilitating the ability to utilise a range of adaptive emotion regulation strategies

(Davis & Nolen-Hoeksema, 2000) and therefore might benefit individuals who present with reactive and impulsive aggression. Interestingly, research also suggests that increased mindfulness is associated with a more balanced TP (Rönnlund et al., 2019), suggesting that mindfulness-based intervention might operate via a common pathway, increasing both emotional and cognitive flexibility.

While the DBTP coefficient was not clinically predictive of increased reactive and impulsive aggression, results from the present study suggest that these types of aggression are associated with increased present-fatalistic and past-negative TPs, which are considered to be 'negative' TPs (Sword, Sword, Brunskill, & Zimbardo, 2014). Time perspective therapy (TPT) is a time-based therapy that focuses on clients' perceptions of their past, present, and future. It is a narrative approach, originally developed to help veterans dealing with service-related post-traumatic stress disorder (PTSD), that aims to help clients develop skills to flexibly move between different TPs, depending on the client's current situation and goals (Sword, Sword, Brunskill, & Zimbardo, 2014).

As has been shown to be effective with other client groups (e.g. Zimbardo, Sword, & Sword, 2012), it is possible that clients who report difficulties with reactive/impulsive aggression might be benefit from TPT interventions aimed at, firstly, reducing their temporal focus on negative TPs, given that these are associated with increased aggression and, secondly, strengthening positive TPs (past-positive and future) in an effort to counteract the effect of negative TPs. For example, clients might be helped to develop their past-positive TP in order to balance their past-negative TP, such as developing an understanding of the positive things that have happened in their past that might have been ignored or overlooked. This would be particularly beneficial for clients who report problems with reactive/impulsive aggression as past-positive TP is associated with an increased ability to regulate emotions,

including the ability to positively reappraise and reframe negative experiences (Matthews & Stolarski, 2015).

As emotion regulation difficulties and an unbalanced TP were not found to be significantly predictive of increased proactive and premeditated aggression, findings from the present study suggest that this subgroup of aggressors would benefit from a different intervention approach. Findings appear consistent with the suggestion that proactive and premeditated aggressors may benefit more from cognitive restructuring interventions (Walters, Frederick, & Schlauch, 2007), focused around efforts to change anti-social, pro-aggression beliefs and assumptions that predispose individuals to acts of aggression (McGuire, 2008).

Further research is needed to understand the relationship between TP, emotion regulation and aggression. In particular, research is needed to explore the causal pathways linking TP and emotion regulation with aggression in order to further the theoretical understanding of aggression and to help guide clinical interventions aimed at treating aggression. As such, both longitudinal and experimental studies are warranted, as are studies using objective measures of aggressive behaviour. Studies investigating the role of TP and emotion regulation in clinical samples of aggressive individuals are also recommended.

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Appendices

Appendix A. Guidelines for publication

Literature review targeted journal: Frontiers in Psychology

<u>Manuscript Guidelines</u>

<u>*Reviews*</u>

Abstract: max 350 words

Figures/Tables: 15
Manuscript max: 12,000 words

<u>Manuscript Length</u>

Frontiers encourages its authors to closely follow the article word count lengths given in the

Summary Table. The manuscript length includes only the main body of the text, footnotes

and all citations within it, and excludes abstract, section titles, figure and table captions,

funding statements, acknowledgments and references in the bibliography. Please indicate the

number of words and the number of figures included in your manuscript on the first page.

<u>Language Style</u>

Authors are requested to follow American English spelling. For any questions regarding style

Frontiers recommends authors to consult the Chicago Manual of Style.

<u>Title</u>

The title is written in title case, centered, and in 16 point bold Times New Roman font at the

top of page.

The title should be concise, omitting terms that are implicit and, where possible, be a statement of the main result or conclusion presented in the manuscript. Abbreviations should be avoided within the title.

Witty or creative titles are welcome, but only if relevant and within measure. Consider if a title meant to be thought-provoking might be misinterpreted as offensive or alarming. In extreme cases, the editorial office may veto a title and propose an alternative.

Authors and Affiliations

All names are listed together and separated by commas. Provide exact and correct author names as these will be indexed in official archives. Affiliations should be keyed to the author's name with superscript numbers and be listed as follows: Laboratory, Institute, Department, Organization, City,

State abbreviation (USA, Canada, Australia), and Country (without detailed address information such as city zip codes or street names).

Headings and Sub-headings

Except for special names (e.g. GABAergic), capitalize only the first letter of headings and subheadings. Headings and subheadings need to be defined in Times New Roman, 12, bold. You may insert up to 5 heading levels into your manuscript (not more than for example: 3.2.2.1.2 Heading title).

Abstract

As a primary goal, the abstract should render the general significance and conceptual advance of the work clearly accessible to a broad readership. In the abstract, minimize the use of

abbreviations and do not cite references. The text of the abstract section should be in 12 point normal Times New Roman.

Keywords

All article types: you may provide up to 8 keywords; at least 5 are mandatory.

Text

The body text is in 12-point normal Times New Roman. New paragraphs will be separated with a single empty line. The entire document should be single-spaced and should contain page and line numbers in order to facilitate the review process. Your manuscript should be written using either LaTeX or MS-Word.

Nomenclature

The use of abbreviations should be kept to a minimum. Non-standard abbreviations should be avoided unless they appear at least four times, and defined upon first use in the main text. Consider also giving a list of non-standard abbreviations at the end, immediately before the Acknowledgments.

Sections

Your manuscript is organized by headings and subheadings. For Original Research Articles, it is recommended to organize your manuscript in the following sections or their equivalents for your field:

Introduction

Succinct, with no subheadings.

Material and Methods

This section may be divided by subheadings. This section should contain sufficient detail so that when read in conjunction with cited references, all procedures can be repeated. For experiments reporting results on animal or human subject research, an ethics approval statement should be included in this section.

Results

This section may be divided by subheadings. Footnotes should not be used and have to be transferred into the main text.

Discussion

This section may be divided by subheadings. Discussions should cover the key findings of the study: discuss any prior art related to the subject so to place the novelty of the discovery in the appropriate context; discuss the potential short-comings and limitations on their interpretations; discuss their integration into the current understanding of the problem and how this advances the current views; speculate on the future direction of the research and freely postulate theories that could be tested in the future.

References

All citations in the text, figures or tables must be in the reference list and vice-versa. The references should only include articles that are published or accepted. For accepted but unpublished works use "in press" instead of page numbers. Unpublished data, submitted manuscripts, or personal communications should be cited within the text only, for the article types that allow such inclusions. Personal communications should be documented by a letter

of permission. Any inclusion of verbatim text must be contained in quotation marks and clearly reference the original source.

Reference list: provide the names of the first six authors followed by et al and doi when available.

Empirical paper targeted journal: Aggressive Behavior

Manuscript Guidelines

Research Articles

Abstract, Introduction, Materials and Methods, Results, and Discussion sections are required.

The literature review should be succinct. Full research papers should be as concise as

possible, without sacrificing documentation of the results, and be limited to 30 pages

including the abstract, text, references, tables and figures.

Manuscripts must be word processed, double spaced using a <u>standard 12-point font</u>, such as

Times New Roman or Arial, and must follow APA Style (Publication Manual, 6th edition)

Parts of the Manuscript

Main Text File

The manuscript main text file should be presented in the following order:

> Title
> The full names of the authors
> The author's institutional affiliations where the work was carried out, with a footnote
> for the author's present address if different from where the work was carried out
> Abstract and keywords
> Main text
> References

Title

The title should be a short informative title that contains the major key words. The title

should not contain abbreviations.

Abstract

Authors should provide an abstract of 250 words or less that will serve in lieu of a concluding

summary. It should succinctly state the objectives, experimental design of the paper, and

principal observations and conclusions. An abstract should contain the major keywords, and it should be intelligible without reference to the rest of the paper.

Keywords

Please provide up to seven keywords. Keywords should be taken from those recommended by the US National Library of Medicine's Medical Subject Headings (MeSH) browser list at www.nlm.nih.gov/mesh.

Main Text

The text should be presented in the following order: Introduction; Methods; Results; Discussion (including limitations and implications). The journal uses US spelling. Authors may submit using any form of English as the spelling of accepted papers is converted to US English during the production process.

References

References should be prepared according to the *Publication Manual of the American Psychological Association* (6th edition). This means in text citations should follow the author-date method whereby the author's last name and the year of publication for the source should appear in the text, for example, (Jones, 1998). The complete reference list should appear alphabetically by name at the end of the paper. Please note that a DOI should be provided for all references where available. Please note that for journal articles, issue numbers are not included unless each issue in the volume begins with page one.

Tables

Tables should be self-contained and complement, but not duplicate, information contained in the text. They should be numbered in order of appearance in the text, and presented in numerical order. Each table should be identified by number and should have a title. All abbreviations must be defined in footnotes. Footnote symbols: Lowercase superscript letters (a, b, c) etc... should be used and *, **, *** should be reserved for *P*-values. Statistical

measures such as standard deviation (SD) or standard error of the mean (SEM) should be

identified in the headings.

Appendix B: Literature review quality assessment

Table B1. Quality assessment data

		Apostolidis, Fieulaine, Simonin, et al. (2006)	Apostolidis, Fieulaine, & Soulé, (2006)	Barnett et al. (2013)	Chavarria et al. (2015)	Daugherty & Brase, (2010)	Fieulaine & Martinez, (2012)	Henson et al. (2006)	Johnson et al. (2010)	Klingemann, (2001)	Petry et al. (1998)	Pluck et al. (2008)	Steiger et al. (2017)	Zentsova & Leonov, (2013)
1.	Explicit theoretical framework	3	2	2	3	3	3	3	3	2	2	2	2	1
2.	Statement of aims/objectives in main body of report	3	2	2	3	2	3	3	2	2	2	2	2	2
3.	Clear description of research setting	2	2	2	1	2	2	2	3	3	2	2	2	1
4.	Evidence of sample size considered in terms of analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
5.	Representative sample of target group of a reasonable size	2	2	2	2	1	2	2	2	3	2	2	2	1
6.	Description of procedure for data collection	3	2	3	2	2	2	3	2	2	2	2	2	1
7.	Rationale for choice of data collection tool(s)	3	2	2	2	3	2	3	2	3	1	2	2	1
8.	Detailed recruitment data	3	3	3	3	2	2	2	2	3	2	3	3	1

		Apostolidis, Fieulaine, Simonin, et al. (2006)	Apostolidis, Fieulaine, & Soulé, (2006)	Barnett et al. (2013)	Chavarria et al. (2015)	Daugherty & Brase, (2010)	Fieulaine & Martinez, (2012)	Henson et al. (2006)	Johnson et al. (2010)	Klingemann, (2001)	Petry et al. (1998)	Pluck et al. (2008)	Steiger et al. (2017)	Zentsova & Leonov, (2013)
9.	Statistical assessment of reliability and validity of measurement tool(s)	3	3	3	3	2	3	3	0	3	0	2	2	0
10.	Fit between stated research question and method of data collection	3	3	3	3	3	3	3	3	3	3	3	3	3
11.	Fit between research question and method of analysis	3	3	3	3	3	3	3	3	3	2	3	3	3
12.	Good justification for analytic method selected	3	2	2	2	2	2	3	2	2	2	2	2	1
13.	Evidence of user involvement in design	0	0	0	0	0	0	0	0	0	0	0	0	0
14.	Strengths and limitations critically discussed	2	2	2	2	0	2	2	0	2	1	1	3	0
15.	Total	34	28	29	30	25	29	32	24	31	21	26	28	15
16.	Quality %	87	72	74	77	64	74	82	62	79	54	67	72	38

Appendix C: Measures

Demographics

1. To which gender identity do you most identify?

    o   Male
    o   Female
    o   Other (please state) _____
    o   Prefer not to say

2. What is your age (in years)?

    o   Age (please state) _____
    o   Prefer not to say

3. To which of these ethnic groups do you feel you belong?

    o   White: British
    o   White: Irish
    o   White: Any other white background
    o   Mixed: White and black Caribbean
    o   Mixed: White and black African
    o   Mixed: White and Asian
    o   Mixed: Any other mixed background
    o   Asian or Asian British: Indian
    o   Asian or Asian British: Pakistani
    o   Asian or Asian British: Bangladeshi
    o   Asian or Asian British: Any other Asian background
    o   Black or black British: Caribbean
    o   Black or black British: African
    o   Black or black British: Any other black background
    o   Other ethnic group: Chinese
    o   Other ethnic group: Another ethnic group (please state) _____
    o   Prefer not to say

Zimbardo Time Perspective Inventory (ZTPI)

Read each item and, as honestly as you can, answer the question: "How characteristic or true is this of you?" Choose the appropriate box using the scale below.

1=very uncharacteristic, 2=uncharacteristic, 3=neutral, 4=characteristic, 5=very characteristic

		1	2	3	4	5
1.	I believe that getting together with one's friends to party is one of life's important pleasures.					
2.	Familiar childhood sights, sounds, smells often bring back a flood of wonderful memories.					
3.	Fate determines much in my life.					
4.	I often think of what I should have done differently in my life.					
5.	My decisions are mostly influenced by people and things around me.					
6.	I believe that a person's day should be planned ahead each morning.					
7.	It gives me pleasure to think about my past.					
8.	I do things impulsively.					
9.	If things don't get done on time, I don't worry about it.					
10.	When I want to achieve something, I set goals and consider specific means for reaching those goals.					
11.	On balance, there is much more good to recall than bad in my past.					
12.	When listening to my favorite music, I often lose all track of time.					
13.	Meeting tomorrow's deadlines and doing other necessary work comes before tonight's play.					
14.	Since whatever will be will be, it doesn't really matter what I do.					
15.	I enjoy stories about how things used to be in the "good old times."					
16.	Painful past experiences keep being replayed in my mind.					
17.	I try to live my life as fully as possible, one day at a time.					
18.	It upsets me to be late for appointments.					
19.	Ideally, I would live each day as if it were my last.					
20.	Happy memories of good times spring readily to mind.					
21.	I meet my obligations to friends and authorities on time.					
22.	I've taken my share of abuse and rejection in the past.					
23.	I make decisions on the spur of the moment.					
24.	I take each day as it is rather than try to plan it out.					
25.	The past has too many unpleasant memories that I prefer not to think about.					
26.	It is important to put excitement in my life.					
27.	I've made mistakes in the past that I wish I could undo.					
28.	I feel that it's more important to enjoy what you're doing than to get work done on time.					
29.	I get nostalgic about my childhood.					
30.	Before making a decision, I weigh the costs against the benefits.					
31.	Taking risks keeps my life from becoming boring.					
32.	It is more important for me to enjoy life's journey than to focus only on the destination.					
33.	Things rarely work out as I expected.					

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34. It's hard for me to forget unpleasant images of my youth.
35. It takes joy out of the process and flow of my activities, if I have to think about goals, outcomes, and products.
36. Even when I am enjoying the present, I am drawn back to comparisons with similar past experiences.
37. You can't really plan for the future because things change so much.
38. My life path is controlled by forces I cannot influence.
39. It doesn't make sense to worry about the future, since there is nothing that I can do about it anyway.
40. I complete projects on time by making steady progress.
41. I find myself tuning out when family members talk about the way things used to be.
42. I take risks to put excitement in my life.
43. I make lists of things to do.
44. I often follow my heart more than my head.
45. I am able to resist temptations when I know that there is work to be done.
46. I find myself getting swept up in the excitement of the moment.
47. Life today is too complicated; I would prefer the simpler life of the past.
48. I prefer friends who are spontaneous rather than predictable.
49. I like family rituals and traditions that are regularly repeated.
50. I think about the bad things that have happened to me in the past.
51. I keep working at difficult, uninteresting tasks if they will help me get ahead.
52. Spending what I earn on pleasures today is better than saving for tomorrow's security.
53. Often luck pays off better than hard work.
54. I think about the good things that I have missed out on in my life.
55. I like my close relationships to be passionate.
56. There will always be time to catch up on my work.

Scoring:

5 items are reverse coded (9, 24, 25, 41, & 56):
Past Negative: Sum items 4, 5, 16, 22, 27, 33, 34, 36, 50, & 54.
Past Positive: Sum items 2, 7, 11, 15, 20, 25, 29, 41, & 49.
Present Fatalistic: Sum items 3, 14, 35, 37, 38, 39, 47, 52, & 53.
Present Hedonistic: Sum items 1, 8, 12, 17, 19, 23, 26, 28, 31, 32, 42, 44, 46, 48, & 55.
Future: Sum items 6, 9, 10, 13, 18, 21, 24, 30, 40, 43, 45, 51, 56

Reactive-proactive Aggression Questionnaire (RPQ)

There are times when most of us feel angry, or have done things we should not have done. Rate each of the items below by choosing never, sometimes, or often. Do not spend a lot of time thinking about the items—just give your first response.

How often have you…

	Never	sometimes	often
1. Yelled at others when they have annoyed you			
2. Had fights with others to show who was on top			
3. Reacted angrily when provoked by others			
4. Taken things from other people			
5. Gotten angry when frustrated			
6. Vandalized something for fun			
7. Had temper tantrums			
8. Damaged things because you felt mad			
9. Had a gang fight to be cool			
10. Hurt others to win a game			
11. Become angry or mad when you don't get your way			
12. Used physical force to get others to do what you want			
13. Gotten angry or mad when you lost a game			
14. Gotten angry when others threatened you			
15. Used force to obtain money or things from others			
16. Felt better after hitting or yelling at someone			
17. Threatened and bullied someone			
18. Made obscene phone calls for fun			
19. Hit others to defend yourself			
20. Gotten others to gang up on someone else			
21. Carried a weapon to use in a fight			
22. Gotten angry or mad or hit others when teased			
23. Yelled at others so they would do things for you			

Scoring:

Proactive aggression items (2, 4, 6, 9, 10, 12, 15, 17, 18, 20, 21, 23) and reactive items (1, 3, 5, 7, 8, 11, 13, 14, 16, 19, 22) are summated to form proactive and reactive scales.

Impulsive-premeditated aggression scale (IPAS)

When people become frustrated, angry or enraged they express that anger in a variety of ways. Considering your aggressive acts from the past please answer the following questions. An aggressive act is defined as striking and/or verbally insulting another person or breaking/throwing objects because you were angry or frustrated.

Your possible answers are:

Strongly Agree = **SA**, Agree = **A**, Neutral = **N**, Disagree = **D**, Strongly Disagree = **SD**

	SA	**A**	**N**	**D**	**SD**

1. I planned when and where my anger was expressed.
2. I felt my outbursts were justified.
3. When angry I reacted without thinking.
4. I typically felt guilty after the aggressive acts.
5. I was in control during the aggressive acts.
6. I feel my actions were necessary to get what I wanted.
7. I usually can't recall the details of the incidents well.
8. I understood the consequences of the acts before I acted.
9. I feel I lost control of my temper during the acts.
10. Sometimes I purposely delayed the acts until a later time.
11. I felt pressure from others to commit the acts.
12. I wanted some of the incidents to occur.
13. I feel some of the incidents went too far.
14. I think the other person deserved what happened to them during some of the incidents.
15. I became agitated or emotionally upset prior to the acts.
16. The acts led to power over others or improved social status for me.
17. I was under the influence of alcohol or other drugs during the acts.
18. I knew most of the persons involved in the incidents.
19. I was concerned for my personal safety during the acts.
20. Some of the acts were attempts at revenge.
21. I feel I acted out aggressively more than the average person over the last six months.
22. I was confused during the acts.
23. Prior to the incidents I knew an altercation was going to occur.
24. My behavior was too extreme for the level of provocation.
25. My aggressive outbursts were usually directed at a specific person.
26. I consider the acts to have been impulsive.
27. I was in a bad mood the day of the incident.
28. The acts were a "release" and I felt better afterwards.
29. I am glad some of the incidents occurred.
30. I am glad some of the incidents occurred.
Scoring:

Ten of the items (3,4,7,9,13,15,21,24,26,27) focus on impulsive aggressive characteristics and 8 items (1,2,6,10,12,14,20,29) focus on premeditated aggressive

characteristics. The remaining 12 items are not scored. Items scores are then added to obtain an Impulsive Aggression and Premeditated Aggression score.

Emotion regulation Questionnaire (ERQ)

We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale:

1-----------------2------------------3-----------------4-----------------5-----------------6-----------------7

Strongly   Neutral   Strongly
Disagree   Agree

                                                                        1   2   3   4   5   6   7

1. When I want to feel more *positive* emotion (such as joy or amusement), I *change what I'm thinking about*.
2. I keep my emotions to myself.
3. When I want to feel less *negative* emotion (such as sadness or anger), I *change what I'm thinking about*.
4. When I am feeling *positive* emotions, I am careful not to express them.
5. When I'm faced with a stressful situation, I make myself *think about it* in a way that helps me stay calm.
6. I control my emotions by *not expressing them*.
7. When I want to feel more *positive* emotion, I *change the way I'm thinking* about the situation.
8. I control my emotions by *changing the way I think* about the situation I'm in.
9. When I am feeling *negative* emotions, I make sure not to express them.
10. When I want to feel less *negative* emotion, I *change the way I'm thinking* about the situation.

Scoring:

Reappraisal scale: sum items 1, 3, 5, 7, 8, 10.
Suppression scale: sum items 2, 4, 6, 9.

Difficulties with emotion regulation scale (DERS)

Please indicate how often the following 36 statements apply to you by writing the appropriate number from the scale below (1 – 5) in the box alongside each item.

1= Almost never (0-10%), 2= Sometimes (11-35%), 3=About half the time (36-65%), 4= Most of the time (66-90%), 5= Almost always (91-100%)

	1 2 3 4 5

1. I am clear about my feelings
2. I pay attention to how I feel
3. I experience my emotions as overwhelming and out of control
4. I have no idea how I am feeling
5. I have difficulty making sense out of my feelings
6. I am attentive to my feelings
7. I know exactly how I am feeling
8. I care about what I am feeling
9. I am confused about how I feel
10. When I'm upset, I acknowledge my emotions
11. When I'm upset, I become angry with myself for feeling that way
12. When I'm upset, I become embarrassed for feeling that way
13. When I'm upset, I have difficulty getting work done
14. When I'm upset, I become out of control
15. When I'm upset, I become out of control
16. When I'm upset, I become out of control
17. When I'm upset, I believe that my feelings are valid and important
18. When I'm upset, I have difficulty focusing on other things
19. When I'm upset, I feel out of control
20. When I'm upset, I can still get things done
21. When I'm upset, I feel ashamed with myself for feeling that way
22. When I'm upset, I know that I can find a way to eventually feel better
23. When I'm upset, I feel like I am weak
24. When I'm upset, I feel like I can remain in control of my behaviours
25. When I'm upset, I feel guilty for feeling that way
26. When I'm upset, I have difficulty concentrating
27. When I'm upset, I have difficulty controlling my behaviours
28. When I'm upset, I believe that there is nothing I can do to make myself feel better
29. When I'm upset, I become irritated with myself for feeling that way
30. When I'm upset, I start to feel very bad about myself
31. When I'm upset, I believe that wallowing in it is all I can do
32. When I'm upset, I lose control over my behaviours
33. When I'm upset, I have difficulty thinking about anything else
34. When I'm upset, I take time to figure out what I'm really feeling

35. When I'm upset, it takes me a long time to feel better
36. When I'm upset, my emotions feel overwhelming

Scoring:

Reverse-scored items are numbered 1, 2, 6, 7, 8, 10, 17, 20, 22, 24 and 34. The measure yields a total sum score.

Appendix D: Power calculation
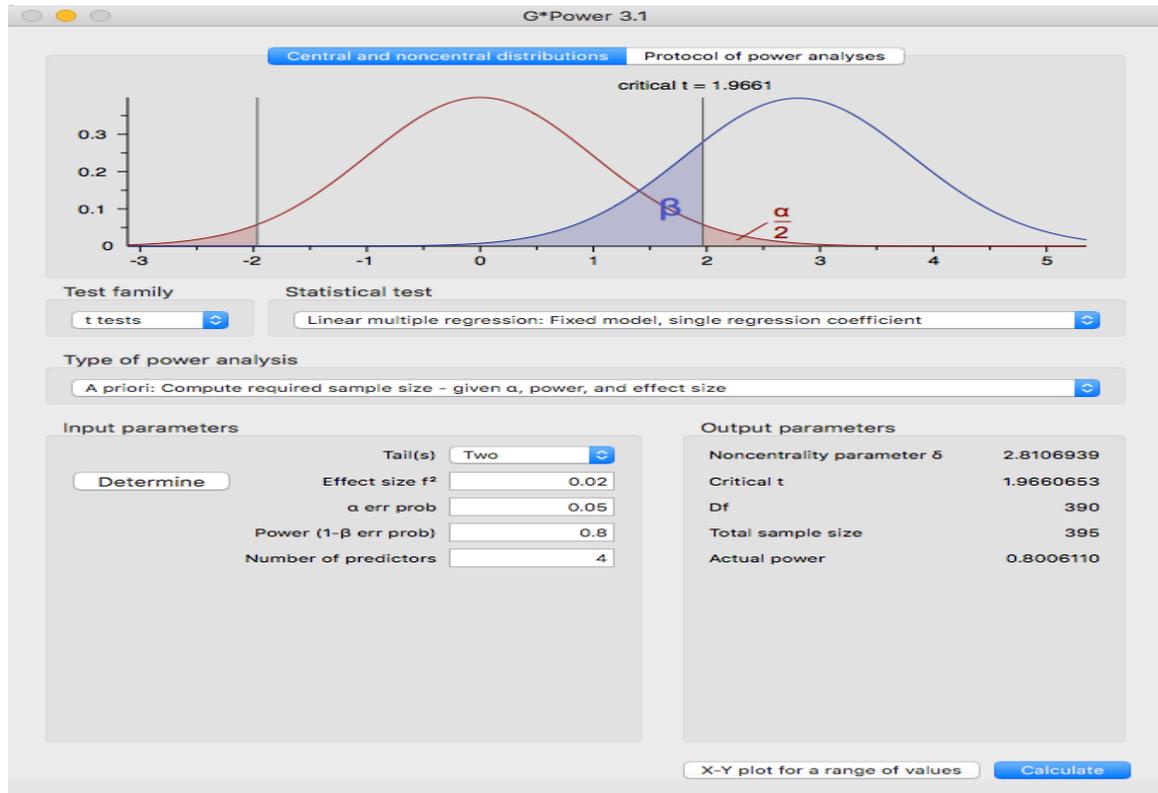
Appendix E: Ethical approvals

D.Clin.Psychology Programme
Division of Clinical Psychology
Whelan Building, Quadrangle
Brownlow Hill
LIVERPOOL
L69 3GB

Tel: 0151 794 5530/5534/5877
Fax: 0151 794 5537
www.liv.ac.uk/dclinpsychol

Tom Merrill
Clinical Psychology Trainee
Doctorate of Clinical Psychology Doctorate Programme
University of Liverpool
L69 3GB

11 December 2018

RE: Time perspective and aggression: Subjective orientation in time as a predictor of impulsive and premeditated aggression in an adult sample
Trainee: Tom Merrill
Supervisors: Steven Gillespie & Luna Centifanti

Dear Tom,

Thank you for re-submitting your revised research proposal to the DClinPsychol Research Review Committee (RRC). Your proposal has been reviewed by two independent readers whose feedback has been provided to the Committee, which was then discussed before reaching a decision. The Committee thought your revised proposed satisfactorily addressed the points raised.

The Committee has decided to **formally** approve your proposal.

I can now confirm that your revised proposal and research budget meet the requirements of the RRC and has been approved by the Committee and Chair.

Please take this decision as **final** approval from the committee.

You may now progress to the next stages of your research.

I wish you well with your research project.

Dr Ross White
Chair D.Clin.Psychol. Research Review Committee.

A member of the
Russell Group

Dr Laura Golding	Dr Gundi Kiemle	Dr Jim Williams	Dr Beth Greenhill	Dr Ross White	Mrs Sue Knight
Programme Director	Academic Director	Joint Clinical Director	Joint Clinical Director	Research Director	Programme Co-ordinator
l.golding@liv.ac.uk	gkiemle@liv.ac.uk	j.r.williams@liv.ac.uk	bethg@liv.ac.uk	rgwhite@liv.ac.uk	sknight@liv.ac.uk

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

28 March 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:	4637
Project Title:	What is the relationship between the way that people think about time and how aggressive they are?
Principal Investigator/Supervisor:	Dr Steven Gillespie
Co-Investigator(s):	Mr Tom Merrill, Dr Luna Centifanti
Lead Student Investigator:	-
Department:	Department of Psychological Sciences
Approval Date:	28/03/2019
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 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	Merrill, Tom_RRC Outcome	25/10/2018	1
Questionnaire	IPAS (lifetime)	19/12/2018	1
Questionnaire	RPQ	19/12/2018	1
Questionnaire	ERQ	19/12/2018	1
Questionnaire	DERS	19/12/2018	1
Questionnaire	ZTPI	19/12/2018	1
Participant Consent Form	Consent form (Ver2)(15.2.19)	15/02/2019	2
Debriefing Material	Debrief material (15.02.19) (Ver2)	15/02/2019	2
Participant Information Sheet	Participant information sheet (ver2) (15.02.19)	15/02/2019	2
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Appendix F: Information sheet, consent form, and debriefing sheet

1. Title of Study

What is the relationship between the way that people think about time and how aggressive they are?

2. Version Number and Date

Version 2

15th February 2019

3. Invitation to participate in a research study

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.

4. What is the purpose of the study?

The research is being conducted by Tom Merrill, who is a trainee clinical psychologist working towards completing the doctorate in clinical psychology at the University of Liverpool. The research is being conducted as part of the requirements for completing the doctorate in clinical psychology.

The study aims to investigate the relationship between the way that people think about time and how angry or aggressive they tend to be. It is hoped that the findings of this study will help psychologists to better understand why some people behave aggressively and help in the development of treatments for anger and aggression.

5. How will participants be selected?

To take part in the study you must be an adult (aged 18 years or older) and be fluent in spoken and written English. We aim to include individuals from a range of backgrounds, and therefore you will be asked to provide brief demographic details such as your age and ethnicity. You will not be identifiable from your demographic details. The study aims to recruit 395 people.

6. Do I have to take part?

No, participation in this study is voluntary. You are free to withdraw at any time without explanation and without incurring a disadvantage.

7. What will happen if I take part?

If you take part in the study you will be asked to provide some brief demographic information (such as your age and gender) and you will complete some questionnaires. The questionnaires will involve reading a series of statements and rating the extent to which these statements are true of you. Some of the statements will be about times you might have got angry or acted aggressively in the past, other will be about how you think about your past, present, and future. There will also be some statements about how you manage your emotions.

Completing the questionnaires should take approximately 30 minutes. You will be required to fully complete all of the questionnaires.

8. How will my data be used?

The University 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. The study supervisor, 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 Dr Gillespie.

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

How will my data be collected?	You will complete an online survey

How will my data be stored?	Your data will be securely and anonymously stored online.
How long will my data be stored for?	Your data will be stored for a period of 10 years, in line with University of Liverpool research guidelines and the British Psychological Society's Code of Human Research Ethics
Will my data be anonymised?	Yes, your data will be fully anonymous
How will my data be used?	Your data will contribute towards a dissertation thesis. It is also anticipated that the finding of the study will be submitted for publication in a peer reviewed journal and will be disseminated at conferences. A lay summary of the study will be made available.
Who will have access to my data?	Tom Merrill-Student Investigator
	Dr Steven Gillespie-Primary supervisor
	Dr Luna Centifanti-Secondary supervisor
Will my data be archived for use in other research projects in the future?	Data from the study will be securely archived. Following publication of reports, anonymous data may be made openly available, for example to other researchers upon request, consistent with open research practices.
How will my data be destroyed?	All data will be deleted.

9. Expenses and / or payments

As a recognition of your time and effort in taking part in this study you will have the opportunity to enter into a prize draw to win one of three amazon vouchers. The prizes available are:

1x£50 amazon voucher
2x£25 amazon voucher

10. Are there any risks in taking part?

Sometimes thinking about times in the past when you might have got angry or behaved aggressively can be upsetting. If you have found taking part in the study distressing and you would like some support with this, then please follow the link below. The link will take you to a website, where you will be able to find information about managing anger and aggression, as well as contact details for relevant support services.

https://www.mind.org.uk/information-support/types-of-mental-health-problems/anger

You can also talk to your G.P about sources of support for managing anger and aggression and you can access your local Accident and Emergency (A&E) department if you need immediate and urgent support.

The above information will also be available on completion of the study, but we request that you take a note of it now in the event that you start the study but decide not to complete it.

11. Are there any benefits in taking part?

Although there are no immediate personal benefits in taking part in this study it is anticipated the data gathered will help us to understand why people get angry and act aggressively.

12. What will happen to the results of the study?

Data collected during this study will be used to produce a research dissertation which will contribute towards the research requirement of the doctorate in clinical psychology. It is also anticipated the research will be published in a peer reviewed psychology journal. All data collected will remain anonymous and you will not be identifiable from the published results of the study. A summary of the findings of the study will also be made available. If you wish to receive a copy of the summary, please contact Tom Merrill at tom.merrill@liverpool.ac.uk.

13. What will happen if I want to stop taking part?

You are free to stop taking part in the study at any time. To exist the study please close the browser window. You can do this for any reason and without explanation. As it will not be possible to identify you from your data, you will not be able to request access to or withdraw any information you provide.

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

If you are unhappy, or if there is a problem, please feel free to let us know by contacting Tom Merrill at tom.merrill@liverpool.ac.uk and we will try to help. If you remain unhappy or have a complaint which you feel you cannot come to us with then you should 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 description of the study (so that it can be identified), the researcher(s) involved, and the 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.

15. Who can I contact if I have further questions?

If you have further questions, please contact Tom Merrill

Address: Division of Clinical Psychology
The Whelan Building
The Quadrangle
Brownlow Hill
Liverpool
L69 3GB
Telephone: 0151 794 5530
Email: tom.merrill@liverpool.ac.uk

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Participant consent page

Research ethics approval number: 4637

Title of the research project: What is the relationship between the way that people think about time and how aggressive they are?

Researcher: Tom Merrill

Supervisors: Dr Steven Gillespie and Dr Luna Centifianti

1. I confirm that I have read and have understood the information page dated 15th February 2019 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that taking part in the study involves completing questionnaires. ☐

3. I understand that taking part in the study involves thinking about times when I might have got angry or acted aggressively and that this could potentially be upsetting or distressing. ☐

4. 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 and without my rights being affected. ☐

5. I understand that the information I provide will be fully anonymous, that it will not be possible to identify me from the information I provide, and that I will not be able to request access to or withdraw any information I provide. ☐

6. I understand that the information I provide will be held securely and in line with data protection requirements at the University of Liverpool, that it will be fully anonymous, and will be deposited on the secure University M-drive for sharing and use by other authorised researchers to support other research in the future. Anonymous data may be made openly available online, such as through a peer review journal, consistent with open research practices. ☐

7. I understand that the information I provide will be retained for a period of 10 years after the completion of the study, in line with University of Liverpool research guidelines and the British Psychological Society's Code of Human Research Ethics. ☐

8. I agree to take part in the above study. ☐

UNIVERSITY OF LIVERPOOL

Debriefing page

Research ethics approval number: 4637

Title of the research project: What is the relationship between the way that people think about time and how aggressive they are?

Researcher: Tom Merrill

Supervisors: Dr Steven Gillespie and Dr Luna Centifianti

Thank you for taking part in the study.

The main aim of the study is to investigate the relationship between the way people think about their past, present, and future and how aggressive they tend to be. Sometimes thinking about times in the past when you might have behaved aggressively can be upsetting. If you have found taking part in the study distressing and you would like some support with this, then please follow the link below. The link will take you to a website, where you will be able to find information about managing anger and aggression, as well as contact details for relevant support services.

https://www.mind.org.uk/information-support/types-of-mental-health-problems/anger

You can also talk to your G.P about sources of support for managing anger and aggression and you can access your local Accident and Emergency (A&E) department if you need immediate and urgent support.

Thank you again for your participation in this study.

Appendix G: Normality Testing

Data for all subscales and the DBTP coefficient were explored for normality assumptions testing using skewness and kurtosis values. An absolute skew value larger than 2 or an absolute kurtosis larger than 7 were used as the reference value for determining substantial non-normality. All subscales were normal, meeting assumptions for parametric testing, except for the RPQ Proactive subscale, which was significantly positively skewed and leptokurtic. Full results are displayed in Table G1.

Table G1. Normality testing results for all subscales and DBTP coefficient.

Measure	Subscale	Skewness (SE)	Kurtosis (SE)
IPAS	Impulsive	-.08 (.12)	.461(.25)
	Premeditated	-.11 (.12)	-.21 (.25)
RPQ	Reactive	.51 (.12)	-.02 (.25)
	Proactive	2.26 (.12)	9.9 (.25)
ERQ	Reappraisal	-.37 (.12)	.10 (.25)
	Suppression	-.09 (.12)	-.61 (.25)
DERS		.41 (.12)	.05 (.25)
ZTPI	Past-Negative	-.04 (.12)	-.65 (.25)
	Past-Positive	-.44 (.12)	.15 (.25)
	Present-Hedonism	-.09 (.12)	-.12 (.25)
	Present-Fatalism	-04 (.12)	-.44 (.25)
	Future	-.19 (.12)	.06 (.25)
DBTP coefficient		.22 (.12)	-.30 (.25)

Notes: IPAS=Impulsive-reactive aggression scale; RPQ=Reactive-proactive aggression questionnaire; ERQ=Emotion regulation questionnaire; DERS= Difficulties in emotional regulation scales; ZTPI=Zimbardo time perspective inventory; DBTP= Deviation from a balanced time perspective.

Regression normality testing

Upon inspection of histogram and P-P plots, RPQ Reactive, IPAS Impulsive and IPA Premediated residuals were normally distributed. RPQ Proactive residuals showed a negative binomial distribution. For each model, bivariate relationships between depended and independent variables were linear following visual inspection of scatterplots. For each model, there was evidence of homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. No multicollinearity was detected in Variance Inflation Factors (VIF), all VIF scores were below ten and tolerances

were above .2. No outliers were found to be influencing any of the models, all Cook's distance values were below one. There was independence of residuals in all models, as assessed by a Durbin-Watson statistic of between 1.8 and 2.1.