Narcissistic Traits and Social Decision-making behaviours; an Exploration through the Information Sampling Trust Game

Markey, Oscar

Universiteit Leiden

Psychologie
Faculteit der Sociale Wetenschappen

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Master Thesis Child & Adolescent Psychology

Date: 09/05/2022

Student number: s3106381

Supervisor: Dr. Ili Ma

Second reader: Dr. Bart Vogelaar

Contents

Abstract

The Information Sampling Trust Game (ISTG) is an updated model of the classic trust game – a paradigm originally designed to assess the perceived benefit of information acquisition prior to making a decision in comparison to the potential cost; financial, social, or otherwise. Previous studies have suggested that narcissistic traits may also influence the decision to invest socially in another individual; that is, whether or not to place one's trust in another person (Franken, 2016). In addition, previous studies have suggested that both narcissistic traits and information sampling behaviours develop throughout adolescence (Jenkins, 2019; Ma, Westhoff, et al., 2020). Results from the ISTG - in terms of information sampled and proportion of investments - in a group of 157 adolescent participants (10-24) were investigated in relation to the narcissistic traits of the participants; the effects of age on this relationship were also investigated. A significant relationship was found between N-R trait scores and proportion of investments. Results also suggested that this relationship varied between age groups; with younger age groups (10-14 and 15-18 year olds) showing a positive relationship between N-R traits and proportion of investments, while adults (19-24 year olds) showed an inverse relationship. Neither a significant relationship between N-A and trust decisions nor significant effects on sampling were found. These findings indicate that N-R traits in particular have a relationship with social decision-making behaviours, and that this relationship between narcissism and social behaviour may change throughout adolescent development.

Layman's Abstract

A game was designed to assess the social decision-making behaviours of individuals, in terms of the amount of information they chose to sample before making a decision, and how often the decision was made to trust another player; the aim of this study was to use this game to investigate how narcissism may influence information sampling and decision-making. The game was played by 157 participants between the ages of 10 and 24. These participants also completed a brief questionnaire assessing their narcissistic traits, split between narcissistic admiration (striving for uniqueness, increased thoughts of grandiosity, self-assuredness) and narcissistic rivalry (wanting others to fail, devaluing thoughts about others, aggression/impulsivity). Upon analysing the relationship between these narcissistic traits and decision-making behaviours, a relationship was found between high levels of narcissistic rivalry and a lower number of decisions to trust others in the social game. Further analysis suggested that this was most often the case in the older participants, between the ages of 19 and 24, while younger participants invested more often when possessing high levels of narcissistic rivalry. This may be due to a tendency toward risk-seeking behaviour in young-middle adolescence; it may also be related to lower levels of self-control at younger ages.

Introduction

Narcissism is an aspect of human psychology first crystalised into a measurable concept by Ellis in the early 20th century (Ellis, 1927) and featured prominently in the Freudian movement (Millon et al., 2004). Later in the 20th century, narcissism was defined as a pattern of grandiosity, need for admiration, and lack of empathy; with this list of traits forming the basis for several popular models of narcissism, the Narcissistic Personality Inventory (NPI) being the most widely used of these (Raskin & Hall, 1979). In addition, these factors form the diagnostic criteria for narcissistic personality disorder as defined in the Diagnostic and Statistical Manual of Mental Disorders (DSM) (American Psychiatric Association, 2013).

However, both the DSM, and the measures associated with its definition of narcissism, are limited in that they only address the grandiose variant of narcissism. Since their conception, a second distinctive variant of narcissism, vulnerable narcissism, has been identified by multiple studies (Russ et al., 2008; Wink, 1991)– defined by defensiveness, sensitivity, and withdrawal from others – with the same overall goal as grandiose narcissism, i.e. the maintenance of the grandiose self. This subtype of narcissism is overlooked by the NPI and undiagnosed by the DSM. The Narcissistic Admiration and Rivalry Questionnaire (NARQ) is a modern tool aiming to act as a replacement or update for the NPI; altering the measurement of narcissistic personality traits to include both variants under the names 'narcissistic admiration' (N-A) and 'narcissistic rivalry' (N-R) (Back et al., 2013).

High N-A scores indicate a personality style directed toward the goal of achieving the admiration of others through self-enhancement. Behaviours associated with this can be split into three subsections, each influencing the other: striving for uniqueness (e.g. showing off your successes, believing that being special gives you strength) and increased thoughts of grandiosity (e.g. I will be famous someday; I deserve to be thought of as great) both leading to a more charming, self-assured demeanour (e.g. consistently managing to be the centre of attention). Reaching the desired effect – i.e. increased social standing – will lead to a repeat of the cycle.

Narcissistic rivalry (N-R) can almost be thought of as the negative flip side of narcissistic admiration. The main underlying aim of N-R is self-protection; based on the underlying belief that others are jealous or generally antagonistic toward your grandiose self. An individual with high N-R traits will be motivated to maintain or reinstate their superior status over social rivals (e.g. wanting rivals to fail, enjoying when someone else does worse than them), leading to devaluing thoughts about these rivals (e.g. other people are worthless/will achieve nothing); these thoughts will naturally lead to aggressive behaviours toward the social group (e.g. annoyance when criticised, anger when another person is the centre of attention), which will in turn lead to a negative social outcome. Receiving this outcome, the individual will become more confident in their negative beliefs, perpetuating the cycle.

Narcissism and development

It is accepted that a certain degree of 'healthy narcissism' is not only acceptable, but necessary, in normal development; the self-centred perspective of childhood being constantly altered and revised in adolescence, contributing to the development of healthy levels of self-esteem (Jenkins, 2019). During this period of dynamic change, it may be the case that narcissistic traits are more prevalent or exaggerated as the developing individual searches for a balance between love for the self and empathy for others (van Schie et al., 2020).

Studies have shown that there is some degree of evidence of a link between narcissistic personality traits and young adulthood overall: overall narcissism increasing slightly throughout adolescence, with narcissistic admiration specifically seeming to come to the fore in early adulthood (Grosz et al., 2019). However, the majority of studies tend to compare narcissism in young adulthood to other stages of life, as opposed to focusing on the trends within the adolescent to young adult age range. In addition, the majority of studies regarding age differences in narcissism treat narcissism as a singular measurable personality trait; not as a collection of traits that can be measured separately, nor as a phenomenon that exists as two contrasting variants (Chopik & Grimm, 2019).

Trust and its relation to narcissism

As may be suggested from the description above, narcissistic traits are most apparent in an individual in their behaviours toward others; and, in particular, are pertinent in the decision-making process regarding whether or not to trust another individual in the pursuit of a common goal. There is a logical correlation between traits of narcissistic rivalry and lower levels of trust-related behaviour - trust, here, being defined as the willingness to risk relying on others (Mayer et al., 1995). High N-R scores suggest a perception of others as trying to undermine oneself, leading to devaluing thoughts regarding others and a tendency towards antagonistic behaviour and impulsivity; thus, in situations where a decision needs to be made regarding trusting another individual, individuals with high levels of N-R will tend to perceive said individual as untrustworthy and act accordingly. The literature supports this relationship, suggesting that vulnerable narcissism has an especially strong negative effect on trust-related behaviours (Franken, 2016; Kwiatkowska et al., 2019).

The decision-making process when trusting others is not only influenced by the personality characteristics of the individual making the decision; it is also highly dependent on the individual's perception of the 'trustee' – the individual in whom trust may or may not be placed. In previous studies, the continuous formation of this perception, and how this influences trust-related decision-making, has been investigated through the use of behavioural economic games in which information about the trustee's history of trustworthiness may be sampled to the discretion of the individual. Results suggest that information is sampled regarding the trustee – and trust-based beliefs updated –

based on several factors, including age, prior beliefs about the trustee, and personal willingness to tolerate uncertainty (Ma, Westhoff, et al., 2020).

Game Theory

As mentioned briefly above, behavioural economic games have been used to examine the relationship between information sampling and trust related decision-making in previous studies, and this will also be the case in the current study; with this in mind, the overall paradigm of game theory will be briefly discussed. Game theory is a field of psychology in which social decision-making behaviours are studied through various formulated games, mostly involving two participants. At concept level, it is assumed that both decision makers are thinking rationally (Myerson, 2013). However, the paradigm has expanded, and now behavioural economic games are now largely used to study the exact opposite: how the emotions, values and heuristic devices held by the human population separate them from the theoretical 'homo economicus', the term coined to refer to the concept of the individual as perfectly rational and self-interested (Kahneman & Tversky, 1979).

The 'dictator game' is the simplest variant of these games (Forsythe et al., 1994). In this game, one individual has the choice to share a monetary reward with another participant. The results show that, despite being offered no tangible benefit for giving away part of their reward, the majority of participants will choose to share at least part of the reward with the other player (Henrich et al., 2006). The 'trust game' develops this paradigm: first one player – the 'trustor' – is given an amount of monetary 'tokens', and decides how to invest in the second player – the 'trustee'. The amount invested is then multiplied, and the trustee must decide how much of the increased reward to share with the trustor (Berg et al., 1995). Results suggest that share rates and keep rates – rates of investment decisions, positive and negative respectively - may be influenced by a variety of both personal and social factors; including, but not limited to, aversion to betrayal by others, inclination toward risk-seeking behaviours, and aversion to responsibility for losses (Alós-Ferrer & Farolfi, 2019).

Research Question & Objectives

In this study, Ma et al.'s information sampling trust game (ISTG) was used, as this provides the opportunity to investigate not only how narcissistic traits influence the decision to trust other individuals, but also how much information is sampled regarding their trustworthiness in order to inform such a decision. Sampling more information may suggest a lower tolerance for uncertainty in social decisions, and less positive prior beliefs about others; while sampling less information may suggest impulsivity in such decisions and higher uncertainty tolerance; or, possibly, more optimistic prior beliefs about others' trustworthiness.

The main objective of this study was to investigate how narcissistic admiration and narcissistic rivalry are related to information sampling of others' trustworthiness, and how said information affects trusting decisions throughout adolescence. The original study from which the data used in this paper was collected, using participants between the ages of 10 and 24 (Ma, Westhoff, et al., 2020), found evidence that information sampling behaviours in the ISTG change throughout adolescence. In addition, as mentioned, some evidence exists that levels of narcissism are related to age or developmental stage. Therefore, as a secondary objective, the relationship between narcissism and age will also be explored in this study.

Studying this topic is relevant for our understanding of how underlying personality factors such as narcissism can alter the way individuals make decisions in real-world social situations: both in terms of tendency to trust others, and in terms of information deemed necessary before making such a decision. This study also pertains to the field of developmental psychology, as it may inform our understanding of narcissism's role in adolescent development, and whether narcissism influences the behaviours of individuals in different ways throughout this process.

Hypotheses

It is hypothesized that high overall scores in the NARQ-kort will correlate negatively with levels of information sampling in the trust game. High N-R scores suggest recklessness as a primary trait, which may lead the individual to make decisions more quickly and with less time devoted to information sampling. High N-A scores suggest the individual is self-assured in their ability to deal with other people; thus, it follows that they may believe themselves able to 'read' the trustworthiness of the trustees without sampling as much information.

It is also hypothesized that high N-R scores in the NARQ-kort will show a positive relationship with higher keep rates in the trust game, while high N-A scores will have a positive relationship with decisions to trust. These hypotheses are based on studies suggesting that individuals with high N-R scores are more likely to devalue others and therefore believe them to be less trustworthy; thus, may choose not to share their monetary tokens more often. Previous studies provide evidence for this, suggesting that levels of vulnerable narcissism relate negatively to levels of trust (Franken, 2016). Higher N-A scores, conversely, suggest a desire for the approval or respect of others, which may lead to higher share rates, possibly in an effort to please trustees.

Methods

Participants

157 participants (75 male, 82 female) were uniformly sampled in the age range of 10-24 (*m* = 17.50, *sd* = 4.34), and were screened for colour blindness as well as psychiatric and neurological disorders. IQ was estimated through subtests of the WAIS and WISC, and socioeconomic status through caregiver education level, both falling within the normal range for all participants. The participants were not informed regarding the nature of their 'opponents' in the trust game. 156 of the 157 participants were included in the data analysis; one being removed due to not completing the NARQ-kort.

NARQ-kort self-report

The NARQ-kort, or NARQ-S (Back et al., 2013) is a brief questionnaire that was used to ascertain levels of narcissistic admiration (N-A) and narcissistic rivalry (N-R) in the participants. N-A questions are split into those assessing grandiosity, uniqueness and charmingness; a typical item reads 'I deserve to be seen as a great personality'. N-R questions pertain to the assessment of devaluation, supremacy and aggressiveness; a typical item reads 'I want my rivals to fail'. Items are answered on a Likert-type scale from 1 ('not agree at all') to 6 ('agree completely'). The NARQ-kort was compiled by selecting the six items from the NARQ with the strongest factor loadings, one for each subscale (and thus three for each dimension of narcissism). Each dimension in the brief questionnaire also contained items of all three content domains (cognitive, behavioural, and affective-motivational). Overall narcissism score is measured by taking the mean of all six questions, while the score for each dimension is computed by taking the mean of the three questions of that dimension separately. The NARQ-kort was found to be internally consistent for the overall measure ($\alpha = 0.74$), as well as for each dimension (admiration: $\alpha = 0.76$; rivalry: $\alpha = 0.61$).

Information Sampling Trust Game (ISTG)

The information-sampling trust game (Figure 1) (Ma et al., 2018) is based on the single-shot Trust Game (Berg et al., 1995), with the addition of the information sampling aspect. It involves an investor and a trustee; in this study, all participants played the investor role. The participants were given 6 'tokens' to either invest in the trustee or keep themselves. They were told that trustees participated in a previous version of the experiment where they could choose to either reciprocate or keep the invested money. If the participant chose to share, the trustee would receive 24 tokens (4 times the

investment) and could choose to either reciprocate – receiving 12 tokens for themselves and returning 12 to the participant – or to keep all 24 themselves.

Each participant acted out the role of investor with 60 different 'trustees'. On each trial, the participants were able to sample information in a 5*5 grid containing the supposed previous behaviours of the trustees, in terms of whether they reciprocated sharing behaviour or not (in reality, the grid outcomes were computer-generated). The grid consisted of grey squares that would change colour when clicked based on the precious decision of the trustee: green if they reciprocated with a previous investor, red if they did not. In this way, the participants could sequentially sample information regarding their trustee before deciding whether or not to invest. There were no downsides to sampling more of the previous information regarding the trustee, apart from the time and effort of information sampling.

Figure 1

The Information Sampling Trust Game

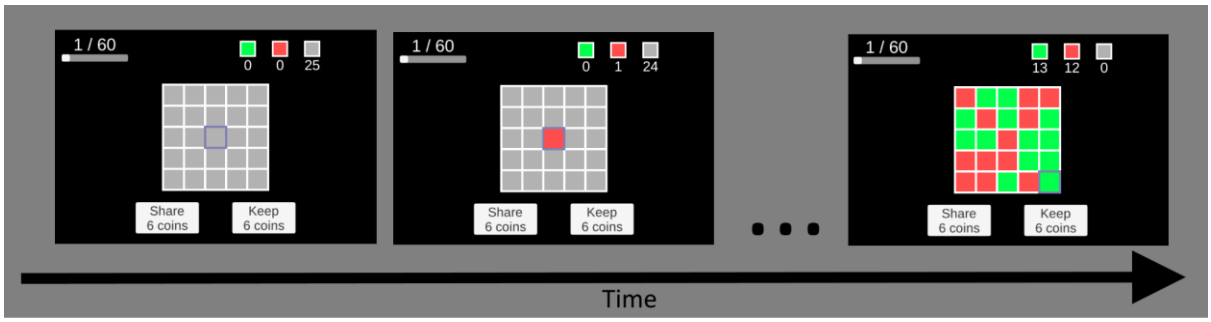


Figure 1. Example of one trial sequence in the Information Sampling Trust Game. Before the participant made an investment decision, they could sequentially sample the decisions that the trustee made for other investors. On each trial, information could be sampled up to 25 times. The colour of the turned tile indicated the trustee's past decision: green = reciprocated trust; red = did not reciprocate trust; grey = not sampled by participant.

Procedure

Participants were recruited both online through a recruitment website and offline from local high schools, and performed this as part of a larger neuroimaging study. The study was approved by the Leiden University Medical Center review board. Written consent was given by all participants, as well as parents of participating minors. This study took place in the Leiden University neuroimaging department, and took roughly 30 minutes. The participants were given a set of questionnaires, including the NARQ-kort, after they had performed the trust game.

Due to being unaware of the nature of the trustees in this study, participants were not aware of how the payoff from the studies was determined. The participants were told that 60 trustees had played the task; that three trials would be randomly selected at the end of the task; and that the average amount of tokens would be converted to a monetary value and paid to the participant. The actual payoff trial selection was not fully randomized: all participants achieved a bonus fee of 3-9 tokens, or €1-5.

Statistical Analysis

Data was analysed using IBM SPSS Statistics 27 (IBM, 2020).

For the descriptive statistics, a Spearman's *rho* test of correlation was used to assess the relationship between measures of narcissism and age, with age as the independent variable and N-R & N-A scores in the NARQ-kort as dependent variables. The main analysis to test the hypotheses as a multivariate linear regression analysis, with age, N-R scores and N-A scores as independent variables, and proportion of investments and mean number of samples taken as dependent variables. Prior to this analysis, the relevant assumptions were tested. Outliers were identified via boxplots. Normality was assessed via histogram and normal Q-Q plot; the latter of these being a plot of the observed percentile values vs the expected percentile values for a normal distribution. In addition, a Shapiro-Wilks test was used. Linearity was assessed through the plotting of each IV against each DV. The assumption of no multicollinearity was tested using a correlation matrix. Finally, the assumption of homoscedasticity was tested through the plotting of standardized residuals for both of the dependent variables.

Significant interaction effects were followed-up by splitting the data into three age groups, using a multiple linear regression with N-A scores and N-R scores as independent variables and proportion of investments as the dependent variable.

Results

Descriptive Statistics

A table of descriptive statistics for the main variables under examination - NARQ-kort N-R scores; NARQ-kort N-A scores; age; proportion of investments; and mean number of samples - is presented below:

Table 1

Descriptive Statistics for Data under Examination

	Minimum	Maximum	μ	SD
Age	10.01	24.97	17.4725	4.3429
N-A Scores	1	4.67	2.406	1.0162
N-R Scores	1	4.67	2.0812	0.9003
Proportion of Investments	0.15	0.7	0.4582	0.082
Mean Number of Samples	2.6167	25	16.2147	5.3911

Note: Age measured in years. Scores for questionnaires measured on a Likert-based scale between 1 and 6. "Mean Number of Samples" variable refers to the average number of samples taken each trial per participant; while the μ *variable of this refers to the average between participants. This is the case in all tables.*

Prior to analysing the relationship between our independent and dependent variables, the relationship between age and NARQ scores – both N-A and N-R – was investigated using Spearman's *rho* test of correlation, as well as other descriptive statistics of the data. This investigation shows no significant correlation between age and narcissism in either case (N-A: $r(156) = 0.155$, $p = 0.053$; N-R: $r(156) < 0.001$, $p = 0.998$), suggesting that no linear relationship exists between age and levels of narcissistic traits. A moderate correlation was found between N-A and N-R scores: $r(156) = 0.383$, $p < 0.001$, suggesting that there is some relationship between the two levels of narcissism.

Assumptions

First, the assumptions associated with the statistical analyses used were completed. Normality of the data was assessed: both the proportion of investments and information sampled appeared to be normally distributed when plotted on a histogram and normal Q-Q plot (Appendix A). However, a Shapiro-Wilk's test of normality showed a significant variation from normality in both cases: proportion of investments ($W(156) = 0.978$, $p = 0.013$); and mean number of samples ($W(156) = 0.955$, $p < 0.001$). The data were log transformed in order to try and solve this deviation from normality; however, this was unsuccessful. For the purposes of the thesis, it was decided to continue with data analysis as planned, but to remain aware of the lack of normality in the interpretation of results.

Second, the assumption of no multicollinearity was tested using a correlation matrix. In all cases (between age and N-R, age and N-A, and N-A and N-R), no correlation coefficient greater than 0.8 was found, suggesting no multicollinearity was present ($r = 0.032$; $r = 0.161$; $r = 0.390$ respectively).

Finally, the assumptions of linearity and homoscedasticity was tested; the plotting of standardized residuals against standardized predicted values for both of our dependent variables showed an approximately linear relationship while also being approximately the same width for all values of the predicted DV, thus meeting these assumptions in both cases (Appendix B).

Primary Analyses

Despite failing the assumption of normality, a multivariate analysis was performed in order to assess whether the proportion of investments and/or the mean number of samples taken had any relationship to N-A scores, N-R scores, and/or age. No statistically significant relationship was found between any of the independent variables and mean number of samples: N-A scores ($F(1,150) = 0.041$, $p = 0.839$); N-R scores ($F(1,150) = 1.012$, $p = 0.316$); or age ($F(1,150) = 0.011$, $p = 0.915$). A statistically significant relationship was seen between N-R scores and proportion of investments, ($F(1, 150) = 5.00$, $p = 0.027$; partial $\eta^2 = 0.032$). There was also an interaction between age and N-R scores on proportion of investments, ($F(1, 150) = 5.152$, $p = 0.025$; partial $\eta^2 = 0.033$), suggesting that the relationship between N-R scores and proportion of investments is significantly influenced by the age of the participant. In order to investigate this further, data was split into three age groups based on the three stages of adolescent development: childhood-early adolescence (10-14); middle-late adolescence (15-18); and late adolescence-young adulthood (19-24). Descriptive statistics for each group are displayed in the table below. No significant relationship was found between N-A scores and proportion of investments ($F(1,150) = 1.150$, $p = 0.285$), nor between age and proportion of investments ($F(1,150) = 2.180$, $p = 0.142$).

Table 2

Descriptive Statistics for Binned Datasets

Age Group 10-14 yrs	Minimum	Maximum	Mean	SD
N-A Scores	1	3.67	2.1395	0.8173
N-R Scores	1	4.67	2.0388	0.9178
Proportion of Investments	0.15	0.65	0.4527	0.1007
Mean Number of Samples	2.6167	24.3833	16.2554	6.1570

Sample size = 43

Age Group 15-18 yrs	Minimum	Maximum	Mean	SD
N-A Scores	1	4.33	2.4167	1.1051
N-R Scores	1	4	2.0416	0.7523
Proportion of Investments	0.2667	0.5667	0.4503	0.066
Mean Number of Samples	5.4833	24.2667	16.6348	4.9671

Sample size = 56

Age Group 19-24 yrs	Minimum	Maximum	Mean	SD
N-A Scores	1	3.67	2.5965	1.0327
N-R Scores	1	4.67	2.152	1.0237
Proportion of Investments	0.2833	0.65	0.4702	0.0808
Mean Number of Samples	5	25	3	5.2348

Sample size = 57

The interaction effect was further investigated using a multiple linear regression post-binning; that is, after splitting the data based on the above age groups. N-A and N-R scores were the independent variables, and proportion of investments the dependent variable. No significant relationship was found between N-A scores and proportion of investments, nor between N-R scores and proportion of investments, for any of the three age groups, 10-14: ($F(2,40) = 0.749$, $p = 0.480$, $R^2 = 0.036$, R^2 adjusted = - 0.012); 15-18: ($F(2,53) = 0.128$, $p = 0.880$, $R^2 = 0.005$, R^2adjusted = -0.033); 19-24: ($F(2,54) = 1.351$, $p = 0.268$, $R^2 = 0.048$, R^2adjusted = 0.012). Despite these results not being significant, the interaction in the multivariate analysis became clearer when these data were plotted per age group (see figure 2 for the relationship between N-A scores and Proportion of Investments, and figure 3 for Proportion of Investments and N-R scores).

Figure 2: *Scatterplot of Proportion of Investments by N-A Scores split by Age Group, with Linear Fit Lines*

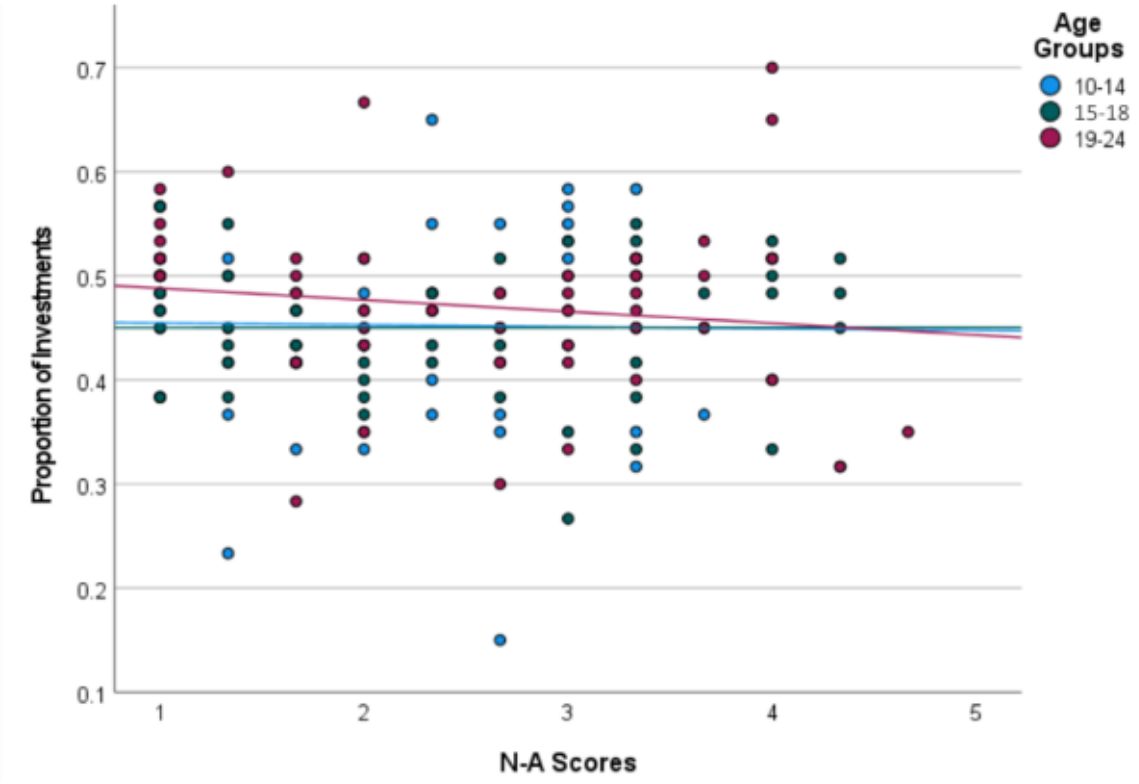
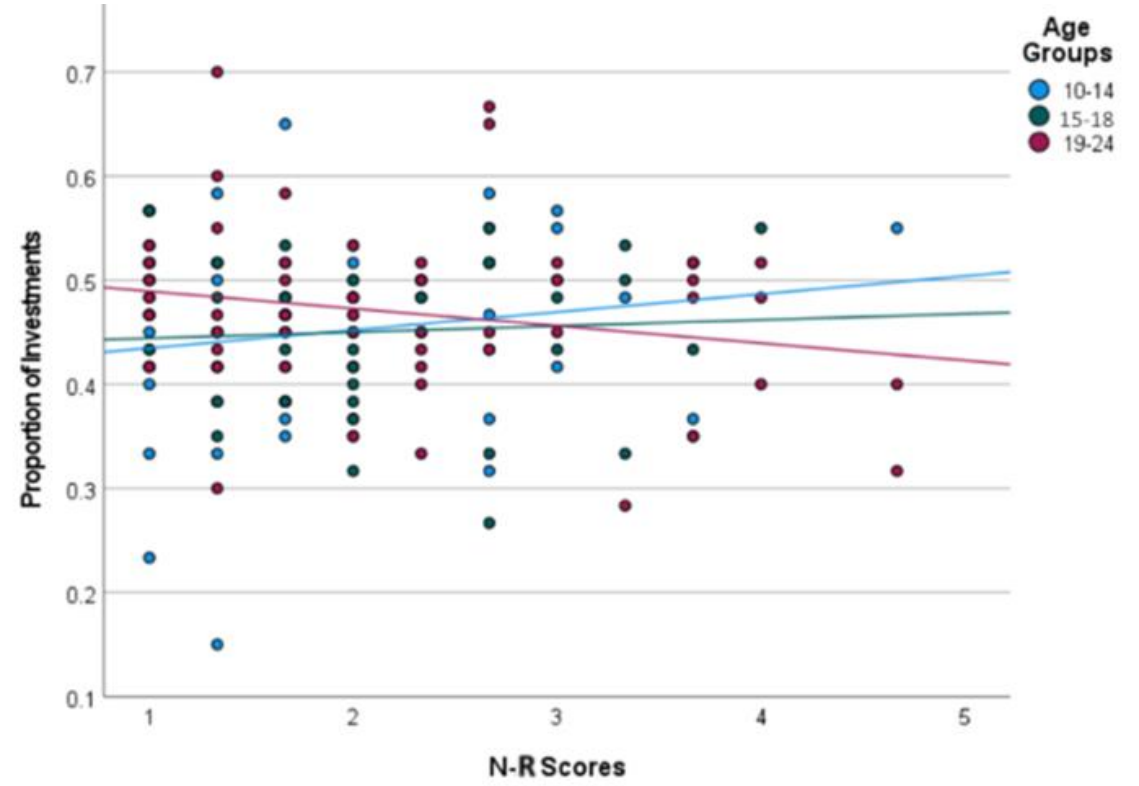


Figure 3: *Scatterplot of Proportion of Investments by N-R Scores split by Age Bins, with Linear Fit Line*



These plots suggest that there is a slight positive relationship between N-A and N-R scores and proportion of investments in the two younger age groups, 10-14 year olds and 15-18 year olds, and a slight negative relationship between N-A and N-R scores and proportion of investments in the oldest age group, 19-24 year olds. This suggests that individuals with high narcissism scores in the oldest age group are less likely to invest in others, while younger people are more likely to invest in others the higher their narcissism scores. However, as the findings per age group were not statistically significant, this interpretation should be taken with caution.

Discussion

This study was an investigation into the potential influences of narcissism on information sampling behaviours in social situations, and of overall levels of trust in others, throughout adolescent development and into early adulthood. Narcissism was defined here based on the view that this trait is not singular, but should be split into two subtypes; more specifically, it was defined based on the Narcissistic Admiration and Rivalry Concept (NARC) and associated questionnaires (NARQ; NARQ-kort), introduced as a replacement for the singular Narcissistic Personality Inventory (NPI) in recent years (Back et al., 2013). The design of the information-sampling trust game (Ma et al., 2018) allowed for the study of both propensity for trusting behaviours – measured through rate of investment in other participants - and information sampling habits of the participants – through the number of previous trials the participants decided to take into account before making their decision. The precedent for studying decision-making behaviours in social interactions in a game such as this is founded in game theory and behavioural economics.

Summary of Results & Implications

Firstly, it was hypothesised that high NARQ-kort scores – whether split into narcissistic admiration (N-A) and narcissistic rivalry (N-R) or taken as an overall measure of narcissism – would result in lower levels of information sampling in the trust game, due to both the social self-assuredness associated with high N-A scores, and the recklessness associated with high N-R scores (Back et al., 2013; Wink, 1991). The data do not support this hypothesis: no relationship was found between any measurement of narcissism and the number of pieces of information sampled by the participant, suggesting that narcissism does not affect the individual's need to sample information in the decision to trust another individual in any way. This may be due to the overall low-average levels of narcissism within the sample group, with neither mean score exceeding 2.5 out of 6 – see Table 1 – leading to the recklessness or self-assuredness associated with high levels of either narcissistic trait not being apparent within the participants tested. It may also be the case that the game used was not realistic enough in emulating a social decision for the participants to treat it as such; in other words, the separation between the participant and trustee may have led to the game being treated as an objective financial decision as opposed to a decision whether to trust in another individual. In this case, the social recklessness and self-assuredness associated with narcissistic traits may not have played a part in the decision to sample more information. There are several methods that may have been implemented to increase social fidelity in this study: for example, previous studies have shown that taking part in social interaction with a third party directly prior to participation in the study, or viewing social interaction between two separate parties, leads to increased perception of the experiment as a realistic social encounter (Reader & Holmes, 2016). Preliminary studies have also

taken place investigating the potential of VR technology as a medium to achieve high levels of social realism while maintaining experimental reliability and validity (Pan & Hamilton, 2018).

The second hypothesis was that higher levels of N-R would result in a lower rate of investment in others, while higher levels of N-A would result in higher rate of investment. This hypothesis was partially supported by the data; it was found that N-R scores negatively influenced proportion of investments in others, but no significant relationship of any sort was found between N-A scores and proportion of investment. It was also found that the interaction between age and N-R scores had a significant relationship with proportion of investments. No significant relationship was found directly between age and either measure of narcissism; in other words, levels of narcissism do not change with age, but their presentation in terms of trusting does. Further exploration of the data suggested that N-R levels were positively correlated with proportion of investments in younger age groups (10-14;15-18), but had an inverse relationship in the older age group (19-24). Younger age groups – specifically, those going through the onset of puberty and most of adolescence – may be more inclined toward risk-seeking behaviour than the more mature cohort, with high levels of N-R – including recklessness and impulsivity as a key feature – emphasizing this trait (Burnett et al., 2010; Leather, 2009). In addition, adolescent participants may be more inclined to react impulsively due to lower levels of self-control than the older participants (Ferguson et al., 2021; Zanolie & Crone, 2018). Individuals in the older age group may be more cautious and risk-averse than the younger participants, and those with higher N-R levels may be less inclined to trust other players as expected. However, these results were not significant within age groups, and thus this should be interpreted with caution.

The same overall pattern as above was present when analysing the relationship between N-A scores and proportion of investments between age groups, though it was less pronounced than N-R as above; a slight positive correlation between N-A scores and proportion of investments in the younger age groups, and a slight negative correlation in the oldest group, were seen. The comparatively minor relationship suggests that N-A levels have a lesser effect on social decision-making regardless of age. As a whole, however, the similarities between N-A and N-R suggest that both variants of narcissism may have a similar effect on behaviour; it may be the case that the effects of narcissism on social behaviour are influenced by age in the same way regardless of narcissistic variant.

Strengths & Limitations

This study had several strengths: firstly, the wide age range of the participants involved. This allowed for the study of decision-making and social behaviours – in relation to narcissism or otherwise – across the entirety of adolescent development, as well as allowing for separation into distinct age groups based on the stages of adolescence. Secondly, as briefly discussed in the introduction, while previous studies have also investigated the link between narcissism and social behaviours through

behavioural economic games, many rely on the narcissistic personality inventory, defining narcissism as a single trait. The measurement of narcissism based on the NARC model of Back et al. – that is, as split into N-A and N-R – in social decision-making is novel to this study. Not only may it be said that this study uses a more contemporary assessment method in this area than has been used in previous studies, this splitting of narcissism into two subscales is more in keeping with the modern perspective of grandiose and vulnerable narcissism as separate variants of the trait.

In terms of limitations, the sample size (N = 156) may have caused some difficulties in terms of reliable data analysis. While on the smaller side, this size was sufficient when taken as a single sample size; however, when splitting participant data into groups, as with age above, it borders on inappropriate in terms of any robust data analysis. A post-hoc power analysis for the multiple linear regression after splitting into age bins using Gpower with power (1- β) set at 0.80, $\alpha = 0.05$, showed that a sample size of 68 per group would be the minimum requirement for statistical significance at the 0.05 level (Faul et al., 2009). It must also be noted that the data failed the assumption of normality based on the Shapiro-Wilks test; the analyses used were fairly robust against normality violations, but results should still be interpreted with caution for this reason.

It should also be considered that the NARQ-kort was used in measuring narcissistic rivalry and admiration in this study. While this has been shown to be a reliable and valid shorter measure of narcissistic traits (Leckelt et al., 2016), the full NARQ will provide a fuller and more nuanced picture of narcissistic admiration and rivalry in any given participant. Unfortunately, no measure currently exists that is both tailored to younger participants and takes into account the current bilateral understanding of narcissism, thus, this is a limitation that was unavoidable based on the nature of this study. Future studies in this area may wish to replicate the design of this study, while keeping in mind the limitations mentioned above; using the well-founded and robust tools provided by behavioural economics in the investigation of a fairly underexplored area of the human psyche in narcissism, but with a sample size that allows for a deeper investigation of the effects of age in this interaction.

Recommendations for Future Research

While the NARQ-kort is sufficient when analysing effects of N-A and N-R levels overall, it is too short to allow for further investigation into the subscales of each measure of narcissism. If using the full-scale NARQ, it may have been possible to perform robust follow-up analysis focusing on this subscale to confirm these observations. However, the full-scale NARQ is not a questionnaire that has been tested for reliability and validity in non-adult populations; thus, it may not be appropriate for use in studies using samples across the adolescent age range. Future studies may benefit from first testing the full-scale NARQ for robustness in the relevant age groups, and second from designing studies using the full-scale NARQ with these populations.

Second, it should be noted that scores on the NARQ-kort in this study were low overall; as previously mentioned, the mean scores for each subtype did not exceed 2.5 out of 6. While significant effects were still found for narcissistic rivalry within this low range, future studies may wish to investigate the social decision-making behaviours of a population with more extreme levels of narcissism, such as those who meet the clinical criteria for Narcissistic Personality Disorder. Not only could this provide more robust results demonstrating the relationship between narcissistic traits and social behaviours, but it may also highlight the aforementioned gap in the DSM definition of Narcissistic Personality Disorder in terms of including N-R traits into the diagnostic criteria (American Psychiatric Association, 2013).

Lastly, gender was a factor not addressed by the current study; however, previous studies have shown a marked difference in NARQ scores between genders, with both N-A and N-R scores overall being significantly higher in male participants than female (Back et al., 2013). In addition, it has been found that the gender of the partner in a two-person game like the ISTG can effect competitiveness in the participant: in some cases, male opponents are shown to elicit higher levels of competitiveness overall; in others, competitiveness is higher if the opponent is matched in terms of gender with the participant (Hojjat et al., 2021). With this in mind, it may be prudent for future studies to investigate the potential effects of gender in mediating the relationship between narcissistic traits and trust-based decision-making; in terms of both the gender of the participant and trustee in isolation, and whether or not these genders are matched.

Conclusion

The findings of this study showed that narcissistic rivalry in particular can influence decisions made by individuals in social situations; specifically, in the area of decisions regarding whether to trust other individuals. It was also shown that traits of narcissistic rivalry exert their influence in a different manner in adulthood than they do in early and middle stages of adolescent development, when narcissistic traits begin to form. While, further studies in the area are needed to corroborate these findings, with larger sample groups and, if possible, the use of the full scale NARQ as potential improvements that could be made, this study is one of the first to use the paradigm of game theory in the study of narcissism: moreover, it is the only study in the area of social decision-making and game theory to measure narcissism in the contemporary paradigm of N-A and N-R. This study provides insight into the phenomenon of narcissism and the differences between these two narcissistic variants; in terms of their respective effects on behaviour, as well as their development during adolescence. In addition, the approach used is more ecologically valid than others in the area, which largely rely on questionnaires to measure trust (Franken, 2016; Kwiatkowska et al., 2019); thus, providing more accurate insight into how N-A and N-R may influence social decisions in a real-world situation.

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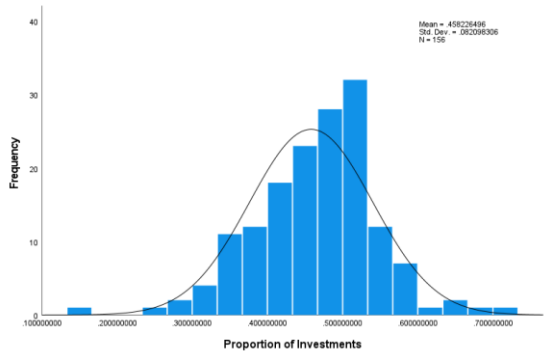
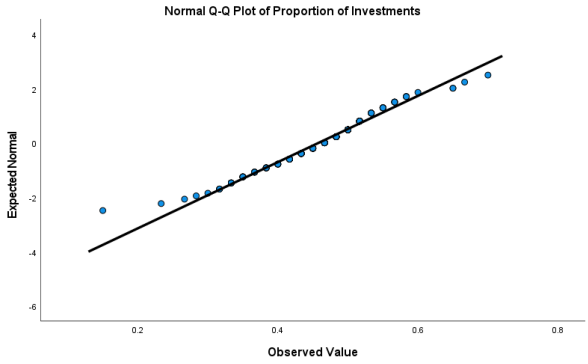
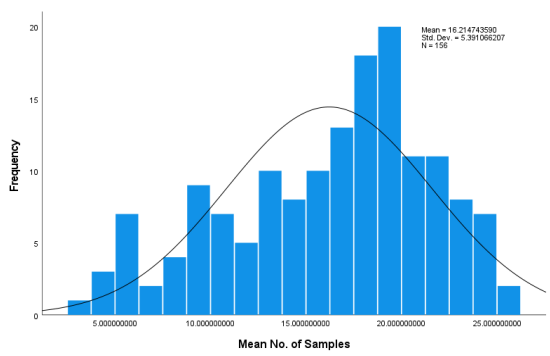
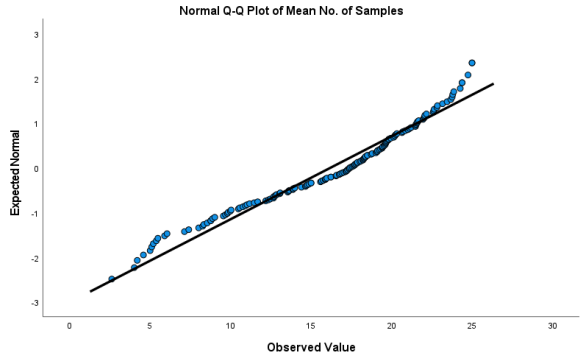
Appendix A: Histograms and Q-Q plots for Normality in Dependent Variables









Appendix B: Scatterplots of Standardized Residuals & Standardized Predicted Values for Dependent Variables