The development of cooperation and trust in 14-24 year olds: relationships with age, gender, socioeconomic status, parenting and psychopathology.

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I, Danai Sofia Kokorikou, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Abstract

This thesis aims to extend the existing knowledge-base on trust and cooperation development during adolescence and early adulthood, but also on the specific methods to study it, particularly as it relates to mental health and the family processes that influence it.

A series of empirical studies are presented which draw from a broad range of theoretical and methodological approaches including evolutionary theory and evolutionary psychology, attachment theory, game theory, and developmental psychology and psychopathology. In Chapter 2, game theory and economic games as well as traditional psychometric questionnaires and simple decision-making indices are employed in comparative study of operationalisations of trust and cooperation. Various operationalisations of the multi-round Trust Game are used against the suspiciousness scale of the Schizotypal Personality Questionnaire as an external measure of mistrust.

Following this, in Chapter 3, multivariate models of parenting and their concurrent and longitudinal outcomes of internalising symptomatology in individuals aged 14-24 years old are explored. Using a data-driven exploratory factor analysis, confirmatory factor analysis, finally, a hierarchical model of parenting factors is estimated. The factor scores are then used as predictors of the latent growth curve of concurrent and prospective internalising scores. Chapter 4 explores how parenting factors are associated with cooperative behaviour and trust in the multi-round Trust Task after having accounted for age, gender, IQ, and socio-economic status. Lastly, Chapter 5 addresses the hypothesis that adolescents and young adults with a higher

ability to cooperate and engage in mutually beneficial interactions might be less vulnerable to the development of psychopathology in the future.

Statement of Impact

This dissertation focuses on parenting and trust and their effects in adolescence and early adulthood. This is a key field of research for developmental psychopathology; the knowledge and expertise as well as the methods of data analysis of this thesis are expected to be helpful for policy-makers, clinicians and researchers alike.

The operationalisation of trust in the Trust Task provides a detailed account on how to measure trust cost-effectively depending on the purpose of the measurement; for example, if this was to be applied in school-based research, in order to find ways to identify adolescents at risk of developing depression and anxiety or conduct problems. Also, the parenting model presented in Chapter 3 can be very helpful for family through family assessments, including abuse and neglect and positive parenting. This is a novel multivariate model of parenting that adds to the existing knowledge on measurement of parenting and can be applied further in all fields of research interested in family relations. Chapter 4 considers parenting and trust showing how parenting can have diverse effects on decision-making. This paves the way for future research that may be able to ascertain how different qualitative experiences and self-reported experiences may lead to similar patterns of decision-making. Lastly, Chapter 5 attempts to investigate longitudinal development of psychopathology through identifying a lack of the ability to trust and maintain cooperation. This is an approach that shifts the focus from deficits to skills and, if applied more broadly, it would help critically review the existing psychopathology categorisation in order to focus more on therapeutic aims and interventions that may be helpful to particular populations.

Output of this project has already been disseminated through academic publications, conferences, general public seminars, and through individual consultation with clinicians and researchers.

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Declaration of the candidate's role in each of the studies

Guidance and support were provided at all stages of this project by Prof Pasco Fearon. Prof Peter Fonagy also provided input as my secondary supervisor and Principal Investigator of the Neuroscience in Psychiatry Network through which the data were drawn.

Data collection

All of the data utilised for this thesis were collected by me as part of a team of research assistants in NSPN. All research assistants collected this vast dataset that was then used in a number of projects including my own.

Chapter 1-2

All the work is the candidate's own.

Chapter 3

All the work is the candidate's own.

Chapter 4-6

All the work is the candidate's own.

Statement of funding

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Preface

According to the Oxford Dictionary definition, *trust* is "the belief that someone or something is good, sincere, honest, etc. and will not try to harm or trick you". The ability to trust (or not trust) is essential for all types of human interactions and it requires the analysis of complex sets of information about the self, the other, and the environment. As such, it is a capacity that develops and changes during a specific social interaction, but also throughout life. Childhood and adolescence are very important for social and emotional development, and particularly for the development of trust.

Parenting is thought to play an important role in the development of the ability to trust because it determines the immediate relational and material environment of the children. Through the consolidation of learning and memory as well as hereditability, it establishes conscious and unconscious beliefs that function as filters regarding others' trustworthiness and the level of rigidity of these beliefs. Other factors, such as age, gender, IQ, and socio-economic status, also play important roles in the development of the capacity to trust.

Trust plays an important role in forming and maintaining healthy relationships which is in turn crucial for mental health. Adverse childhood experiences related to negative parenting, such abuse or neglect, are key risk factors for the development of mental health problems. There are several hypotheses regarding the effect of adverse experiences on the ability to trust and the potential of psychopathology development, but these relationships are not well understood. This is particularly true for late adolescence and young adulthood which is the period when many common mental health problems appear and show their most rapid growth.

On this premise, this dissertation presents a series of empirical studies that aim to address questions regarding the measurement of trust through a social economic exchange game as well as its relationship to parenting and psychopathology in adolescence and young adulthood.

1. General Introduction

1.1. Overview of the theoretical framework

Cooperation and reciprocity are fundamental for survival both in animals and in humans and they have played a key role in evolution. This project draws its theoretical background from game theory, evolutionary theory, and clinical and developmental psychology to explore cooperation and reciprocity in relation to young people's life experiences and their mental health. Here, I explain the rationale and how these different approaches can be combined theoretically and methodologically.

Evolutionary biology and psychology have been studying cooperation and reciprocity for the past six decades. Evolutionary theory was initially built upon the notion of competition between species and organisms and, in early formulations, tended to emphasise self-interest, as genes propagate themselves through competitive advantage, or fitness. However, William Hamilton's and Robert Trivers' work on the evolution of cooperation and reciprocity (Axelrod & Hamilton, 1981; Hamilton, 1964; Trivers, 1971, 2006) employed the concepts of genetic relatedness, kin selection and inclusive fitness in order to describe the evolution of reciprocity (and its evolutionary advantages) in the context of repeated interactions. This has broadened the scope of earlier theoretical approaches about the "Selfish Gene" (Dawkins & Davis, 2017) to provide a coherent framework for understanding the evolution of altruism and cooperation. It is beyond the scope of this introduction to analyse these theories in depth, but, briefly, evolutionary theory was extended to explain -on the level of genes- why and how organisms within and between species have evolved to cooperate. In particular, modern evolutionary theory shows that cooperation is likely to confer selective advantages, and therefore be favoured by evolution, among closely related

genetic relativeness (so-called inclusive fitness) and where ecological conditions favour sharing and individuals can engaged in repeated reciprocal interactions (Axelrod & Hamilton, 1981; Hamilton, 1964).

Connected to this evolutionary thinking, there is a relatively large body of work that employs game theory and economic games in order to study cooperation and reciprocity. These sorts of game-theoretic models were critical in demonstrating how cooperation can evolve in ways that nevertheless promote individual fitness and survival (Archetti et al., 2011; Clutton-Brock, 2009). In the context of non-kin interactions, the ability to monitor reciprocal exchange and detect and avoid or punish cheating/defecting are central for allowing cooperation and trust to arise (Nowak, 2006; Trivers, 1971). The present project follows this theoretical and methodological tradition by using game-theoretic tasks to measure trust and cooperative behaviour in adolescents.

Game theory is a coherent framework that allows us to conceptualise (and measure) how agents make decisions based on their "beliefs" and "preferences". A belief is an agent's understanding of the potential outcome of an action they might take. A preference is the evaluation of an outcome that makes it more desirable than another outcome. In human societies, cultural evolution has shaped conformist decisions and the development of norms (Richardson et al., 2003; Young, 2015). Norms, social expectations, and reputations play an important role in cooperative behaviour and in its evolution more generally (Axelrod & Hamilton, 1981; Osborne, 2003) because they influence how people behave and whether they can form cooperative and reciprocal interactions. Evolutionary anthropology and game theory

provide a way of understanding how the social context, and social experiences more generally, may affect trust and cooperation.

From the macro-cultural level to the micro-psychological level, attachment theory is another field that is important for understanding the social influences on cooperative behaviour, particularly because it is situated on the intersection of contemporary evolutionary theory and developmental psychology. Essentially, attachment figures are considered to be the "prototypes" through which humans learn (among other things) norms and expectations through a long period of development in a close circle of people. This social micro-environment may be thought of as the setting that functions as a training ground for several psycho-social and mental abilities including prosociality and mentalisation. Mentalisation is the capacity to understand ourselves and others in terms of intentional mental states (Fonagy & Campbell, 2017). In turn, according to Fonagy et al. (2017), mentalising is thought to have provided early humans with an evolutionary advantage because it allowed them to adapt better to their environments because it promoted social collaboration and made kinship groups function better, and ultimately led to better odds of survival.

1.2. Overview of the thesis

This PhD investigates cooperation in adolescence and young adulthood, and addresses its connections to family relationships, and specifically parenting, and to adolescents' mental health. Adolescence is a pivotal developmental period for social cognition. During adolescence the brain and the nervous system undergo change both structurally and functionally as it has been shown by large-scale MRI and fMRI studies (Blakemore, 2012). Mentalising or the ability to monitor others' expressions, intentional and unintentional cues, and actions as well as the attribution of mental

states starts very early in life, but continues throughout adolescence. There is convincing evidence that during adolescence and young adulthood (from 12 years until at least 24 years) the medial prefrontal cortex (mPFC), i.e. the brain area mainly responsible for mentalising, develops and prunes its synaptic structure in order to underpin and support social cognition and the capacity to mentalise (Blakemore, 2012). Adolescence is also the onset time for various psychological difficulties highlighting the importance of research focusing on this period of life. Thus, this project focused on studying trust and cooperation in 14–24-year-olds.

Chapter 2 begins this work by introducing a key example of a game-theoretic task that has been widely used in the literature, known as the Multi-round Trust Task. In this chapter, the various metrics and ways to operationalise cooperation and reciprocity through this task are examined. The basis on which any individual decides to cooperate beyond personal gain is trust that the other will reciprocate. For this reason, the suspiciousness scale of the Schizotypal Personality Questionnaire is used as an external measure of mistrust in order to compare the metrics' performance and test the extent to which behaviour in the Trust Task is capturing 'real world' trust-related social behaviour or attitudes.

In contemporary societies, the quality of parenting – positive and negative aspects of it – are recognised as crucial parameters in the psycho-social development of individuals. Parenting research predominantly focuses on psychological/psychopathological and academic outcomes. Abilities such as cooperation and reciprocity (or indeed other factors that may promote resilience) have tended to be overlooked. With the aim to explore (in Chapter 4) how parenting is associated with cooperative behaviour and trust in the context of the Trust Game,

first, I employed factorial and structural equation modelling to determine the optimum dimensional and multivariate structure of parenting. Chapter 3 explores multivariate models of parenting and its longitudinal effects on internalising symptoms of depression and anxiety in adolescents and young adults (Chapter 3). Chapter 4 investigates how positive and negative parenting factors are associated with the capacity to trust and cooperate in 14–24-year-olds. Lastly, Chapter 5 focuses on the relationships between trust, concurrent, and longitudinal development of psychopathology in this population.

Within the stream of work dedicated to elaborating frameworks for conceptualizing psychopathology, the work of Caspi et al (2014) challenged previous models in important ways. The discrete psychopathology categories that are used in psychiatric diagnoses rarely remain consistent over the life course of any one individual (Fonagy & Campbell, 2017). Caspi et al (2014) suggest that this lack of specificity may relate to compelling evidence suggesting that there is, in fact, a "general psychopathology factor" in the structure of psychiatric disorders.

Fonagy et al (2017) suggest that the cultural transmission of epistemic trust might be underlying many, if not all, psychopathology groups and that the p-factor may be an indicator of difficulty develop and/or repair epistemic trust. Epistemic trust is "the trust in the authenticity and personal relevance of interpersonally transmitted knowledge". It enables social learning and reciprocity and allows individuals to benefit from ever-changing social and cultural contexts (Fonagy & Allison, 2014).

In Chapter 5, the relationship between cooperation and psychopathology is addressed in individuals 14-24 years old both concurrently and longitudinally, making use of the literature on the p-factor as a trans-diagnostic framework for understanding

psychopathology. It is hypothesised that individuals with a higher ability to cooperate and engage in mutually beneficial interactions will be less vulnerable to the development of psychopathology. Socio-economic status and gender are included in this analysis, because it has been shown that these factors predict an important portion of the variance of resilience to stress (Campbell-Sills et al., 2009). Testing this hypothesis also allows us to investigate whether individual differences in the capacity to trust and cooperate might operate as a mediator of the relationship between psychosocial disadvantage (including parenting and maltreatment) and psychopathology.

This project belongs within the larger body of research that attempts to reconceptualise psychopathology and mental health employing behavioural, psychological and neuroscientific dimensions rather than employ traditional categories. In that sense, it presents an approach to studying psychopathology which is based on essential psychological capacities (trust) and their respective behavioural phenomenology (cooperation and reciprocity) paired with the measurement and operationalisation aspects that are necessary. To accomplish this, it set out to investigate: (a) what is the most advantageous computationally and the most psychologically valid operationalisation of trust in the Multi-Round Trust Game, (b) what is the multivariate structure of parenting dimensions, (c) what is the relationship between the subjective experience of parenting (employing these parenting dimensions) and the development of the capacity to trust and cooperate, and lastly, (d) whether the capacity to trust and cooperate might act as a protective factor with regards to depression and anxiety controlling for other factors.

1.1. **Adolescence, social cognition, trust and cooperation**

Intense hormonal and physical changes characterise adolescence (Feldman et al., 1990). Psychosocial development is also sharply accelerated due to the change in orientation from a family-focused social life to a peer-focused one (Crone & Dahl, 2012; Steinberg, 2005). Identity, self-consciousness and cognitive flexibility primarily develop during this time (Rutter & Rutter, 1993). Although empirical research on cognitive and neural development of adolescence has only been taking place for the last 15-20 years, adolescence is increasingly recognised as the critical period for the development of social cognition, theory of mind, mentalisation, self and other awareness, and self and other reflection (Blakemore & Choudhury, 2006; Vetter et al., 2013).

Self-control and emotion regulation are key for mental health and successful relationships and adolescence is a particularly challenging and important period for their development (Morris et al., 2017; Riediger & Klipker, 2014; Zeman et al., 2006). Closely linked to emotion regulation and self-control, trust and cooperation are also crucial for establishing successful and satisfying relationships. The ability to trust and recognize trustworthiness in others in order to cooperate with them is essential to initiate, establish, repair and maintain social relationships (Balliet & Van Lange, 2013). Attachment style and other relational and psychological factors are frequently researched and shown to be closely associated with trust and cooperation in younger children, but there is a surprising lack of research in adolescents and young adults linking family relationships (and their longitudinal effects) with trust and cooperation (Szcześniak et al., 2012). In those age groups, research focuses on the development of trust as a social cognitive skill, as will be seen below in the review of the literature on

age differences in trust and cooperation. This thesis aims to address these gaps in the literature.

1.3. Early life stress hypothesis, socio-economic status and (the lack of research in) parenting

There is a very interesting body of work that has investigated the hypothesis that early life stress has effects on prosocial behaviour and cooperation measured through economic games (Lettinga et al., 2020; McCullough et al., 2013; Wu et al., 2020). It has been suggested that poverty and deprivation promote and help establish psychological mechanisms that perpetuate inequality (Haushofer & Fehr, 2014). The early life stress hypothesis has yielded important results (which will be reviewed below); but the research on early life stress might be confounding effects that stem from the family environment with effects from the broader social context such as neighbourhood crime levels, the broader social capital of an individual, access to education and health care etc. In other words, the effects of the macro-level and the effects of the micro-level of the family are not always well-defined and as a result the potential interactions between the two are neglected.

In order to research early life stress in humans, researchers have investigated several different sources of stress and adversity. The most common groupings of sources of stress are material and socio-emotional deprivation. Socio-economic status and material deprivation as well as family relationships and parenting have been employed as measures.

Here, I will focus on studies that investigated these sources of early life stress in relation to the development of cooperative behaviour and prosociality. The studies

reviewed are grouped in two categories: those that include parenting and family relations and the ones that do not. This will highlight the gaps in the literature that this project aimed to address because the study of parenting in relation to cooperative behaviour is generally very limited.

1.2. **Early life stress including parenting**

Lettinga et al. (2021) attempted to investigate the association between adverse environments during childhood (i.e. resource scarcity, parental investment and care, respondents' exposure to extrinsic mortality, violence and unpredictability during childhood), life-strategy and cooperation. They posited that variability in levels of cooperation may be partly explained as a contextually-appropriate response to environmental conditions. Lettinga et al. (2021) used the life history approach which follows evolutionary principles in order to define adversity during childhood. In this framework, there are two dimensions for adversity, which are "*harshness (i.e., externally caused levels of morbidity–mortality that an individual cannot control) and unpredictability (i.e., spatial–temporal variation in harshness".* This approach stipulates that the evolutionarily appropriate adjustment to an uncertain environment with high levels of morbidity-mortality is the shift of attention to the present (Amir et al., 2018). As a result, according to this, people who develop and live in uncertain environments should be less inclined focus on future positive outcomes and choose to have the most immediate gains. Lettinga et al. (2021) investigated childhood adversity retrospectively by recruiting 19-83 year-olds (mean age 53 ±14 SD) who played three different economic exchange games. Although they found that their latent variables, which describe cooperation (across the three games) and life-history strategy, were adequately captured by their analysis, the hypothesised relationship between

childhood, environmental adversity and adult cooperation, and the mediation effect by life-history strategy were not found.

McCullough et al. (2013) found that childhood exposure to family neglect, conflict and violence, and to neighbourhood crime, were positively associated for men (but not women). Beyond genetic explanations, random developmental variation or the operation of domain/general cultural learning mechanisms, these results may be supportive of an adaptive calibration of social strategies to local social–ecological conditions.

1.2.1. Early life stress excluding parenting

When investigating adverse socio-economic environments (excluding parenting and family relationships), some studies find a link between these environments and decreased cooperation and others find the reverse relationship.

Korndörfer et al. (2015) report that across eight studies with large and representative international samples, they predominantly find that individuals of higher social class adopt more prosocial behaviours. *"Higher class individuals were more likely to make a charitable donation and contribute a higher percentage of their family income to charity (32,090* ≥ N ≥ *3,957; Studies 1–3), were more likely to volunteer (37,136* ≥N ≥ *3,964; Studies 4–6), were more helpful (*N = *3,902; Study 7), and were more trusting and trustworthy in an economic game when interacting with a stranger (*N = *1,421; Study 8) than lower social class individuals."*

Contrastingly, Côté et al. (2015) found that individuals who make a higher income exhibit less generous behaviour than poorer individuals, but only in the context of large economic inequality, i.e. when they lived in states with smaller

inequality the effect was absent. The authors suggest that inequality might be moderating socio-economic status and generosity. Schmukle et al. (2019), however, failed to replicate this finding when they analysed the same interaction in three large representative datasets of 27,714 US households (donating behaviour), 1,334 German individuals in an economic game (generosity), and 30,985 participants from 30 countries (volunteering to participate in charitable activities). These findings suggest that economic inequality might not have a generalisable moderation effect and might not be a plausible explanation for the heterogeneous results on the effect of social class on prosociality.

Nettle et al (2011) compared cooperativeness using a Dictator Game played by residents of two neighbourhoods in one city while controlling for naturalistic measures of cooperativeness. The two neighbourhoods did not differ in any measured variables other than socio-economic deprivation. They found that behaviour in the Dictator Game was dramatically different between participants from the two neighbourhoods, with the affluent neighbourhood being much more willing to cooperate and risk their coins compared to the deprived neighbourhood. They also link this finding with broader socio-economic environment and the naturalistic measurements of cooperativeness. The deprived neighbourhood participants reported lower social capital, higher frequencies of crime and antisocial behaviour, a higher frequency of littering, and less willingness to take part in a survey or return a lost letter; however, there were no reported differences between groups in relation to the probability of helping a person who dropped an object, needed directions to a hospital, or needed to make change for a coin. The same pattern of cooperativeness in high versus low socio-economic status has been found in children both 9 and 6-7 years old (Safra et al., 2016).

On the other hand, Amir et al. (2018) described an uncertainty management perspective for the relationship between childhood socio-economic status, risk, time, and social preferences. They proposed the *uncertainty management* framework, instead of a delayed discounting explanation (valuing a smaller but immediate reward more than a larger but delayed reward) or a mortality cues explanation (effects are only observable in the presence of salient cues to mortality). According to this framework, early life deprivation promotes the development of strategies that minimize the downside costs of uncertainty across domains and ultimately results in greater risk-aversion, present-orientation, and greater prosociality. They found that lower childhood SES uniquely predicts greater risk-aversion (both incentivized and hypothetical), and greater present-orientations, but also greater prosociality. It is necessary to underline that in this case, risk taking and time preferences were investing separately from prosociality in the economic task, thus, they are able to disaggregate trust/prosociality from risk-taking.

Piff et al. (2010) reported that individuals with lower subjective socio-economic status proved to be more generous (using a Dictator Game), charitable, trusting (using the Trust Game), and helpful (employing a schema activation paradigm) compared with a higher class group and attributed this to a greater commitment to egalitarian values and feelings of compassion. The subjective socio-economic status was measured by the MacArthur Scale of subjective SES (Giatti et al., 2012). This study has failed to be replicated, not finding the reverse effect, but no effect of class at all (Stamos et al., 2020). Similarly, Wu et al. (2017) found no interaction between early childhood environments and current resource scarcity for the prediction of cooperation.

A meta-analytic review (Wu et al., 2020) of 123 papers reporting 867 effect sizes among 199,019 adults looking at early-life stress and risk, time, and prosocial preferences, and testing the boundary conditions of these associations, found relatively small effect sizes indicating that early-life stress is associated with greater risk taking (r = .123), more present orientation (r = .126), and less prosociality (r = -.085), and its positive association with present orientation is stronger in currently stressful situations. They did not find differences relative to harshness and unpredictability dimensions of early-life stress. Importantly, these results refer to data captured by self-report measures, but not hypothetical choice and laboratory behaviour measures of preferences which are less frequently employed by researchers. This contradicts some of the laboratory-based findings regarding prosociality and, therefore, indicates that more pre-registered studies are required in order to test the extent to which preferences measured with laboratory-based tasks capture real-world behaviours and to increase the ecological validity of laboratory-based measures. Equally, the stark lack of studies with adolescent samples and longitudinal cohorts highlights the importance of further research in adolescence.

1.3. **Game theory**

This project relies heavily on a socio-economic task and a game theoretical analysis of it. Game theory is a branch of applied mathematics which studies strategic interactions and decision-making, conceptualising them as *games*. An interaction is considered strategic when the outcome for each side is interdependent and this dependency is known to the actors. The actors of the interaction are called *players* and they can be people, firms, governments or any entity that may behave according to *a set of preferences* or desirable outcomes. Game theory can be applied on any situation

that can be defined as such e.g., choosing a certain product, voting, giving a diagnosis etc. Game Theory also constitutes a unique and very promising framework for psychological and neuroscientific research which has yielded significant results (Jeung et al., 2016; Montague, 2012; Sanfey, 2007; Sharp et al., 2012).

History and principles. The mathematical study of games dates back to the 16th century, but modern Game theory was established when John von Neumann published the paper "On the Theory of Games of Strategy" in 1928 (Neumann, 1959). He was a Hungarian-American mathematician and computer scientist who is regarded as the most prominent mathematicians of his time. This first paper was followed by the book "Theory of Games and Economic Behavior" where John von Neumann and Oskar Morgenstern, an economist (Neumann & Morgenstern, 2007) published their utility theorem (explained below) and a ground-breaking theory of economic and social organization which was founded on their theory for strategic games.

The most fundamental premise of game theory is Rational Choice Theory (Green, 2002; Herrnstein, 1990). Briefly, this is the assumption that agents decide *rationally* based on their preferences and, in the context of game theory, they decide based on their preferences over *interdependent outcome*s. Mathematician John Nash received the Nobel Prize in economics in 1994 for his concept of the Nash equilibrium which measures how choices are made according to rationality and how humans depart from pure rationality. Contemporary theorists do not place qualitative restrictions on the decision-maker's preferences e.g. self-interest, but work on the assumption that the agent chooses the best action according to their preferences; their own "rationality" (Green, 2002; Osborne, 2003). Amartya Sen, who is a Nobel Prize laureate in economics, criticised the "preferences, beliefs, and constraints" approach

suggesting that it ignores the significance of promises (or commitments as he called them) and that actors behave primarily on anticipated outcomes (Sen, 1977)

Parameters and types of games. The basic concepts and principles of Game Theory are briefly explained here using the Prisoner's Dilemma as an example. The Prisoner's Dilemma is probably the most famous and common of all the analysed games. According to the classic version, two members of a criminal organisation are arrested and imprisoned in solitary confinement without being able to communicate with each other. The police offer both the prisoners a bargain; they might betray the other prisoner by testifying against them or cooperate by remaining silent.

To analyse a game, the players, the strategy, the order of play, information, and payoffs need to be identified. In this example the game has two players, the two prisoners. The set of all possible actions available to the player is called a strategy set; in this case the actions are betrayal or cooperation. The game is *simultaneous* because the players have to decide simultaneously without knowing the other player's action; if the players were taking turns in deciding a strategy the game would be *sequential*. The information set should specify: who knows what, when they know this, whether what they know is known to others, if it can be used to enforce consequences, and whether "what" they know is true or deceptive. Here, the players are aware of the set of available actions and that the other player has the same strategy set which is not influenced by any of the players' preferences. In the case of multi-round or sequential games, a player might be faced with a subset of the strategy set A. The strategies that are selected by each player are called strategy profiles (Bowles & Halliday, 2021).

The level of desirability of the available actions is defined as preference. It is assumed that the player regards one action as more desirable than another or equally

desirable; i.e. *"the action chosen by a decision-maker is at least as good, according to her preferences, as every other available action"* (Osborne, 2003). This is called a payoff i.e. a number that is assigned to a possible outcome based on its level of desirability (Bowles & Halliday, 2021). In our example, the payoffs would be w>x>y>z (e.g., w=5, x=3, y=1, z=0). When one player betrays the other while the second cooperates, the one who betrayed would get the highest payoff (w) and the one who cooperated would get the lowest (z). If they both cooperate, they get x and if they both betray, they get y. If w=5, x=3, y=1, z=0, the payoff matrix would be as shown in Table 1

Table 1

Payoff Matrix for Each Move of the Prisoner's Dilemma

		Player 1	
		Cooperate	Defect
Player 2	Cooperate	3,3	0,5
	Defect	5,0	1,1

(The payoff to the row player is given first in each pair of numbers.)

This leads to what is called a payoff function or utility function which associates a value with an action in a way that a higher value is more desirable or preferable. This function which defines how a player chooses one action over another can be deterministic or probabilistic. A function is considered deterministic (as in our example) when, given a set of input values, it returns the same result; in this case, having a specific rule such as an order of preference based on earnings. A probabilistic function defines preference with a predetermined or a random probability distribution (deterministic or stochastic probability distribution). Utility

functions may include the outcomes or the probability of the outcomes of other players; this means that one player might prefer to take big risks, another might seek to maximise their gain or to bring equal outcomes.

A model (mathematical or not) of interacting decision-makers in a strategic game consists of:

a. A set of players;
b. A set of actions for each player;
c. The preferences over the set of actions (expressed by the payoff function) including the preferences over the set of action *profiles* of the other players. An action *profile or strategy profile* specifies the action the player chooses.

A strategic game can be an *extensive game* – i.e., have more than one decision point. An extensive game consists of:

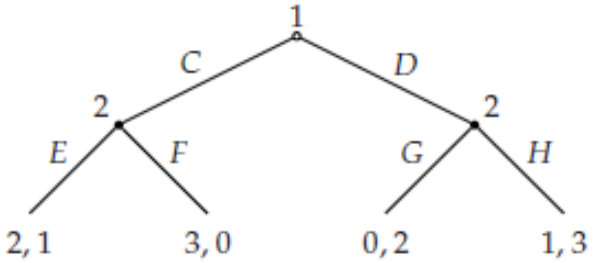
a. The set of players;
b. The set of terminal histories *h* i.e., all sequences of actions that can possibly occur;
c. The player function that assigns a player to every terminal history and;
d. For each player, their preferences of the set of terminal histories;
e. A *strategy profile*, which specifies the action the player chooses for *every* history after which it is their turn to make a move.

A *strategy profile* of a player *i* in an extensive game is a function that assigns an action A to each history *h* after which it is player *P*'s turn to move (i.e., $P(h) = i$, where *P* is the player function).

Figure 1 shows an example of a decision tree to explain the terms history, action and strategy (Osborne, 2003).

Figure 1

Example of decision tree with decision points and strategies



Note. The decision points of the game are shown with the numbers 1 and 2. Available Actions for Player 1 who moves first are C and D. C and D are also histories for Player 2. After History C, available Actions are E and F; after, History D available Actions are G and H. Thus, a strategy for Player 2 is a function that assigns either set of Actions to each History. There are four possible strategies *P(h)=EG, EH, FG, FH where h is C, D*

Robert Axelrod studied strategies empirically using iterated Prisoner's dilemma games in the 70s (Axelrod, 1980, 1984). He suggested that the strategy with the highest payoff is tit-for-tat i.e., mirroring your opponent's decision; cooperate to start with and then act according to the other's actions. There is a very interesting and lively debate on the issue of strategies (Osborne, 2003), but it is beyond the scope of this chapter to review strategies.

Nash Equilibrium. Another important concept of game theory is the Nash equilibrium. Named after its inventor, mathematician John Nash, the Nash equilibrium is a concept that describes the optimal outcome of a game as no incentive to deviate from the initial strategy. In our Prisoner's Dilemma example, if both players defect, they have no incentive to unilaterally change their strategy. Thus, the

Nash equilibrium of a game is one where no player has an incentive to deviate from their chosen strategy after considering an opponent's choice. The Nash equilibrium also implies that the players' beliefs about each other are correct or that their expectations are coordinated.

1.3.1. Using game theory to study normative and non-normative human behaviour

The assumption that humans are rational agents (with pure rationality) who make decisions with controlled thinking and strive to maximise their profit has been challenged by psychologists, sociologists and philosophers (Anderson, 2000; Fehr & Gächter, 2000; Sen, 1977; Wischniewski et al., 2009) as well as by neuroeconomists who use game theory to study social exchanges and their neurobiological underpinnings (Axelrod & Hamilton, 1981; Fehr & Fischbacher, 2004; Fehr & Gächter, 2000).

Games and game theory are commonly used as a framework in order to study human behaviour because they offer certain advantages over other paradigms (King-Casas & Chiu, 2012, p.; Sharp, 2012; Sharp et al., 2012). This is because the way in which game theory defines a strategic game expands the common use of cognitive tasks in psychology and neuroscience, creating a complex social exchange and presenting the decision-makers with a variety of options regarding cooperation, fairness, loss and gain, rupture and repair of reciprocity. Neuroeconomics provide a controlled research environment where performance (behavioural) measures can be combined with intermediate measures between behaviour and neurobiology (e.g., neuroimaging) (Sharp, 2012). Importantly, the behaviour can be examined as it's happening, offering an advantage of ecologically validity compared to research

designs that employ self-report or interviews (Sharp, 2012). Finally, the field of neuroeconomics provides a space for researchers from different disciplines to develop an interdisciplinary approach with regards to studying decision making in psychiatric disorders and, therefore, is a promising field for the creation of endophenotypes associated with psychiatric disorders (King-Casas & Chiu, 2012; Montague, 2012; Sharp, 2012).

There are many games, but the ones that are most commonly used are:

1. The Ultimatum Game and the Dictator Game, in which players have to divide a sum of money,

2. The Trust Game and Prisoner's Dilemma, in which players invest money to a partner and the partner decides how much to return to the investor.

3. Coordination games that assess the player's insights into the preferences of others and the following choices. For example, in matching pennies, players choose between two alternatives (heads or tails). One player wins if the two choices are the same, and the other wins if they are different (Sanfey, 2007).

Each game provides an opportunity to study a slightly different domain of cooperation and decision-making and each has been used to test certain hypotheses. The Ultimatum and Dictator Games have been used more for the study of fairness and intention attribution (Raihani & Bell, 2017; van 't Wout & Sanfey, 2011; Wischniewski et al., 2009) whereas the Trust Game and Prisoner's Dilemma have been utilised for the study of cooperation and reciprocity, particularly the multi-round version of the Trust Task (Franzen et al., 2011; Hula et al., 2018; Jeung et al., 2016; King-Casas et al., 2008a; Unoka et al., 2009).

1.3.2. Theoretical rationale for a Game Theory approach (theory of evolution, cultural anthropology and more)

There is diverse multi-disciplinary work on cooperation and reciprocity and there are several theoretical explanations and hypotheses attempting to explain human behaviour with regards to cooperation and reciprocity. The most influential concepts and hypotheses will be outlined here.

Firstly, social norms play an important role in decision-making in humans. Social norms are rules that define expectations in interactions (Young, 2003). As seen above, game theory considers rationality and expectations as the two determinants of decisions. Consequently, there are theoretical and computational frameworks that construct and explain social norms through the cumulative effect of many decentralised interactions and employ evolutionary game theory to model how norms are created, sustained and can be understood with evolutionary theory (Young, 2003, 2015). From a different perspective, social norms are the result of cultural norms, i.e. the intergenerational transmission of information, and group selection dynamics (Richardson et al., 2003). It has been shown through neural network models that cultural information transmission is more efficient than the vertical (i.e. from parent to child or teacher to student or genetic information transfer) or purely horizontal (i.e. the diffusion of the majority's opinion) information transfer (Jaffe & Cipriani, 2007). Thus, the analysis of behaviour in socio-economic exchange games can reveal how social and cultural norms, e.g., gender norms, affect decision making.

On a broader level, reciprocity and altruism are two important concepts that have been the epicentre of heated debates within evolutionary biology and cultural

anthropology (Axelrod & Hamilton, 1981; Fehr & Fischbacher, 2004; Trivers, 2006; Wilson, 2005).

The important point which is relevant to this field of study is that, according to the classic theory of genetic kinship, altruistic behaviour should happen only among members of the same kin, but this has not always been validated empirically (Axelrod & Hamilton, 1981; Haig, 2004). This may be: (a) because there are certain evolutionary advantages in preserving altruistic behaviour (Axelrod & Hamilton, 1981); (b) because of the expected reciprocation as defined by Robert Trivers in 1971 by the term reciprocal altruism (Trivers, 2006); (c) because certain circumstances make reciprocity dominant and advantageous compared to others which make self-interest dominant e.g. bilateral interactions versus competitive markets (Falk & Fischbacher, 2006; Fehr & Fischbacher, 2004). In this project, game theory is applied in order to study reciprocity and cooperation in relation to parenting differences and longitudinal development of psychopathology as well as age differences, gender differences, and to explore evolutionary and psychosocial interpretations.

1.3.3. The Trust Game and Psychopathology

The game theoretical approach has been used to study behavioural and biological differences between different groups of the general population categorised using the system of classification of psychopathology and comparing them to healthy controls. One of the problems of the current psychiatric diagnostic categories is that emotional, behavioural, and interpersonal difficulties are not linked with their decision-making profile, functional anatomy and the neurobiological substrate (e.g. Cuthbert & Insel, 2013; Insel et al., 2010). Game theory and neuroeconomics are considered to be an advantageous framework for the study and re-classification psychological difficulties (Montague, 2012; Sharp, 2012) particularly because decision-making profiles and functional neuroanatomy can be studied simultaneously.

Traditional psychiatric diagnoses aggregate several dimensions of dysfunctional behaviour and domains of dysphoria, while neuroeconomic tasks offer the opportunity to identify neuro-behavioural profiles. These profiles are likely to exist in spectrums of intensity or of a dimension e.g. trust/mistrust. Importantly, they transgress traditional diagnostic categories and focus on the phenomenological and behaviourally observed aspect of psychological capacities that may be indicating the level of risk or resilience of an individual.

The Trust Task was chosen among other well-established paradigms because it provides a social situation where the player needs to show trust to their partner in order to maximise their gains offering an opportunity to study how individuals make decisions regarding dependency on others; a critically important issue for vulnerable individuals, such as adults with interpersonal difficulties. In this game, two players are given 20 coins each and the first one (the investor) gives some to the other player

(the trustee). The trustee receives triple the number of coins given by the investor and has to decide how many (if any) they will share with the investor. In the iterated version of the game, this is repeated for ten rounds. The iterated version of the task allows for the possibility of rupture and repair of the interaction which is also very important, particularly for the study of interpersonal difficulties.

1.3.3.1. Borderline Personality Disorder (BPD)

Borderline personality disorder is a condition that is characterised by a pervasive pattern of instability in affect regulation, poor impulse control, difficulties in interpersonal relationships, and disturbances of self-image. Self-harm and/or impulsive aggressive behaviours and severe psychosocial impairment are included in the diagnostic criteria for the disorder (Fonagy & Bateman, 2008; Lieb et al., 2004).

The prevalence of the disorder is about 1–2% of the general population—up to 10% of psychiatric outpatients, and 20% of inpatients. BPD onset is estimated in early adolescence (Cohen et al., 2005; Sharp, 2016; Stepp et al., 2010; Videler et al., 2019), more than 30% of adult BPD patients report onset of self-harm before the age of 13 and another 30% between 13 and 17 years (Zanarini et al., 2006). Overall, adolescence is the age of onset for several diagnosable psychological disorders including BPD with certain risk factors playing a triggering and cumulative part in the process. Low socio-economic income, family relationships, maltreatment and abuse, negative affectivity and impulsivity are some of the risk factors (Stepp et al., 2016; Videler et al., 2019). Although, BPD symptoms can be reliably distinguished from normative adolescent behaviours (Chanen, 2015), there are some commonalities in identity issues and affective instability; those diminish in healthy adolescents, whereas they persist in BPD adolescents.

Individuals diagnosed with Borderline Personality Disorder have a significantly higher mortality rate than the general population due to suicide which can be up to 10% of patients. Also, these patients require substantial mental health resources which are costly. For these reasons, rigorous research focusing on understanding the condition better and treating it effectively has been conducted and has yielded important results (Bateman & Fonagy, 2003; Lieb et al., 2004).

According to Bateman & Fonagy (2003), BPD patients exhibit a quintessential deficit of the capacity to mentalise. Mentalisation is the capacity to understand ourselves and others in terms of intentional mental states (Fonagy & Campbell, 2017). In turn, mentalising is essential in order to maintain healthy relationships and in order to repair ruptures when they happen.

The game theoretical paradigm has yielded some of the most influential studies on trust and cooperation in patients with BPD. Most of these studies have utilised the iterated Trust Game because it allows the observation and measurement of behaviours that require mentalising. Furthermore, beyond the primary aim of studying BPD, mentalisation is a human capacity that is necessary for most domains of life and a deficit is likely to be present in other diagnostic categories.

King-Casas et al. (2008b) were the first to study BPD patients using a multi-round Trust Game and showed that BPD patients exhibited less trust and cooperation in the game when playing as trustees. More specifically, Borderline Personality Disorder patients have shown a profound difficulty to maintain cooperation and to repair cooperation when it was broken (King-Casas et al., 2008b) i.e. if the trustee didn't return (what was considered) a fair amount of coins to them, they were less likely to share coins with their partner in the following rounds. Hula et al. (2018)

have created a computational model of trust task performance that makes use of 7 parameters such as risk aversion, guilt, irritation and more. In this model, if trust were to be measured for the investor, then risk aversion would be the expression of lack of trust i.e., the player who gives less money shows less trust to their partner. Through this model, they identified a subgroup of trustees who act perilously in relation to the continuation of a cooperative interaction because they are more risk averse (or less trusting) and more irritable when playing as the investor and more aware of change when playing as the trustee. This type of trustee is over-represented in borderline patient samples compared to control groups.

Franzen et al. (2011) suggest that BPD patients have superior Theory of Mind compared to non-patients (using an iterated Trust Task and playing as investors) because they are superior in identifying the unfair trustee in the presence of facial emotional cues. They found that BPD patients are more accurate in identifying an unfair trustee (and similar controls in adjusting their investment levels), while controls were able to do this only when facial emotional cues were absent. Furthermore, BPD patients appraise their own fairness level higher in the presence of facial emotional cues of an unfair trustee. The authors interpreted this as superior Theory of Mind and posit that this contradicts hypotheses of mentalising impairments in BPD patients. However, another plausible interpretation would be that BPD patients are less "tuned in" to facial expressions and hypersensitive to behavioural rewards and punishments. This interpretation is consistent with research that suggests that BPD patients show some specificity in recognising anger when socio-affective cues are ambiguous suggesting that BPD patients are hypervigilant, not impaired in emotion recognition (Bortolla et al., 2020; Domes et al., 2008; Kuo et al., 2016; Lynch et al., 2006).

This task performance profile is also consistent with evidence that suggests that BPD patients invest less than patients of Major Depressive Disorder or other Personality Disorders in the Trust Task and this is not related to differences in risk-taking behaviour in general e.g. when playing a risk-taking lottery game (Botsford, 2020; Unoka et al., 2009). When investigating whether or not risk aversion is heightened rather than interpersonal trust reduced, Unoka et al. (2009) conducted both a traditional trust game and a "risk game" in which participants believed that a computer lottery program (instead of a human partner) randomly determined repayments. In the trust game, investors with BPD transferred significantly less money to trustees and predicted worse outcomes. However, in the risk game, investors with BPD and controls transferred comparable amounts of money. Together, these findings demonstrate that decreased spending specifically reflects diminished interpersonal trust (Masland et al., 2020). Also, Niedtfeld and Kroneisen (2020) showed that BPD patients differ from healthy controls in how they cooperate with trustworthy targets specifically and there is no difference in how they trust untrustworthy partners, indicating that the cognitive bias is located in the assumption that all people are untrustworthy.

Abramov et al. (2020) used the innovative paradigm of discontinuous growth modelling that allowed them to model how trust forms, dissolves and is restored after experimenter-induced violation and restoration events in a multi-round Trust Game. They found that BPD traits (in a general population sample) were associated with declines in trust with new and cooperative partners and increases in trust after multiple violations of trust, as well as quicker trust restoration than trust formation.

Overall, the Trust Task has offered very fertile ground for the study of Borderline Personality difficulties and decision-making allowing for in-depth study of interpersonal interactions and revealing the difficulty this population has in adjusting after rejection.

1.3.3.2. Other psychiatric categories

Ong et al. (2017) found that people with mood disorders (bipolar I and major depressive disorder) were more cooperative trustees than healthy control participants. According to data from Mellick et al. (2019), adolescent girls with depressive symptoms invested more across trials when playing the Trust Game compared to playing a lottery risk game where they invested similarly to healthy comparisons. Caceda et al.(2014) also found that men who experience suicidal ideation exhibit much more reciprocity than healthy men.

Individuals with generalised social anxiety do not differ from healthy participants in the frequency of choosing to invest in the iterated Trust Game. However, they show smaller activation in their prefrontal cortex during this investment phase of the game (C. S. Sripada et al., 2009). Also while choosing to invest, this particular group of patients shows diminished brain activation in the ventral striatum relative to the consistency of their partner and the severity of their condition (C. Sripada, Angstadt, Liberzon, McCabe, & Phan, 2013). The ventral striatum is associated with reward processing, which (Phan et al., 2010).

Fett et al. (2016) showed that the initial investment, which some have referred to as ‘basic trust’, as it is uncontaminated by the other players behaviour, was lower in patients with early psychosis than controls. However, when playing a cooperative

partner, patients increased their trust towards the levels of controls, i.e., they were able to learn and to override initial suspiciousness, but they decreased their trust less than controls during unfair interactions.

Adult patients with Attention Deficit Hyperactivity Disorder have been found (a) to invest more when they play as investors, (b) to not be as able to adjust their behaviour to the (un)fairness of their counterpart, and (c) to exhibit equivalent abilities to non-patients in attributing emotional states and adjusting their behaviour in the game based on facial emotional cues (Lis et al., 2016).

A variation of the multi-round design (i.e. offering a choice between a binary of trust or no trust) has also been used to assess trusting behaviour in adopted and institutionalised children (Pitula, Wenner, Gunnar, & Thomas, 2016). These children are more mistrusting (choose not to share money), more sensitive to both defection and reciprocation (in response to the respective decision by their counterpart as well as in the later rounds of the game), and potentially more accurate in their trusting decisions than the control young people.

Moreover, using a modified mistrust game that required participants (mean age 29.2 years) to estimate the monetary deductions their counterparts would indicate for them, Hepp et al. (2021) found that higher levels of childhood maltreatment were associated with higher levels of mistrust (they indicated more expected money reductions) and a smaller decrease in mistrust (they indicated smaller decreases in expected money reductions) despite receiving the feedback that the co-player had deducted a smaller amount than predicted. Further, they found that individuals with higher levels of childhood maltreatment rated facial emotional expressions more negatively (Hepp et al., 2021). These findings confirmed the cognitive models of

PTSD hypothesis that individuals that have undergone traumatic situations would be less responsive to positive feedback and less adaptive (able to trust) showing persistent response patterns to perceived interpersonal threat.

1.3.4. Age differences

Beyond the field of psychopathology, cooperation games have been used in order to study the development of social behaviour as a function of age. The focus of this literature review is on research that employed the Trust Task in order to study the development of cooperativeness and reciprocity.

Research on age differences in the Trust Task is complex because different forms of the game have been used. When comparing younger with older groups, three studies have used the classic one-round Trust Task (Holm & Nystedt, 2005; Rieger & Mata, 2013; Sutter & Kocher, 2007), three used consequent trials of the one-shot Trust Task with different partners (Bailey et al., 2015; van de Groep et al., 2020; van den Bos et al., 2010), and two used the multi-round Trust Task (A.-K. J. Fett et al., 2014; King-Casas et al., 2008c).

Evidently, this affects the results and the interpretation of the results of each study. Two out of three studies that used the one-shot task to assess age differences in the whole adult age-range (Holm & Nystedt, 2005; Rieger & Mata, 2013) found no age related differences in the amounts of money invested in the trust game. However, in the context of a multiple-round task (Bailey et al., 2015; A.-K. J. Fett et al., 2014; King-Casas et al., 2008c, p.; Sutter & Kocher, 2007; van den Bos et al., 2010) older participants were consistently more likely to invest more money than their younger counterparts.

One likely explanation for this is that the one-shot task is not appropriate for the study of social skills because it offers minimal data for each participant and is heavily dependent on cognitive skill. Another explanation might be that it and is not appropriate for the study of social skills such as perspective-taking. Perspective-taking becomes more sophisticated during adolescence and might be the cause of the increase in investments by older participants. Both MRI studies of the adolescent brain (Blakemore, 2008) and Trust Task MRI studies (van den Bos et al., 2011) have shown that the medial and dorso-lateral prefrontal cortex, which is responsible for better perspective-taking and resulting in more investments in older adolescents, develops during the time of adolescence.

The finding that perspective-taking is linked to "trusting" others in the Trust Task has been consistent (A.-K. J. Fett et al., 2012a, 2014). Fett and her colleagues (2014) found that adolescents with a higher perspective-taking tendency demonstrated (a) greater trust through giving higher contributions and (b) greater sensitivity to the other's perspective by reducing their contributions drastically when treated unfairly by their counterpart.

Prosociality might be another possible mechanism through which trust increases with age. Derks, Van Scheppingen, Lee, and Krabbendam (2015) examined social value orientation ('prosocials' and 'egocentrics'), mindreading (measured by the Reading the Mind in the eyes test), and trust in an adolescent sample (14.1-16.4 years old). They found that social value orientation moderated the relationship between mindreading and trust. There was no correlation between mindreading and trust in prosocials and mindreading was negatively correlated to trust in egocentrics indicating that the egocentric social orientation leads to less trust.

These findings are important in order to understand the development of the ability of perspective-taking and prosociality, but also show that a multi-round Trust Task is appropriate for the study of the development of these capacities.

Beyond the willingness to cooperate with (or trust) others in the Trust Game, another important realm of decision-making is reciprocity. Van de Groep et al. (2020) found that trust increases with age, but reciprocity reduces in the ages of 12-18 years old, claiming that this is because adolescents develop more refined social skills during this time. This study employed a multi-round game, but offered closed decision options (i.e., the participants were not free to choose any number of coins from 1-10). Using a multi-round paradigm, van den Bos, Westenberg, van Dijk, and Crone (2010), who presented a sample of 9-25 years old divided over four age groups, found that both trust and reciprocity increased with age. Moreover, young adults (Mean age=22.3) trusted more when the benefit of the trustee was large.

The multi-round paradigms also offer the crucial advantage of studying reciprocity and trust after a ruptured interaction which has yielded important results as already mentioned. From a developmental point of view, Belli, Rogers, and Lau (2012) demonstrated that in the condition of a multi-round interaction without ruptures, adolescents (aged 13-14) were motivated by an aversion towards unequal gains (inequity aversion), whereas young adults (aged 19-35) overcompensated the investor. In the condition of an interaction with rupture adults have more polarised responses than adolescents.

The development of emotion regulation from childhood to young adulthood also plays a role in reciprocal interactions in the Trust Task. It has been found that anger and punishment in reaction to an unfair partner decrease from late childhood to

young adulthood and that feelings of anger mediate willingness to punish (van den Bos et al., 2012).

1.3.5. Gender differences

Another important area of difference in trust and reciprocity is gender. Trusting behaviour entails complex processing of risk, perspective taking, seeking fair or unfair outcomes, altruism and, social norms and stereotypes. In the case of gender differences, it is reasonable to assume that both social and biological factors are at play. Indeed, trust has been associated with oxytocin receptor genes, serotonin transporter genes, and AVPR1A gene (Dong et al., 2018). Trust evaluation (i.e., whether we judge someone as trustworthy), however, has been shown to be influenced by non-shared environments in twins indicating that social learning plays a significant role. Although, trusting behaviour has been linked to specific genetic variations (Cesarini et al., 2008) and oxytocin and vasopressin (Krueger et al., 2012), there is no evidence of neurobiological gender differences associated with differences in trusting behaviours.

Female individuals have consistently been shown to be more willing to show interpersonal trust and to be helpful to others (Rotenberg et al., 2005). According to Schniter & Shields (2020), "Gender differences in dishonesty and mistrust have been reported across cultures and linked to stereotypes about females being more trustworthy and trusting". Irwin et al. (2015) posit that this is due to risk-avoidance differences between the two genders. Other authors consider it to be due to a socio-cultural difference in gender roles that promotes "agentic" (i.e. instrumental and efficient) behaviour (van de Groep et al., 2020), and differences in equity and efficiency preferences (Meuwese et al., 2015).

Socio-economic task studies overwhelmingly find that males are more willing to trust, that is to make decisions that involve more risk taking or less risk-avoidance. Initially, Croson and Buchan (1999) found no gender difference in trust using the one-shot Trust Game paradigm with a multi-cultural sample (Canadian/Japanese). They did find that women were more likely to reciprocate and share more of their money with their co-player. Chaudhuri and Gangadharan (2018) found that male participants invested more when they tested a sample of Australian undergraduate students. Derks, Lee, and Krabbendam (2014) used the one-shot Trust Task (but did five trials for each participant) in an adolescent sample (14.1-16.5 years old) and found that boys were more trusting than girls, but there were no gender differences in reciprocating. Also, a study that used a paradigm which allowed specific decisions in one-shot games and the participants were made to believe that they were playing same gender partners (9-25 years old) found no gender differences in trusting behaviours (van den Bos et al., 2010). These are important methodological parameters that may have affected the results.

In terms of prosociality, which in this case was defined as the preference to maximize one's own outcomes (‘proself’) versus both the outcomes of self and other (‘prosocial’), they found that prosocials were more trusting and were reciprocating more than proselfs. Gender and social value orientation were independent predictors of trust (but not reciprocity) showing that the higher levels of trust in boys are not the result of a gender difference in prosocial orientation. Consistently, van de Groep et al. (2020) also showed that males choose to “trust” more than females.

Another possible explanation for the contradictory finding might be that males and females differ in how trustworthy they perceive their partner to be; this can be

shown only when using adjusted paradigms. Lemmers-Jansen (2017) investigated brain activation in 16-27 year-olds using a multi-round trust task with two different trustees (one fair and one unfair) and showed that trust and reciprocity differences between genders only occur in the unfair condition and become more pronounced with older participants. This suggests that males trust more when deciding their initial investment (linking it to less risk avoidance) and reduce their investments more when playing an unfair partner (linking it to less equity seeking). This gender-specific pattern regarding reciprocity has been shown to be inversed in depressed males (Caceda et al., 2014). These authors used a one-shot Trust Task paradigm (30 trials for each participant), which indicated that depressed men exhibited reciprocity (i.e., the participant returning money when playing as a trustee) more frequently than healthy men. Interestingly, suicidal ideation was associated with increased reciprocity behaviour in both genders. This finding indicates that equity seeking increases in individuals who experience suicidality and men who experience depressive symptoms.

Overall, there is solid evidence that male players exhibit less risk aversion or less equity seeking, despite the differences when one-shot versus multi-round tasks are used. This gender difference was not found in older children (9-11 years old) (van den Bos et al., 2010), but it has been found in young adolescents (12 year olds) (van de Groep et al., 2020) and continues to older age. This indicates that social learning of gender norms may have an important influence. The paradigms used differ significantly and more research is necessary to determine when these gender differences in trust begin. This will help illuminate the interplay of social and biological factors because these preferences develop very early on in childhood.

Another issue that remains unclear with regards to the role of social norms and how they differ for each gender. Independent of whether this pattern will be interpreted as a fear that others will exploit them as in Croson & Gneezy (2009), or a specific male orientation to gains, even exploiting others' cooperation (Eagly, 2009; Simpson, 2003; van de Groep et al., 2020), individuals generally trust others because that is what people think they should do in order to fulfil a social duty or responsibility associated with feelings of guilt and anxiety (Dunning et al., 2014). This accounts for at least a significant proportion of the excessive trust observed towards strangers versus known peers and that trust rates collapse when respect for the other person's character is eliminated as an issue (Dunning et al., 2014). Additionally, our group has shown that males showed lower risk-aversion, associated with greater investments and females show higher inequality aversion (Hula et al., 2021). Taken together these findings suggest that there is a perceived social responsibility to seek equitable results in females that does not exist for males allowing them to be less risk averse.

1.4. **Research design and methodological considerations**

1.4.1. Multi-round, multiple one-shot, and one game paradigms

As it is evident from the literature review so far, there are certain research design choices that researchers make which can be pivotal for the results and interpretation of them.

Historically, the first design of the Trust Game was a paper and pencil game with two human partners playing one round of the game (Berg et al., 1995). Following this, within psychology, there have been numerous diverse research

designs combining paper and pencil or computerised versions with questionnaires, emotion recognition, neuroimaging and more. The research designs also include playing with real partners or virtual ones, playing with one partner or more, playing more than one round of the one-shot game (Bailey et al., 2015; van de Groep et al., 2020; van den Bos et al., 2010) or playing multiple rounds (Abramov et al., 2020; Hula et al., 2020a; King-Casas et al., 2008c).

1.4.2. Investors vs Trustees

Another important part of the research design when using the Trust Task is whether the participant will be placed in the Investor or the Trustee role.

The Investor starts the game and this position offers insight into the investor's priors i.e. the a priori beliefs or predictions they might have e.g. Unoka et al. (2009). Depending on whether the researchers create different conditions such as a cooperative and a non-cooperative partner, the Investor's reactivity can be tested as well (A.-K. J. Fett et al., 2012b). For example, Franzen et al. (2011) found that BPD investors are more sensitive than non-patients in adjusting their behaviour to unfair partners and superior at attributing emotional states through facial expressions.

On the other hand, there are important findings that focus on BPD impairments where the participants were placed in the position of the Trustee e.g. King-Casas et al. (2008c). According to Thielmann et al. (2014) due to low levels of Agreeableness, but normal levels of Honesty-Humility, borderline personality features are related to impaired reactive cooperation, but unrelated to active cooperation. This suggests that individuals with borderline traits will have greater difficulty to respond appropriately as the receiver of a social cue of cooperation. As initiators of the

interaction, they will make similar choices due to the similar levels of their honesty and humility as control individuals.

1.5. **The Neuroscience in Psychiatry Network (NSPN)**

The data for the present thesis were collected as part of the Neuroscience in Psychiatry Network (NSPN). NSPN is a large-scale longitudinal cohort study which was set up in order to "link normal and psychopathological variation at the behavioural, cognitive and emotion level to phenotypic variation at the level of brain systems, subverting the traditional division between adult and child/adolescent psychiatry by measuring specified dimensions in healthy volunteers and patients in the age range of 14–24 years" (Kiddle et al., 2017).

The cohort was set up in order to enhance the reconstruction of psychopathological categories through the use applied neuroscience. There are three pathways that have been identified for this purpose: (a) the study of the extent of variation in cognition and behaviour throughout the general population (as opposed to comparing categories of mentally well and ill), (b) investigating brain systems underlying cognition, emotion, and behaviour, (c) employing a developmental approach for understanding optimal/suboptimal trajectories of neurocognition as well as the possible high-risk periods.

As described in the cohort profile: "The NSPN 2400 Cohort was established in July 2012 as a collaboration between the University of Cambridge and University College London supported primarily by a strategic award from the Wellcome Trust.

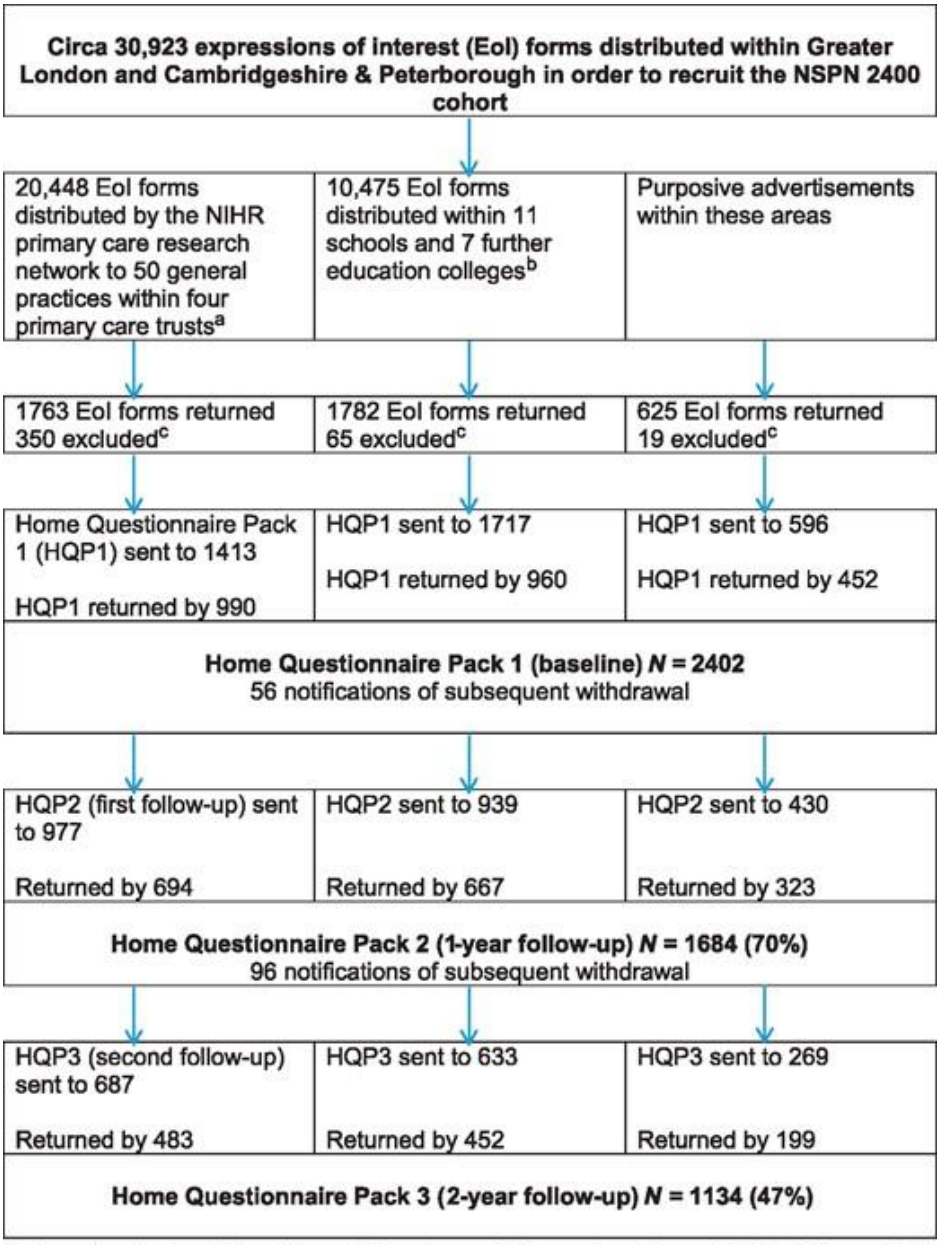
The NSPN 2400 Cohort is a general population sample aged 14-24 years conceived to support an accelerated longitudinal design to measure developmental

change. This design involves recruitment of multiple, age-adjacent cohorts followed longitudinally for a limited period of time, which permits estimation of trajectory across a wider range of ages more quickly than a single-cohort longitudinal follow-up. In addition to its efficiency, bias from attrition can be less problematic given that dropouts in cohorts are related to study duration, highlighting another advantage of the accelerated design.

The NSPN 2400 Cohort aimed to recruit at least 2000 participants in an age-sex-stratified sample, including equal numbers of males and females for the following five age groups: 14-15, 16-17, 18-19, 20-21, and 22-24.99 years. Participants received a Home Questionnaire Pack (HQP) and Sociodemographic Questionnaire that focused on assessing participants' mood, behaviour and wellbeing along with demographic characteristics. This was accompanied by an Oragene saliva sampling kit for DNA collection that was returned to the study team by post, together with the completed questionnaires. Figure 2 shows the recruitment process.

Figure 2

The Recruitment and Data Collection Process Kiddle et al. (2017)



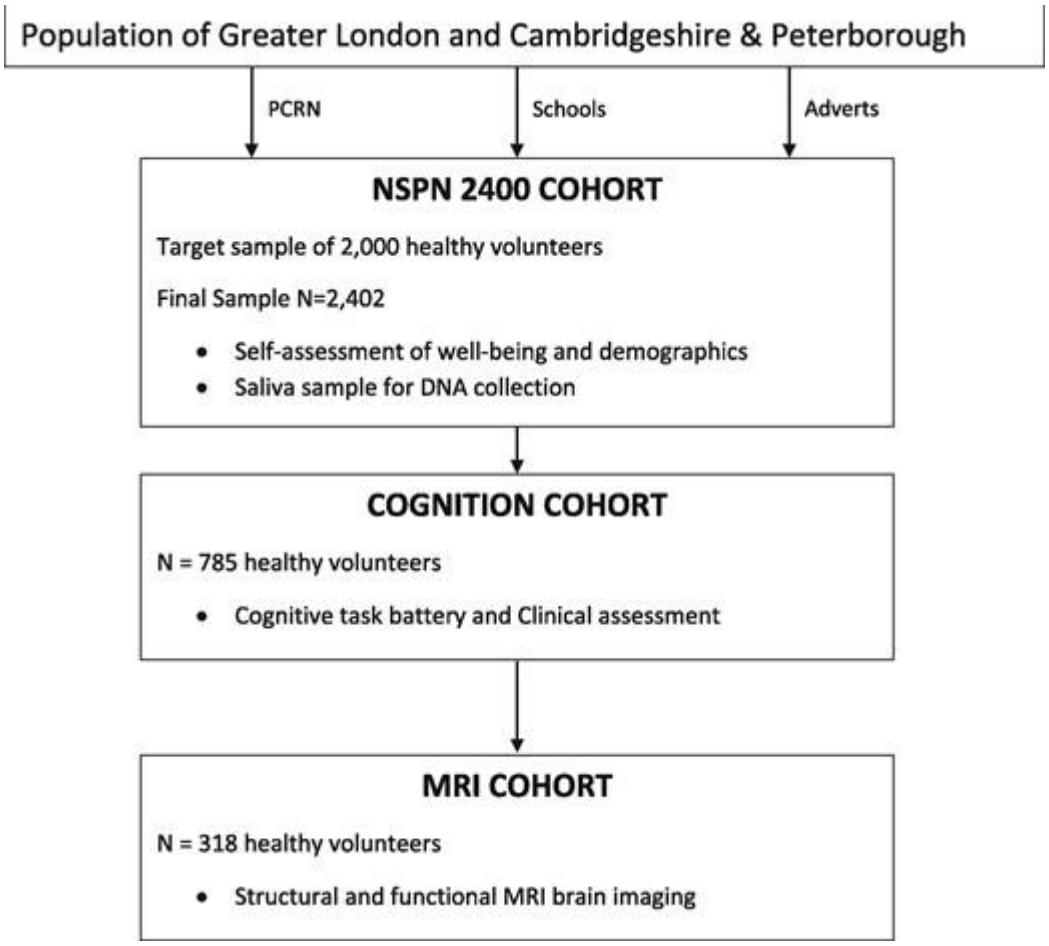
[a]36 practices in Cambridgeshire and Peterborough Primary Care Trust (PCT), 8 in Barnet PCT, 3 in Camden PCT and 3 in Islington PCT.
[b]Schools in Barnet (2), Camden (4), Islington, Tower Hamlets, Haringey, Lambeth and Redbridge (all 1 each), and colleges in Cambridgeshire and Peterborough (6) and Islington (1).
[c]Excluded due to current age beyond scope.

There were also two subsamples with more intensive measures embedded within the NSPN 2400 Cohort. Again, these were recruited from the ten age-sex strata as for the MRI cohort, aiming for a sample size of at least 450 additional subjects with detailed cognition measurement and, including the MRI cohort, a total of 750 or more people with the cognitive assessments. This combined subsample with cognition measures (the 'cognition cohort') comprises 785 people, of which 318 (the MRI

cohort) have both MRI and cognition measurements (Figure 3). When resources for taking blood allowed, participants in both cohorts were asked to provide a venous blood sample for future genetic, epigenetic and gene expression. The MRI and cognition cohorts were followed-up on one or two occasions. By the virtue of this design, there are participants that completed all three waves of HQP as well as three in-unit assessments."

Figure 3

The Recruitment and Data Collection Process Kiddle et al. (2017)



The final sample sizes and time intervals were as follows: Time 1 was the baseline measurement (N=2454); Time 2 was the first follow-up (N=1854), where the

median interval was 12 months (11-14 months); and Time 3 was the second follow up (N=1306), where the median interval was 13 months (12-16 months) (Figure 2).

Participants were recruited from GP practices, schools, youth clubs, and universities as well as through posters in the community. Every effort was made in order to recruit young people from all ethnic backgrounds and socio-economic classes.

All participants completed the Home Questionnaire Pack and received £10 for completing a pack of questionnaires sent to their homes. Twelve months later, a subsample of the 2k cohort (N=807) was invited to participate in an in-unit assessment; for which they received £10/hour plus travel and lunch expenses.

If a participant was under the age of 18, parental consent was sought for them to participate in the study and complete the Home Questionnaire Pack. The Socio-economic Questionnaire was completed by the parent if the participant was under 16 (Kiddle et al., 2017).

1.6. **The present project**

As part of the larger NeuroScience in Psychiatry Network, this project seeks to investigate the variation of trusting behaviours focusing on the period from 14-24 years and bridging the gaps in the literature that split child/adolescent and adult populations. The epidemiological approach of NSPN and the size of the sample offer a unique opportunity to study a broad range of questions.

The project presents an innovative methodology of research which investigates the roots of the psychological capacity to trust and its behavioural

phenomenology (cooperation and reciprocity) in order to predict future psychological distress in a general population sample. The broader cohort was set up to study the extent of variation in cognition and behaviour throughout the general population (as opposed to comparing categories of mentally well and ill) and to employ a developmental approach in order to identify potential risk factors or sensitivity periods. Under this broader aim, this project specifically investigates the relationship between the capacity to trust in the general population of 14–24-year-olds and its potential origins in parenting as well as its whether it may predict future depression and anxiety.

In order to answer these questions, first, I address issues of measurement. The first aim of this thesis is to investigate the various ways that cooperation and reciprocity can be measured within the Trust Game in order to determine which one is the most appropriate compared to an external measure of mistrust.

Following this, the question of measurement of the multivariate structure of parenting is addressed; there is a long and rich line of research around parenting styles and parenting dimensions, but I explore a data-driven multivariate model of parenting which includes positive and negative dimensions as well as the whole spectrum of parenting practices from warmth and praise to abuse and neglect. Such a comprehensive multivariate model of parenting has not been presented until now.

The effects of parenting as well as age, gender, and socio-economic status on trust and cooperation are examined. Based on previous literature, I hypothesise that trust will increase with higher positive parenting, age increase, that males will be more trusting than females and individuals with lower SES will trust less than those with higher SES.

Lastly, the effects of low mood and anxiety on trust are studied. In this case, I use this general population adolescent-to-adult sample which includes individuals with and without diagnosable conditions in order to examine whether low mood and anxiety are linked to less trusting and cooperative behaviour. I also hypothesise that individuals who are more trusting will exhibit lower levels of psychological distress in the future.

2. Operationalisations and measurement of trust using a socio-economic task.

2.1. Introduction

Trust is defined as the belief that someone or something is good, sincere or honest. If someone is considered to be untrustworthy, unreliable or dishonest, they will be identified as a potential threat. This would lead to vigilant or competitive behaviour. For this reason, it is considered to be an overarching concept that may potentially explain cooperative and competitive behaviour because such behaviour depends heavily on the trust and reliability of the partner (Sperber et al., 2010). This is of particular importance for adolescents and young adults who begin to independently relate with others and need to rely on their own judgement about who to trust and how to manage interactions.

Indeed, accessing resources, learning, and leading a fulfilling life, all depend heavily on being able to cooperate and sustain reciprocity with others (Hamilton, Helliwell, & Woolcock, 2016; Helliwell, Huang, & Wang, 2018; Helliwell & Wang, 2010; Luhmann, 2018; Sztompka, 1999). Thus, trust has been used as a concept that helps to predict and explain mutuality, continuity, and rupture in relationships. These dimensions of human relating are of great interest because of the implications they have on financial, educational, interpersonal and other decisions and behaviours as well as the way they may be affecting psychological development in childhood and adolescence (King-Casas et al., 2008; C. E. Sharp, Fonagy, & Goodyer, 2008).

There is a relatively recent, but rich tradition of experimental studies of cooperative behaviour using game theoretical hypotheses and methodology. This line of work includes -but is not limited to- the iterated Trust Task, a social economic

exchange game. This task (and various operationalisations of trust) is the main focus of this chapter. In it, I explore different ways of operationalising and measuring the concept of trust through the Trust Task by comparing them against the personality trait of suspiciousness as a measure of mistrust. Suspiciousness was selected to function as an external validity indicator because it is an established personality trait that has been studied consistently and measured with reliable and valid scales. The study aims to establish the most psychologically relevant and valid operationalisation of trust with regards to predicting risk and resilience to psychopathology.

The original version of the Trust Task, called the Investment Game, by Berg, Dickhaut, and McCabe (1995) stems for the field of microeconomics and games and it was created in order to study behavioural reciprocity and trust. When participants play this game, they have to decide to share some of their money with their partner while risking getting nothing back. The psychological question that arises is why people choose to cooperate, even though it is not in their personal interest i.e., they give money to their partner even though they could choose not to without any consequences. It is evident that this cannot be explained purely by a cost-benefit calculation. In order to deepen our understanding of this process, first of all, the most appropriate way to measure willingness to cooperate and to show trust to another human in relation to the psychological concept of (dis)trust needs to be established. The potential explanatory factors are associated with cognitive biases, core beliefs, personality traits, socio-environmental factors and potentially the state of mind of the subject at the time of playing the game. It is important to explore and incorporate all of these influences in order to investigate the validity of the measurement of trust via the Trust Game, but this is beyond the scope of this chapter. In this chapter, the focus will be on the personality trait of suspiciousness as a measure of mistrust.

There is growing interest in the use of game theoretical tasks as a complementary method for studying social and emotional behaviour and decision making because of their methodological advantages. Traditionally, questionnaires have been the most common psychometric tools; however, they have been criticised for a lack of ecological validity (Cicourel, 1982). On the other hand, observational and qualitative methods are costly and time-consuming, and they tend to suffer from poor standardisation (Bauer & Gaskell, 2000).

Tasks borrowed from Game Theory applications have long been used in the economics literature to operationalise and measure interactions between partners and groups (Morgenstern & Von Neumann, 1953). Intention and subjective experience cannot be studied through these tasks, but they offer the opportunity to study observable behaviour in controlled conditions, much more than a retrospective self-report measure administrated to the individuals themselves or to individuals of their environment (e.g., parents, teachers, etc.). Secondly, a sequence of interactions can be produced capturing the richness and complexity of real-life ongoing interactions with another player while the neural correlates of the process are being recorded. Thirdly, neuroeconomics could provide an interdisciplinary platform for studying behaviour and propose endophenotypes of problematic behaviour informing clinical practice, diagnosis and treatment (C. Sharp, Monterosso, & Montague, 2012). Economic exchange games provide an additional reliable and ecologically valid framework in order to study human behaviour as it is occurring in a social situation (Camerer, Ho, & Chong, 2003) and with the appropriate adjustments they can be used for most ages.

Thus, the combination of the long-standing and repeatedly validated self-report measures with the advantageous setup of games can yield promising results.

This chapter presents a unique study of different metrics of the Trust Game against the self-reported trait of suspiciousness in order to investigate the most meaningful measurement of the psychological construct of (dis)trust for the Trust Task and the psychological underpinnings of these metrics.

2.1.1. Different ways to operationalise trust through the Trust Task

Initial Investments. Although game-theoretic tasks are widely used in the literature, there is considerable inconsistency and large variation in the structure of the tasks used and in the specific operationalisations that derive from them to capture trust. As mentioned above, some studies have relied on a one-shot Trust Game (when players only play a single round), which has been considered to capture a priori expectations of cost and gain as well as societal norms and ethical rules that may play an important role in decision making (Buchan, Croson, & Solnick, 2008; Chaudhuri, Paichayontvijit, & Shen, 2013; Croson & Buchan, 1999; Delgado, Frank, & Phelps, 2005; Dunning, Anderson, Schlösser, Ehlebracht, & Fetchenhauer, 2014; Evans & Krueger, 2011). In multi-round tasks (when the participant plays multiple rounds with the same partner), this is represented by the decision the participant makes in the first round, i.e., the initial investment.

Mean Investments. Multi-round trust tasks provide a more dynamic and interactive measure of trust and cooperation. Nevertheless, there are numerous ways in which trust and reciprocal co-operative (and non-co-operative) behaviour can be operationalised in these tasks. The most common way to measure it is through the amount of money given by the investor across all rounds of the task, i.e. the total investments or mean investments (Aimone, Ball, & King-Casas, 2014; A.-K. J. Fett, Gromann, et al., 2012b; A.-K. J. Fett et al., 2014).

Decision Classification. Beyond total and mean investments, the iterated Trust Task allows more detailed analysis of reciprocal behaviour, particularly behaviour in response to a trustee's response. This has yielded important findings. According to A.-K. J. Fett, Shergill, et al. (2012) in a multi-round trust task, each of the participant's decisions can be classified into one of the following four categories: "(i) trust honouring: the trustee did not decrease the repaid amount; (ii) trust repairing: the investor did decrease the invested amount in the previous round, but the trustee did not; (iii) trust disrupting: the investor did not decrease the invested amount, but the trustee, nevertheless, did decrease the reciprocated amount; and (iv) mistrust reciprocating (or elsewhere referred to as retaliation): the investor did decrease the invested amount and, in response, the trustee did decrease the investment from the preceding to the current round.

Further, Belli, Rogers, and Lau (2012) analysed trustee behaviour in an effort to focus on the reciprocity aspect of cooperative behaviour. All of the participants played as the trustee. They split the 14 rounds of their version of the Trust task into three phases: the initial cooperative phase; the investor played a normative player based on Berg et al. (1995), the middle reduced-investments phase -this was a social rupture period with investors based on King-Casas et al. (2008c)- and the final return-to-cooperation phase. They found that a single "repairing" action by the trustee during the rupture phase predicts higher returns to the investor across all three phases.

Computational Modelling. A very innovative approach for the analysis of the Trust Task was employed by Hula, Montague, and Dayan (2015). They adapted Monte Carlo planning algorithms (heuristic algorithms for games) and developed a computational model based on Interactive Partially Observed Markov Decision

Processes. Markov Decision Process Models contain a set of possible states (S) and a set of possible actions for the decision maker (A) that result in a different state (S') which depends on the action (A) and a reward for the decision maker (R) (Givan & Parr, 2001). According to Hula et al. (2015), "States describe the position of the agent in the environment, and determine which actions can be taken, accounting for, at least probabilistically, the consequences for rewards and future states."

Based on this model and using both healthy participant and patient data, they extracted various parameters that were successful in reproducing 43% of assumed cooperative states and behaviours (Hula et al., 2018). Some parameters are more relevant to measuring trust and cooperation and some have to do with the computational and cognitive processes involved in the process.

The following parameters model recursive steps and/or decision probabilities in the task. Risk Aversion expresses a preference to keep a number of coins instead of risking some for the opportunity to increase it. It is defined as a specific preference to treat a part of one's coins as exclusively their own and choosing to risk only from the rest of the amount. The authors call this social Risk Aversion because it does not have to do with risk probabilities, but an a priori belief about how much sharing is safe and how much is not.

Guilt quantifies seeking equality in outcomes of the task, meaning that-for players with high level of guilt- the more inequality in the outcome the less they prefer it.

Theory of Mind is a parameter that models how the player learns about their partner and models them in their mind, computationally this was expressed as the

probability the player assigns that their partner has high or low levels of guilt and how this affects the player's preferences/ how much it changes in the course of the game.

Planning horizon quantifies the number of future exchanges to be taken into account in thinking forward by the player, i.e., a player with a short planning horizon might exploit their co-player too early in the game whereas a player with a longer planning horizon will lead their co-player to believe that they are trustworthy and stop sharing at the end.

Irritation models a state when the participant's preferences become very rigid leading to no cooperation or sharing, even when the co-player tries to coax them back to a more cooperative state.

Irritation awareness expresses the possibility that the player attaches to their opponent becoming irritated (as above) and how they adjust their game according to this.

Temperature models the certainty of a player's own preferences i.e. their consistency in their preferences throughout the game (Hula et al., 2018).

Growth Modelling. Beyond the simpler ways of trust operationalisation and the very complex computational modelling, Fulmer and Gelfand (2013) quantified trust formation, rupture and repair through discontinuous growth modelling. Latent growth curve modelling assumes a latent curve that approximates the growth or decline of a variable longitudinally across repeated measures, in this case the growth of trust in the course of a multi-round game. Unlike the complex computational modelling approach, here the only parameters that are extracted are the intercept and the slope of the curve which can be linear or u-shaped etc. In this particular study, the

researchers created a discontinuity by programming a trust-violation phase when the opponent was not sharing their coins. Then, they estimated three curves corresponding to the three phases of the game: (a) the baseline curve (the null model); (b) the curve before and after the trust violation (trust dissolution); and (c) the curve after the violation (trust restoration) (Audrey Korsgaard et al., 2018). They found that the change in the level of investments in the 15 rounds of the game was a function of the magnitude to the trust violation, but the change was also associated with contextual factors expressing how identified the participants were with the social group that they belonged to (their university, university students) and how important it was for them to fit in and not create conflict in a group (independent or inter-dependent self-construal). Abramov et al. (2020) also used this method and found that the count of borderline traits was associated with trust decline with new and cooperative partners and trust increase after multiple violations of trust as well as quicker trust restoration than trust formation.

Other Research Designs. Reciprocity and response sensitivity to the co-player's social cues has been studied with the participants playing both as investors and as trustees, although the role of the trustee is likely to be more advantageous for the study of reciprocity. Further, the research designs that included a cooperative and non-cooperative co-player have succeeded in yielding responses that were varied enough to reveal individual differences. A.-K. J. Fett, Gromann, Giampietro, Shergill, and Krabbendam (2012a) and A.-K. J. Fett et al. (2014) had their participants play as investors against a cooperative and an uncooperative trustee and then analysed the development of trust in blocks of 5 rounds in the 20-round games. A.-K. J. Fett, Gromann, et al. (2012a) found that investor-participants are more sensitive to the uncooperative trustees' negative social signals (and that this ability increases with

age). A.-K. J. Fett et al. (2014) found that adolescents with a higher perspective-taking tendency demonstrate greater trust towards others by investing and sharing more during cooperative interactions. Further, they show that even in adolescence high perspective-takers are more sensitive when treated unfairly by their counterpart.

Another important methodological issue is the one of intentionality and expectations. King-Casas et al. (2005) suggest that the other person's intentions are taken into account before making a decision as well as the player's own expectations of the outcome. King-Casas et al. (2005) found that there is a time-sensitive brain activation that encodes reciprocity and more specifically the intention-to-trust and the expectation that the other player will reciprocate (the activation is greater before making the choice to invest). Ma, Meng, and Shen (2015) also found that promising to cooperate invokes higher investments in the Trust Task by investors and a larger differentiated Feedback-Related Negative Event-Related Potential (FRN ERP) in Electroencephalography responses to the reward and non-reward discrepancy.

Overall, there are generally three approaches for the measurement of trust in the Trust Game: (a) investments i.e., how many of their coins players choose to share with the opponent and in response to what partner decision, (b) computational modelling of behaviour through which different parameters of preferences are created and combined together, and (c) growth curve modelling of the latent curve that approximates the development of trust in the course of a multi-round game. Each approach has methodological advantages and disadvantages regarding their computational complexity and applicability, but there has been no study to date comparing their psychological validity. Researchers chose between these methods

depending on their own field of study and expertise, but there is no comparative study to show how these different methods perform against an external measure of trust.

2.1.2. The present study

There is a critical gap in the literature concerning the most appropriate operationalisation and measurement of trust and cooperative behaviour. Being that trust is a highly complex social concept that cannot easily be reduced to a psychometric index in order to be measured, it is important to systematically examine how the different operationalisations and measurement indices correspond to the psychological property (state or trait) of trust. In this chapter, the various operationalisations of trust in the multi-round Trust Task will be compared.

It is hypothesised that individuals who exhibit lower levels of trust will also show higher suspiciousness levels, and that they will be more vigilant and more rigid in their choices in their game due to a feeling of insecurity and mistrust. For this particular study, the focus of interest is not on a psychological state, but a rather stable personality trait of the individual and their tendency (or preference) to trust in another person. According to the theory of epistemic trust and attachment theory, individuals who feel secure enough to trust others will be making cooperative choices appropriately depending on the social cues that they receive (Fonagy & Bateman, 2008; Fulmer & Gelfand, 2013; King-Casas et al., 2008c).

To compare between different metrics, the suspiciousness scale of the Schizotypal Personality Questionnaire (Raine, 1991) is used as the external validity indicator against which the performance of the different trust task operationalisations can be compared. Suspiciousness was chosen to be employed as an indicator of a stable personality trait that may exist independently of schizotypal personality traits.

Thus, I am not examining this particular subscale of the Schizotypal Personality Questionnaire Trust as a measurement of the DSM criteria categorisation. The epistemological and methodological framework employed here utilises dimensions that can be observed behaviourally or reported directly in order to test a hypothesis; in this case, that reported suspiciousness functions as an external point of reference in order to compare behaviourally observed decisions with regards to trust. Additionally, as willingness to cooperate is also dependent on an individual's (social) anxiety, their mood as well as their level of motivation (Kaplan et al., 2015), depression, anxiety, and social anxiety were controlled for in the analysis, so as to disaggregate them from suspiciousness due to mistrust.

More specifically, I will utilise suspiciousness in order to compare the variability explained by (a) the initial investment, mean investments, and the total number of rounds when the participant cooperated, defected, repaired the cooperation, (b) the parameters extracted from the Hula et al. (2015 & 2018) computational model, and (c) a continuous Latent Growth Curve Model developed in order to explore the latent growth curve of investments across the ten rounds and different latent classes of participant behaviour in the task.

The first hypothesis, which will indicate that the simple metrics of investments in the game (i.e., initial investment, mean investments etc.), as well as the intercept and the slope of the latent curve model are good indicators of suspiciousness and mistrust, is that they will increase as suspiciousness decreases. Also, it is hypothesised that the seven of the computational parameters of Hula et al. (2018) together will be positively associated with Suspiciousness. Social Risk Aversion is expected to increase as suspiciousness increases because it expresses the willingness of an

individual to risk and share. Guilt, Irritation, Irritation Awareness, Theory of Mind, Temperature, and Planning are parameters that may be linked to reciprocity of trust, thus, not linearly associated with investments in the game. More details and rationale can be found in Hula et al. (2020a).

2.2. **Method**

The data for this paper were collected as part of the Neuroscience in Psychiatry Network (NSPN). NSPN is a collaboration between several research groups in UCL and Cambridge University with the aim to investigate typical and non-typical neuro-psychological development between the ages of 14-24 years.

2.3. **Sample**

In total, 2454 young people (2k cohort) in the age range 14–24 years (min=13.95, max=24.99) were recruited in London and Cambridgeshire through schools, universities and the wider community. A more detailed account of the recruitment process can be seen in Chapter 1 and a detailed profile of the cohort can be found at Kiddle et al. (2017) .

All participants completed the Home Questionnaire Pack and received £10 for completing it. Twelve months later, a subsample of the 2k cohort (N=807) was invited to participate in an in-unit assessment; for which they received £10/hour plus travel and lunch expenses. In this paper, I will only use data used from this subsample because they were the ones who completed the Trust Game.

If a participant was under the age of 18, parental consent was sought for them to participate in the study and complete the Home Questionnaire Pack. The Socio-economic Questionnaire was completed by the parent if the participant was under 16 (Kiddle et al., 2017).

2.4. **Demographics**

This primary cohort was stratified into five contiguous age-related strata: 14–15 years inclusive, 16–17 years, 18–19 years, 20–21 years and 22–24 years. Recruitment within and between stratums was evenly balanced for sex (males = 1129, 46%) and age group. Table 2 summarises the age distribution in each stratum of the sample.

Table 2

Sample Age

Age bin		Age			
	N	Minimum	Maximum	Mean	Std. Deviation
Age bin 1	491	13.95	15.99	15.03	.56
Of which assessed in person	193	14.01	15.99	14.84	.58
Age bin 2	549	16.00	17.99	17.07	.54
Of which assessed in person	174	16.01	17.99	17.05	.52
Age bin 3	470	18.00	19.99	18.87	.59
Of which assessed in person	129	18.01	19.99	18.90	.63
Age bin 4	455	20.00	21.99	20.95	.57
Of which assessed in person	162	20.00	21.95	20.89	.57

Age bin 5	488	22.00	24.99	23.45	.84
Of which assessed in person	128	22.00	24.82	23.21	.77

The 2K cohort participants (N=2454) were 78.1% white (N=1917), 9.1% Asian (N=224), 4.2% black (N=103), and 6.6% were mixed and other ethnicities (N=59). 1% of the ethnicity data was missing (N=25). Participants' Socio-Economic Status (SES) was measured using parental education as a proxy. Participants had responded whether any of their parents/ parents' partners had any of the following degrees:

1. GCSEs / O levels or equivalent,
2. A-levels or equivalent,
3. First degree (e.g., BSc),
4. Higher degree (e.g., MSc, PhD),
5. Professional qualifications (e.g., teaching, nursing, accountancy),
6. Other vocational / work-related qualifications.

The maximum score was 12, if both parents/ parents' partners had all 6 levels of education. If participants had answered that both parents and their step-parent had anyone of those the highest score of two individuals was chosen e.g., mother and father's partner.

The mean SES score of the 2K cohort was 4.93 (SD=3.2), missing were 5. For the 807 participants who were invited to the in-unit assessment, mean SES level was 5.13 (min= 0, max =12, SD = 3.23).

The 2K cohort had 1129 males (45.7%), 1325 females (53.7%) and 15 participants did not answer. The in-unit assessment subsample had 382 (48.6%) male and 404 (51.4%) female participants.

2.5. **Design and procedure**

In this cross-sectional study, I report on In-Unit Assessment data for the five contiguous age-related strata at the first assessment point: 14–15 years inclusive, 16–17 years, 18–19 years, 20–21 years and 22–24 years. Participants attended an In-Unit Assessment Day which was held in two parts, a morning and an afternoon session. In the morning session, they completed the Home Questionnaire Pack and the battery of computerised cognitive tasks. In the afternoon session, they completed a clinical assessment.

2.6. **Measures**

The In-Unit-Assessment included a Home Questionnaire Pack, the Wechsler Abbreviated Scale of Intelligence, Second Edition (WASI-II) (Wechsler, 1999), subtests of vocabulary and matrix reasoning, and a battery of several computerised cognitive tasks, of which only the Trust task is relevant to this paper. Below I describe the measures relevant to this paper; for more information regarding the rest of the questionnaires, tasks as well as the MRI arm of the study, see Kiddle et al. (2017).

Participants completed:

The *socio-demographic questionnaire* (see Appendix II), which was designed by the NSPN researchers in order to collect information regarding the participant's family characteristics like ethnicity, highest maternal and/or paternal qualification, current postcode, employment status etc. (Kiddle et al., 2017).

The *Schizotypal Personality Questionnaire* (SPQ) which assesses the nine traits of schizotypal personality disorder according to DSM-III-R criteria. This self-report measure comprises of 74 items and asks the subject to read the statement and respond if it applies to them by choosing the "yes" or "no" box. It contains subscales for all nine traits (ideas of reference, excessive social anxiety, odd beliefs or magical thinking, unusual perceptual experiences, odd or eccentric behaviour, no close friends, odd speech, constricted affect, and suspiciousness), but for the purposes of this paper I only employed the sum score of the suspiciousness scale that has 8 items:

9. I am sure I am being talked about behind my back.

18. Do you often feel that other people have it in for you?

27. Do you sometimes get concerned that friends or coworkers are not really loyal or trustworthy?

36. I feel I have to be on my guard even with friends.

44. Do you often pick up hidden threats or put-downs from what people say or do?

52. Have you found that it is best not to let other people know too much about you?

59. I often feel that others have it in for me.

65. Do you often have to keep an eye out to stop people from taking advantage of you?

The SPQ has been bound to have high sampling validity, internal reliability (.91), and test-retest reliability (.82) (Raine, 1991).

The Moods and Feelings Questionnaire (MFQ) (Costello & Angold, 1988) a child self-report measure of depressive symptoms following the DSM-III-R which is frequently used both for preliminary screening and to monitor change in symptomatology. It has been found to have high internal validity (.95) (Burleson Daviss et al., 2006), test-retest reliability (.72)(Costello & Angold, 1988). The MFQ has 33 items and asks the subject to rate recent depressive symptoms on a Likert scale (0= never, 1= sometimes, 2= mostly, 3= always) with wording simple enough for younger children as well as adolescents,

The Revised Children's Manifest Anxiety Scales (RCMAS) which is a measure of manifest anxiety adapted for children from the Taylor's Manifest Anxiety Scale (Reynolds & Richmond, 1978). The RCMAS was combined with the MFQ in one questionnaire meaning that the subject was asked to respond similarly on a Likert scale (0= never, 1= sometimes, 2= mostly, 3= always). The measure normally has 37 items including 28 items measuring anxiety symptoms and 9 items measuring social desirability (lie scale)(Dadds, Perrin, & Yule, 1998). I only included the anxiety items.

The Trust Task: Our version of the computerised multi-round Trust Task was first created and used by King-Casas et al. (2005). The participants completed a battery of seven cognitive tasks in total, one of which was the Trust Game. The order of the tasks was randomised between participants. They were sat in front of a computer where they were told that they would play some games, some with and

some without a partner. In order to avoid biases, the participants were told that they were playing through the internet with someone who was in another room/lab.

Participants were playing as investors and they started each round with 20 play coins and were asked to "trust" some or all of their coins to their partner. The amount the participant invested tripled in the hands of the trustee who in turn can give back from 0 to all of the coins that they have. The trustee was simulated by the computer using the algorithm described by King-Casas et al. (2008). This algorithm simulates an adaptive computer trustee generating responses using a k-nearest neighbours sampling algorithm. From a database of real responses in a 10-round trust game, the algorithm identifies a similar interaction (i.e., 7 dyads in the database with smallest Euclidean distance from the vector of 5 previous choices – last 3 investments and last 2 repayments). Then, one of these similar interactions is chosen at random and given as a response to the participant. As a result, the computer trustees behave as average healthy human trustees.

2.7. **Data Analysis**

As mentioned above there are different metrics that have been used in order to measure trust in the Trust Task. The (a) simple algebraic indices; (b) the seven parameters extracted from the Hula et al. (2015) computational model; and (c) parameters from growth mixture models. In order to compare which is the best way to measure the construct of trust in the iterated Trust Task, each measurement is compared against the suspiciousness scale of the Schizotypal Personality Questionnaire (Raine, 1991).

All participants who did not have missing data were included in the analysis (N= 786).

2.7.1. Simple indices

The most parsimonious way to explore differences in behaviour in the Trust Task is by creating simple algebraic indices. There are (a) the initial investment i.e. total number of coins invested by the participant in the first round, (b) the mean investments i.e. mean number of coins invested across the ten rounds (e.g. A.-K. J. Fett, Gromann, et al., 2012b), and (c) the count of rounds that the subject had cooperated, repaired the interaction, defected or retaliated (e.g. Caceda et al., 2014). These were measured as follows:

a. Cooperated i.e., the participant gave the same or larger share of their coins compared to the previous round while the trustee did the same;
b. Repaired an interaction i.e., the participant gave the same or larger share as the previous round while the trustee had shared a smaller share of their endowment in the previous round;
c. Defected i.e., the participant gave a smaller share of their coins compared to the previous round while the trustee had shared the same or a larger proportion, and lastly;
d. Retaliated i.e., the participant gave a smaller share of their coins compared to the previous round when the trustee had also decreased their endowment.

2.7.2. Computational Model Parameters

As described above Hula et al. (2015) adapted Monte Carlo planning algorithms and developed a computational model based on Interactive Partially Observed Markov Decision Processes. This model describes seven parameters that predict 43% of participant behaviour. The seven parameters that are extracted from the computational modelling of behaviour in the iterated Trust Task (Hula et al., 2015; Hula et al., 2018) are:

1. Guilt: Guilt levels express how eager a subject is to reach a fair outcome (Levels 0, 0.4, 1; 1 = very eager, 0.4 = mostly self-interested, 0 = purely self-interested).
2. Planning: Planning expresses the number of future interactions most likely shaped the subject's choices. Each agent has a planning horizon that is likely to lead them to more or less consistent playing (Levels 1, 2, 3, 4; longer planning = more consistent tactics).
3. Theory of Mind (ToM): ToM expresses the number of "mentalisation" steps that best explain subject's choices. (Level 0 is a participant who thinks about what their partner may be thinking, level 2 is a participant who takes into consideration what the partner thinks of them, level 4 is a participant who is thinking about what their partner is thinking that the participant thinks about them.).
4. Temperature: Temperature shows how diffuse (variable) a subject's choices were overall (Levels 1, 2, 3, 4; 4 = maximally diffused).
5. Risk Aversion**:** Expresses a subject's preference for the kept amount of money (as an investor) compared to the money returned by the partner.

(Levels.4,.6,.8, 1.0, 1.2, 1.4, 1.6, 1.8; values below 1 indicate that money returned was valued higher than money kept and caused the subject to invest more and engage more in the interaction, while values greater than 1 indicate a preference of kept money over the uncertain return by the partner).

6. Irritability**:** Parameter that governs a shift to an internal state with ToM 0, Planning 0 and Guilt 0 (a state encouraging retaliation). This is triggered by unfair partner actions (lower than expected trustee returns, for the investor for instance). (Level NaN, 0, .25, .5, .75, 1. Since irritation does not necessarily occur during the game, the value NaN indicates that we cannot determine whether the subject was irritable (N=654).
7. Irritation Awareness: Subjects can hold individual beliefs on whether they consider the partner to be irritable. (Levels 0, 1, 2, 3, 4; level 0 indicates that they do not consider the possibility of irritation at all, level 4 indicates that they consider the partner strictly irritable and levels in between indicate different in between settings, with level 2 indicating a balanced (50% partner is irritable, 50% partner is not irritable) belief on partner irritability).

2.7.3. Growth Curve Modelling

The ten rounds of the iterated Trust Task were used as ten data points (time points), in order to explore how behaviour trajectories, unfold during the task. Additionally, the way that participants might form sub-groups or classes of different trajectory patterns in the course of the ten rounds of the task is explored.

Latent Growth Curve Modelling framework in the MPlus software (L. Muthén & Muthén, 2010) was used. This is an extension of structural equation modelling. The objective of Latent Growth Curve Modelling is to describe non-linear change across time. It provides a representation of variation in growth parameters through a polynomial model by estimating latent continuous population parameters such as intercept and slope (deRoon-Cassini, Mancini, Rusch, & Bonanno, 2010; Mäkikangas, Bakker, Aunola, & Demerouti, 2010; Ram & Grimm, 2009).

The statistical analyses consisted of two stages. In the first stage, I used LGC modelling to examine the mean growth trajectories. Initially, I tested a model by estimating the initial level (intercept) and linear mean-level change (slope). Following this, I tested a model with quadratic slope. The second stage of the analysis consists of mixture modelling which identifies latent classes of participants based on their growth curves.

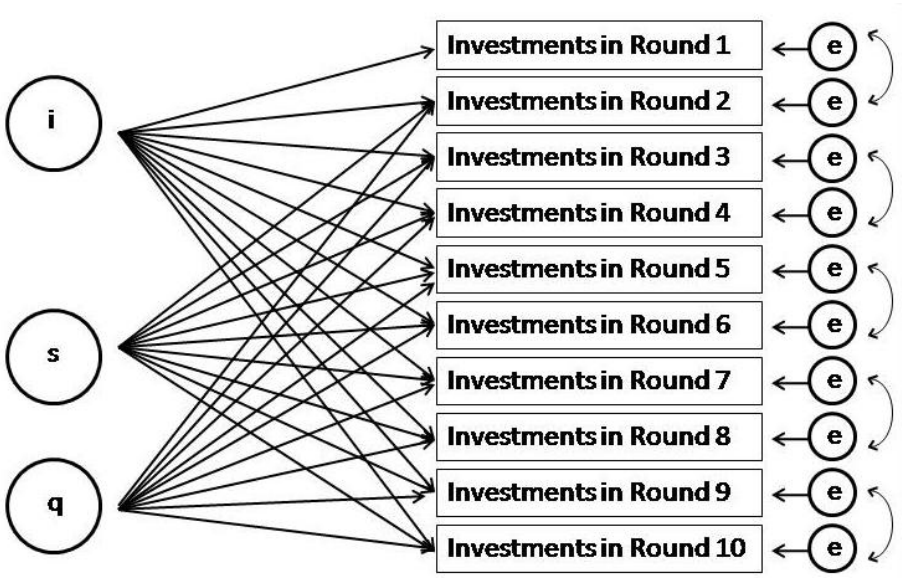
The zero-time score for the slope growth factor (i.e., the first round of the task) defines the intercept (i.e., the initial level factor). The slope describes individual differences in a constant rate of mean-level change across measurement points, hence, the factor loadings for the slope growth factor are fixed at 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 to define the linear model and at 0, 1, 4, 9, 16, 25, 36, 49, 64, and 81 for the quadratic model (Mäkikangas et al., 2010). The coefficients of the intercept growth factor are set to 1 as part of the standard parametrisation of the growth model (L. Muthén & Muthén, 2016). By default, the residual variances of the outcome variables are allowed to be different across time (L. Muthén & Muthén, 2016).

The parameters of the LGC model were estimated with the robust maximum-likelihood estimator which is robust to non-normality of outcomes and non-

independence of observations (L. Muthén & Muthén, 2016) and is widely endorsed (deRoon-Cassini et al., 2010). Goodness-of-fit was tested using the Root Mean Square of Approximation (RMSEA) (Steiger, 1990), the Comparative Fit Index (CFI)(Bentler, 1990), and the Tucker- Lewis Index (TLI) (Tucker & Lewis, 1973). For the RMSEA, values of .05 or less indicate good fit, for CFI and TLI values above .95 indicate acceptable fit (L. Muthén & Muthén, 2016). Figure 4 shows the Latent Growth Curve model.

Figure 4

Latent Growth Curve Model of the 10 rounds of the Trust Task



Note. Model estimates have been omitted for simplicity. They can be found in tables below.

In the second stage of the analysis, Growth Mixture Modelling (GMM) was used to investigate the hypothesis that there are homogenous sub-groups of participants in our sample that would differ in initial level and growth rate. The GMM framework does not assume a single population and estimates different growth curves

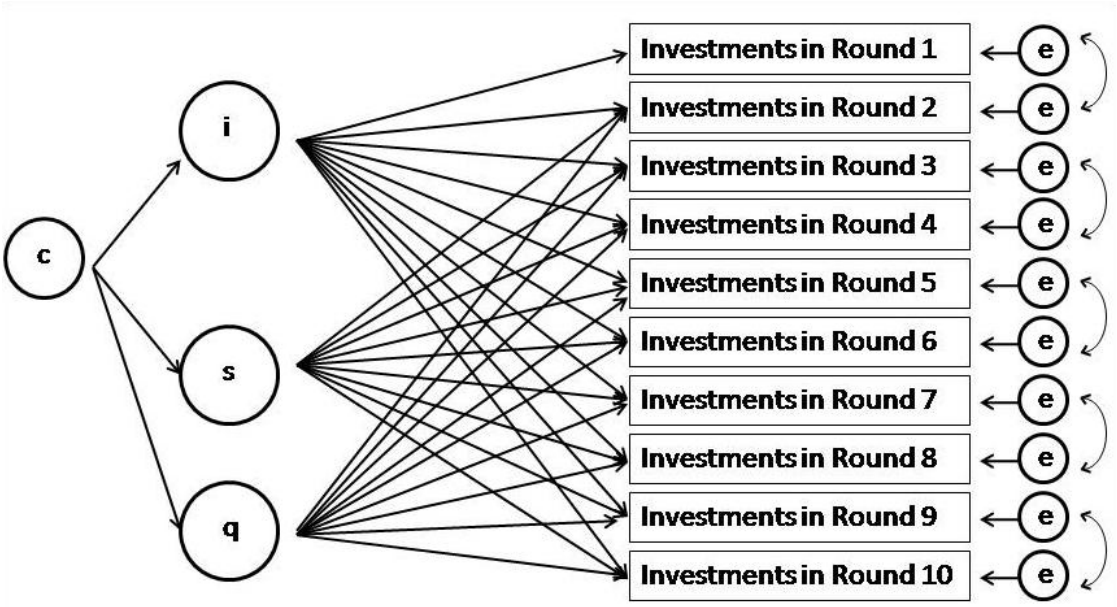
for each latent group of participants. I tested for the presence of up-to 5 latent sub-groups of participants. The sub-groups are modelled using latent categorical variables, the classes. The analysis was based on the latent growth curve model which models the covariance structure of participants' investments across the 10 rounds of the Trust Task. However, in the case of the growth mixture model, a growth trajectory is estimated for each latent class (Mäkikangas et al., 2010). The default estimator for this type of analysis in Mplus is the maximum-likelihood with robust standard errors (L. Muthén & Muthén, 2016). See figure 5 for a graphic depiction of the model.

Goodness-of-fit with regards to the appropriate number of classes was evaluated using the Akaike and Bayesian Information Criteria, and entropy values. The Akaike and Bayesian information criterion (AIC, BIC), indicate the best model as the one with the smallest value (B. Muthén, 2003). The quality of the classification be determined by entropy values; entropy values range from 0 to 1, where values close to 1 indicate clear classification (Celeux & Soromenho, 1996). RMSEA, CFI and TLI are not available measures of good fit for mixture models. Lastly, I considered the practical usefulness, clarity and the proportions of the latent classes in practice.

Participants with missing data were excluded from the analysis.

Figure 5

Growth Mixture Model to identify classes of participants' behavioural patterns in the 10 rounds of the Trust Task



2.7.4. Model comparison

Multiple linear regression was used to create a baseline model which included age, gender, IQ, SES, mood, anxiety and social anxiety regressed on suspiciousness. Following this, hierarchical linear regression was used to create one model for each metric to compare the extent to which each metric improved the regression model. The R^2 change was used in order to compare the level of this improvement.

2.8. **Results**

For the baseline regression model, suspiciousness was regressed on age, gender, IQ, SES, mood, anxiety and social anxiety, R^2=.436, F (7,784) = 86.578, p<.001. The effects coming from those variables were statistically significant.

Gender (B=-.077, p=.005), IQ (B= -.078, p=.007), anxiety (B= .413, p<.001), and social anxiety (B= .204, p<.001) also predicted suspiciousness significantly, whereas Mood (B= .114., p=.052), SES (B= -.057, p=.050), and age (B= -.042, p=.126) did not.

2.8.1. Initial investments

The results of the regression indicated that initial investments are significantly associated with suspiciousness (R^2=.407, F (8,750) = 64.351, p<.001). R^2 change was small but significant (F change= 6.221, R^2 change = .005, p=.013) indicating that initial investment explains a small part of the variance of suspiciousness above and beyond the other predictors. It was found that initial investments were negatively associated with suspiciousness – i.e., (B= -.075, p=.013).

Gender (B=-.087, p=.003), IQ (B= -.064, p=.038), Mood (B= .164, p=.004), anxiety (B= .361, p<.001), and social anxiety (B= .193, p<.001) also predicted suspiciousness significantly, whereas SES (B= -.057, p=.058), and age (B= -.040, p=.172) did not.

2.8.2. Mean Investments

Mean investments were significantly associated with suspiciousness R^2=.412, F (8,750) =65.784, p<.001). R^2 change was small but significant (F change= 13.077, R^2 change = .01, p<.001).

It was found that mean investments were significantly negatively associated with suspiciousness (B= -.111, p< .001).

As in the previous analysis, Gender (B= -.098, p=.001), Mood (B= .176, p=.002), anxiety (B= .345, p<.001), and social anxiety (B= .199, p<.001) were also significantly associated with suspiciousness, as opposed to age (B= -.034, p=.243), IQ (B= -.051, p=.101), and SES (B= -.056, p=.064).

2.8.3. Cooperation, Repair, Defect, and Retaliation indices

Hierarchical linear regression was used to test if the total number of rounds that the subject has cooperated (C), repaired a relationship (R), defected (D) or retaliated (RT) were significantly linked with participants' ratings of suspiciousness.

The total number of rounds that the subject cooperated (C) was significantly associated with suspiciousness R^2=.408, F (8,750) =64.653, p<001). R^2 change was small but significant (F change= 7.667, R^2 change = .006, p<.001). C was significantly negatively associated with suspiciousness (B= -.081, p= .006).

The total number of rounds that the subject tried to repair the interaction (R) was significantly associated with suspiciousness R^2=.412, F (8,750) =65.732, p<001). R^2 change was small but significant (F change= 12.827, R^2 change = .01, p<.001). R was significantly positively associated with suspiciousness (B= .105, p< .001).

The total number of rounds that the subject defected (D) was not significantly associated with suspiciousness R^2=.403, F (8,750) =63.166, p<001, F change= .551, R^2 change = .00, p=.458, B= -.021, p=.458.

The total number of rounds that the subject retaliated (RT) was not significantly associated with suspiciousness R^2=.404, F (8,750) =63.68, p<001, F change= 3.01, R^2 change = .002, p=.083, B= -.050, p=.083.

The standardised Beta coefficients for each model are shown in Table 3

Table 3

Standardised Beta Coefficients for Each Covariate in The Regression models for Cooperation, Reparation, Defection, and Retaliation rates

Independent variables										
N of Rounds the Participant Cooperated			N of Rounds the Participant Repaired			N of Rounds the Participant Defected			N of Rounds the Participant Retaliated		
	Beta	Sig.		Beta	Sig.		Beta	Sig.		Beta	Sig.
Age	-.04	.14	Age	-.05	.10	Age	-.05	.07	Age	-.05	.13
Gender	-.09	.00	Gender	-.09	.00	Gender	-.08	.01	Gender	-.08	.01
IQ	-.07	.03	IQ	-.06	.07	IQ	-.08	.01	IQ	-.07	.02
SES	-.06	.05	SES	-.06	.05	SES	-.06	.05	SES	-.06	.05
Low mood	.18	.002	Low mood	.17	.00	Low mood	.17	.00	Low mood	.18	.00
Anxiety	.35	.00	Anxiety	.35	.00	Anxiety	.36	.00	Anxiety	.35	.00
Social Anxiety	.2	.00	Social Anxiety	.2	.00	Social Anxiety	.12	.00	Social Anxiety	.2	.00
Cooperation	-.08	.01	Repair	.11	.00	Defection	-.02	.46	Retaliation	.05	.08

Note. Dependent variable: Suspiciousness

2.8.4. Computational Model Parameters

I entered age, gender, IQ, SES, mood, anxiety and social anxiety in the first block of a hierarchical regression, with the seven parameters (Guilt, Irritability,

Irritation Awareness, Risk Aversion, Theory of Mind, Temperature and Planning) in a hierarchical multiple linear regression to test if they significantly predict participants' ratings of suspiciousness.

The results of the regression indicated that age, gender, IQ, SES, mood, anxiety and social anxiety were significantly associated with suspiciousness. Some differences in R and F are due to the different number of parameters in the model, R^2=.444, F (4,620) = 7.030, p< .001. Including the seven computational parameters was not a significant improvement to the model (R^2=.452, F (14,617) = 36.344, p< .001, R^2 change= .008, p=.23).

It was found that Risk Aversion (β= .075, p=.040), gender (B= -.099, p=.002), and IQ (B=-.076, p=.025) were significantly associated with Suspiciousness. Guilt (β= .002, p=.94), Planning (β= -.061, p=.067), Theory of Mind (B=-.010, p=.736, Temperature (.013, p=674, IQ (B=-. 136, p=.002), Irritability (β= .038, p=.212), Irritation Awareness (β= -.018, p=.584) age (B=-.035, p= .263), SES (β= -.048, p=.137), and age (B=-.134, p=.399) were not predictors of Suspiciousness to a significant level.

2.8.5. Growth Curve Modelling

First, I present the results of the growth models and after that the hierarchical regressions that included the model parameters as predictors of Suspiciousness.

Latent Growth Curve Model. For the model to converge, I allowed the residuals of each round's investments to be correlated in pairs. The LGC model with the quadratic slope fit the data to an acceptable level. The intercept was estimated to

be 1.12, the linear slope was .61 and the quadratic slop was -.076, χ^2 (37) = 137.784, p<.000, CFI=.967, TLI=.96, RMSEA=.059.

I repeated the hierarchical regression with age, gender, IQ, SES, mood, anxiety and social anxiety in the first block, R^2=.402, F (7,751) = 72.154, p<.001. The intercept (i), slope (s) and quadratic slope (q) were extracted for each participant and entered in the second block of the hierarchical regression, R^2=.413, F (10,748) = 52.673, p< .001, R^2 change= .011, p=.003). I also estimated the regression model without the slope and quadratic slope, because their coefficients were not statistically significant; R^2=.408, F (8,750) = 64.502, p< .001, R^2 change= .005, p=.009).

Table 4

Beta Standardized Coefficients of Each Covariate on Suspiciousness

	Beta	Sig.
Age	-.034	.248
Gender	-.099	.001
IQ	-.057	.061
SES	-.049	.118
Low mood	.175	.002
Anxiety	.346	.000
Social Anxiety	.199	.000
i	-.126	.000
s	-.130	.236
q	-.045	.679

Mixture Growth Curve Model. In order to examine different homogenous sub-groups of participants within our sample, I performed a mixture analysis using the

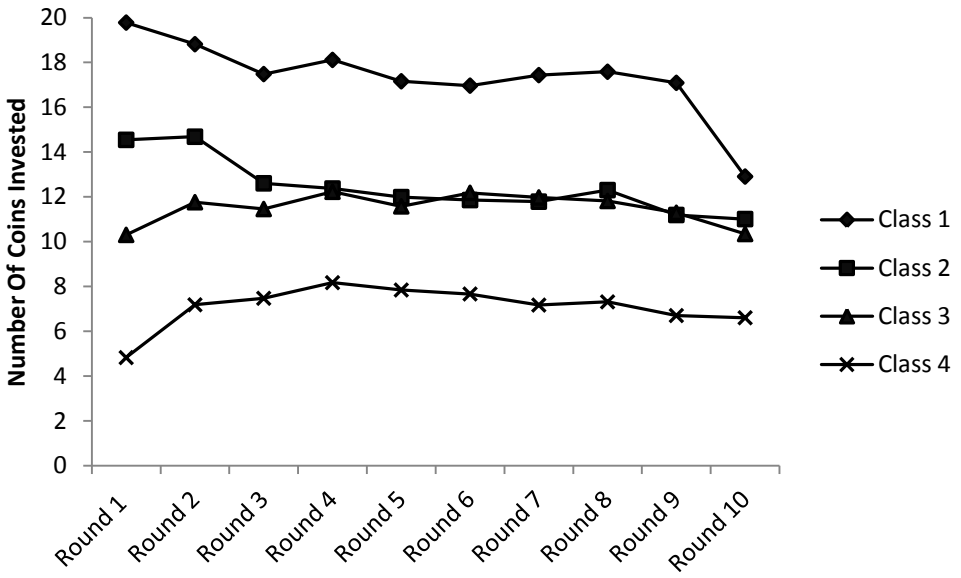
LGC. 1000 random starts and 100 iterations were used. The mixture model with the best fit was the one with four classes. Model fit indices of the four-class model were: Akaike (AIC) = 44319.46, Bayesian (BIC) = 44506.19, entropy=.925.

The five-class solution had slightly better fit indices, but the four- class solution was considered better because it provides four meaningful classes with reasonable membership distribution. There were 18 individuals with an extreme pattern of behaviour starting with very high contributions, decrease sharply and finally increase their contributions again. This led us to the rejections of the five-class solution.

Model fit indices as well as number of cases in each class are shown in the comparison table 5. Figure 6 shows the mean growth curves of the four-class solution.

Figure 6

Growth Curves of Each Class of Participants



Note. The mean of each round was used for each class of participants as it was extracted by the model adjusted with the corresponding beta coefficients.

Table 5

Comparison Table of Model Fit Indices

#Classes	Loglikelihood	Number of parameters	BIC	AIC	Entropy	Class Counts and Proportions			RMSEA	CFI	TLI
1	-22374.9	24	44909.79	44797.76					.088	.918	.91
1 (quadratic)	-2227.2	28	44727.07	44596.36					.059	.967	.96
2 (quadratic)	-22233.4	32	4468.27	4453.88	.706	1	494	.62			
						2	293	.37			
3 (quadratic)	-22211.7	36	44663.46	44495.41	.798	1	486	.62			
						2	18	.02			
						3	283	.36			
4 (quadratic)	-22119.7	40	44506.19	44319.46	.925	1	325	.41			
						2	276	.35			
						3	87	.11			
						4	99	.13			

5 (quadratic)	-22102.8	44	44498.99	44293.59	.929	1	99	.13
						2	76	.1
						3	11	.014
						4	325	.41
						5	276	.35

I entered the four classes in the hierarchical regression's second block to test if they improved the regression model on participants' Suspiciousness ratings. Age, gender, IQ, SES, mood, anxiety and social anxiety were included in the first block of the regression, R^2=.402, F (7,751) = 72.154, p<.001. The analysis indicated that the different classes of participants significantly improved the model. R^2=.414, F (1,748) = 52.827, p<.001.

The 4-classes-model explained 1.2% more variance (R^2 change= .012, p=.002). The Beta coefficients for each comparison can be seen in table 6. Table 7 compares R square change between the different models.

Table 6

Beta Coefficients of Each Class of Participants

Reference class		Unstandardized Coefficients Beta	Standardized Coefficients Beta	Sig.
Class 1	Class 2	.548	.119	.002*
Class 1	Class 3	-.250	-.036	.343
Class 1	Class 4	.179	.027	.476
Class 2	Class 1	-.548	-.123	.002*
Class 2	Class 3	-.798	-.114	.003*
Class 2	Class 4	-.370	-.056	.149
Class 3	Class 1	.250	.056	.343
Class 3	Class 2	.798	.173	.003*
Class 3	Class 4	.428	.065	.182

Table 7

Comparison Table of the Different Models and Indicators of Suspiciousness

	R^2	R^2change	β
Age, Gender, IQ, SES, Low Mood, Anxiety, Social Anxiety	.402		
Initial investment	.407	.005*	-.075*
Mean Investments	.412	.010*	-.111*
N of rounds of Cooperation	.408	.006*	-.081*
N of rounds of Reparation	.412	.010*	.105*
N of rounds of Retaliation	.403	.000	.050
N of rounds of Defection	.404	.002	-.021
Computational model parameters	.452	.008	
Guilt			.002
Risk Aversion			.075*
Planning			-.061
Irritability			.038
Irritation Awareness			-.018
Theory of Mind			-.010
Temperature			.013
Growth Curve Model Parameters	.413	.011*	
Intercept			-.126*
Slope			-.130
Quadratic Slope			-.045
Mixture model 4 Classes	.414	.012*	

2.9. **Discussion**

There is a multitude of approaches to the study of trust, which take different epistemological and methodological perspectives. In this study, I considered trust employing a game-theoretical approach i.e. rational choice theory (Sztompka, 1999) combined with and compared against the self-reported measure of the personality trait of suspiciousness. This will set the basis from which I will explore its relationships with other developmental, environmental, and psychological parameters in the subsequent chapters.

Trust is a construct that describes the willingness of an individual to rely on somebody or something else. The development of trust has complex aetiological and developmental dimensions as it depends on many environmental and situational parameters that fluctuate over time. Even within the confines of a single methodological approach, such as the Trust Game, researchers have adopted a range of different approaches to capturing trust behaviour within the task, and it is not clear which is more robust as a measure of individual differences. The aim of this chapter, therefore, was to directly compare different metrics of the Trust Task against an external measure of trust-related individual differences: the Suspiciousness subscale of the Schizotypal Personality Questionnaire (Raine, 1991).

There are three methodological approaches commonly utilised for the measurement of trust in the multi-round Trust Game. The simplest and most frequently used is the number of coins in the initial investment and the mean of investments across the rounds of the game. More rarely, the number of rounds in which players cooperated or defected have been employed. The alternative approaches extract parameters from computational or statistical models of the game.

There is only one computational model employing heuristic algorithms in order to approximate human behaviour which has been developed by Hula et al. (2018, 2020b). This model yielded seven parameters: social risk aversion, guilt, irritation, irritation awareness, planning, temperature and theory of mind. Lastly, latent growth curve models are used extracting the intercept and the slope of the latent curve.

All of these indices were compared against the Suspiciousness subscale of the Schizotypal Personality Questionnaire (Raine, 1991) as an external measure of mistrust. The Suspiciousness scale and the construct of suspiciousness are of course not gold standards for the measurement of trust. However, the SPQ Suspiciousness scale explores a personality trait that demonstrates a basic belief that others are unreliable or even threatening while disaggregating it from social anxiety (Raine, 1991) And provides a useful indication of the validity of trust task metrics to predict behaviour outside of the confines of the game. The Moods and Feelings Questionnaire (Costello & Angold, 1988) and the Revised Children's Manifest Anxiety Scales (Reynolds & Richmond, 1978) were included in the regression models in order to control for depression and anxiety symptoms.

I will now discuss advantages and disadvantages of these indices and their potential use.

2.9.1. Simple Indices

The initial investment made by the participant indicates how many coins they are willing to entrust to their partner, in this case an unknown individual in a different room that they have no information about. As an initial investment made in the first round, this also indicates how this particular individual prefers to start the game. This can function as an independent indication of a priori trust of an individual before

"getting to know" their partner (A.-K. Fett et al., 2016). Initial investments have a small, but significant contribution (R^2 change = .005, p=.013) in predicting suspiciousness after all the other factors that I used as predictors (age, gender, SES, IQ, mood, anxiety, social anxiety). Overall, initial investments are a good indicator of suspiciousness compared to our other indicators, particularly if one wants to research prior beliefs and is not interested in the development of the interaction. In this sense, initial investment incorporates the least information about the game, but it is a metric that is independent of the co-player.

In this analysis, mean investments were a somewhat stronger predictor of suspiciousness. The metric of mean investments across ten rounds might be expressing a more consistent choice to trust larger sums of money to their partner. It is an index that is very easy to extract and seems to be explaining a good or equal portion of variance compared to other much more complex and costly indices e.g., the growth curve indices which require more time and necessary expertise. This index could also be considered an appealing choice for researchers because it combines information from all of the ten rounds and appears to retain much of the predictive value of the trust task, at least in terms of the external criterion of suspiciousness that chose in this paper.

I also used the total number of rounds that the subject has cooperated, repaired a relationship, defected or retaliated as predictors of suspiciousness. Only the number of rounds that the participant cooperated and tried to repair the interaction was found to be associated with suspiciousness. This finding is consistent with the findings in Borderline Personality Disorder and Psychosis (A.-K. Fett et al., 2016; King-Casas et al., 2008). Patients with BPD and psychosis have difficulty sustaining mutual

interactions and repairing a ruptured relationship, thus the number of rounds of cooperation and repair is likely to express exactly this ability (King-Casas et al., 2008c). If so, the repair index might be thought of as measuring a specific capacity to tolerate frustration and attempt to re-establish a cooperative interaction which is diminished in the aforementioned populations.

2.9.2. Computational Model Parameters

As per the initial hypothesis, Social Risk Aversion (a subject's preference for the kept amount of money compared to the money returned by the partner) was the only parameter that was significantly associated with Suspiciousness. Planning (how consistently an individual plays across rounds), Guilt (how eager a subject is to reach a fair outcome), Irritability and Irritation awareness were not significant predictors of Suspiciousness and the addition of the parameters in the regression was not a significant improvement to the regression model.

Risk Aversion expresses a tendency to keep a part of the coins allocated by the game to oneself and not risk giving them to someone else, even when there is the possibility of gain (Hula et al., 2015), this is likely to express suspiciousness about the co-player. Guilt is measured in three levels (0, 0.4, and 1) and it can be considered to capture a tendency to try to reach a fair outcome and was not significantly related to Suspiciousness. Planning, measured in 4 levels (1,2,3, and 4), is a parameter measuring the number of steps ahead that the player is planning their game and it was not found to be significantly associated with suspiciousness in this case. One technical reason why these parameters may not have been found to be statistically significant is that they have relatively short ranges and variability may be too small. Irritation is a parameter that describes a shift to a state of complete inability to cooperate and trust

the partner. Irritation was not found significantly associated with suspiciousness; this may be because almost 70% of our sample (N=457 out of 654) did not exhibit this state at all indicating that such an extreme state might be found more frequently in patient populations. Lastly, Irritation awareness expresses a type of learning from the player indicating the possibility they attribute to their opponent shifting to the Irritation state of mind (cf above), this might be an indicator of ability to mentalise the opponent's state of mind. Irritation awareness is not predictive of Suspiciousness in this case. Potentially, comparing groups of participants with higher levels of interpersonal difficulties (higher than the general population prevalence) would offer sufficient data to explore these parameters' relationship to Suspiciousness.

Overall, it is important to note that the computational model was created with the intention to approximate normative behaviour as accurately as possible with all the parameters working together to create a model of human behaviour. This approach is radically different from the more traditional approaches in Psychology that emphasise individual differences and focus on the discriminant validity of indices and measurements. This does not make the computational model irrelevant, but it is more difficult to combine such a sophisticated methodology with self-report scales.

2.9.3. Growth Curve Modelling

Using a latent growth curve model, I extracted the intercept, slope and quadratic slope of a latent growth curve modelling the 10 rounds of the game. These latent variables were extracted for each participant and used in the hierarchical regression to test whether they are significantly associated with Suspiciousness. The intercept i.e., the level of the first investment in the game was found to be significantly associated with Suspiciousness. This is consistent with the finding of the

initial investment and makes the two indices approximately equivalent. The slope and the quadratic slope were not significantly associated with suspiciousness. This may be because the development of investments across the 10 rounds is not associated with suspiciousness as a trait. Alternatively, this general population sample may not be presenting with the variance of suspiciousness and responsiveness to the game to a sufficient degree that could reach levels of statistical significance.

Utilising a Mixture Growth Curve Model, I estimated 4 classes of participants that exhibit different types of behaviour patterns in the game. There are two classes of participants that were investing distinctly higher and lower amounts than the rest of participants across the 10 rounds of the game (classes 3 and 2 in figure 6). There are two more classes that behave in a very similar way to each other (middle-range investments), but their initial investments were significantly different (classes 1 and 4 in figure 3), with one (Class 4) showing a higher initial investment than the other (Class 1).

Membership in each of the four classes was predictive of Suspiciousness at a comparable level to the other growth curve indices and the initial/mean investments/ reparation indices. However, this analysis would be preferable for research and/or clinical applications that aim was to identify risk groups or to cluster a population based on their ability to trust.

2.9.4. Final considerations

The comparison of the different ways to measure trust is important, particularly because practice varies widely in the literature and different operationalisations have not been directly compared. Most of the constructs in psychology are measured through questionnaires, psychophysical tests and cognitive

or behavioural tasks. Psychological constructs are not directly observable and issues of reliability and validity are often debated. The calculation of a correlation between a scale and a criterion (or in this case a behavioural metric and a commonly used psychological scale) is not the same as establishing meaningful links between the behaviour and the construct (Blanton & Jaccard, 2006).

This study did not address general issues of validity and reliability, but compared different metrics against an external criterion (the SPQ suspiciousness scale) which has an acceptable level of reliability and validity for the measurement of the personality trait of suspiciousness. The conclusions that can be drawn are focused mainly on the comparison across the different metrics that have been used for this task.

With this under consideration, it was found that the personality trait of suspiciousness was significantly (negatively) associated with most of the metrics in this study and that initial investment, mean investments, total number of rounds of repair, the intercept of the latent growth curve, and the classes of the participants are indices that yield comparable associations with the Suspiciousness scale. Although, the SPQ mostly reflects the DSM-5 Section II criteria for Schizotypal Personality Disorder which have remained the same since DSM-III (Somma et al., 2019), one significant limitation of the SPQ suspiciousness scale is that it does not disaggregate between the affective and the cognitive aspects of suspiciousness (Hummelen et al., 2012). In this study, I have controlled for various states of mind that may be interfering with decision-making i.e. anxiety and depression, but there is no reliable way to investigate whether it is an interpersonal affective component or a cognitive component that links suspiciousness to cooperation and trust.

However, some of these indices have some advantages compared to others that have to do with parsimony and ease of extraction e.g., the simpler indices such as initial or mean investments. Initial investments and mean investments are simple and robust measures of trust that are associated with suspiciousness. Latent growth curve models do equally well. However, depending on the research question of a study, the variables and sample size, a growth curve model might be more appropriate. The methodological advantage of a growth curve model would be that it can include many independent variables while being less prone to collinearity problems (Tu et al., 2013). Studies with large sample sizes and many predictor variables for the investments in the Trust Task would benefit from this robust method of modelling. Regression models with initial investments or mean investment as the dependent variable would be less robust and would not provide the richness of information that the growth curve model could provide. A growth curve model captures the complexity and the temporality of the interaction of a multi-round task while retaining the capacity to incorporate multiple indicator variables and covariates.

In terms of limitations, some of the indices used here are more relevant to samples with specific interpersonal difficulties (e.g., the behavioural shift that is expressed through the parameter of irritation did not appear frequently in this sample of general population). In order to investigate whether these indices are significantly associated with a specific interpersonal capacity to relate to others, two issues need to be addressed. The first is that the experimental design needs to be adjusted in order to generate more variance in the participant responses. This has been seen in other studies, i.e., having opponents who play different levels of fairness and cooperation, with promising results. The second issue is recruiting samples of the population who

have more varied cooperative abilities i.e., having people who are at more extreme points of the spectrum of the capacity to cooperate.

Overall, the latent growth curve approach was deemed to be the most appropriate method for the studies in the following chapters considering that the aim is to explore the multiple relationships that parenting, age, gender, socio-economic status and psychopathology have with trust.

3. Multivariate models of parenting and longitudinal parenting outcomes

3.1. Introduction

Parenting is considered a key determinant of mental and physical health (Brody et al., 2014; Dube et al., 2009; Miller et al., 2009; Repetti et al., 2002; Wegman & Stetler, 2009). The immediate family environment and the quality of care provided within the family are widely acknowledged as significant factors in well-being and social adjustment (Forehand & Nousiainen, 1993; Hardy, Padilla-Walker, & Carlo, 2008; Kawabata, Alink, Tseng, Van Ijzendoorn, & Crick, 2011; Lamborn, Mounts, Steinberg, & Dornbusch, 1991; Manongdo & Ramirez Garcia, 2007; Spera, 2005; Wolfradt, Hempel, & Miles, 2003), although not deterministic ones (Lee, Bristow, Faircloth, & Macvarish, 2014; Walker & Kirby, 2010).

In this chapter, I investigate the optimal measurement and structure of young people's experience of parenting by their caregivers and the longitudinal effects of parenting on internalising symptoms. First, I explore models of parenting dimensions and, in the second section of the chapter; the longitudinal effects of parenting on internalising symptoms will be examined. This novel data-driven analysis will produce a multivariate model of parenting dimensions that covers most –if not all– areas of parenting. These parenting scores will, then, be used as indicators of concurrent and prospective internalising scores, thus exemplifying how parenting dimensions can be utilised as explanatory factors of longitudinal mental health and psychological development. This comprehensive model of parenting will pave the way for the investigation of the relationship between parenting and trust in later chapters.

3.1.1. The construct of parenting

Parenting is a concept that describes the process of raising a child and tending to their physical, emotional, social, intellectual, and academic development. After World War II nuclear families became the norm, childhood started to be acknowledged as a critical period of development and parenting became an important research subject. The theoretical and experimental construct of parenting was developed during the 60s (Power, 2013), especially due to Diana Baumrind's seminal work on parenting styles (Baumrind, 1966) which has dominated the field for decades.

Theoretical frameworks such as Attachment theory (Bowlby, 1969) and Social Learning theory (Bandura & Walters, 1963) gave prominence to the importance of parenting and predominantly influenced the field (Gorostiaga et al., 2019). This becomes evident in reviewing the choice of methods—e.g., conceptualisation, thematic focuses of research, and types of questionnaires—that have been used to study parenting.

Overall, parenting research was initially dominated by Diana Baumrind's three parenting styles: authoritative, authoritarian and permissive. These describe groupings of general patterns of behaviour and strategies that are deployed by parents. The focus shifted from categorically defined parenting styles towards dimensions of behaviours and practices, namely the building blocks from which styles are derived. Maccoby et al. (1983) proposed a model of parenting styles based on two broad orthogonal dimensions: demandingness and responsiveness. This produced a typology involving four potential parenting styles: authoritative or democratic (i.e., high demandingness and high responsiveness), authoritarian (i.e., high demandingness and low

responsiveness), indulgent (i.e., low demandingness and high responsiveness), and uninvolved or neglectful (i.e., low demandingness and low responsiveness).

The selective use of specific dimensions and, generally, the interest in child rearing research gave rise to a vast research field that utilises numerous variables and constructs. Here, I review this work focusing on the two main ways of measuring parenting which are parenting styles and parenting dimensions.

3.1.2. Parenting styles

Baumrind (1966, 1971, 1978) formulated parenting styles from the combination of parenting dimensions that emerged from thematically analysed observations, interviews and questionnaires. Responsiveness, emotional involvement, control/non-control, acceptance/rejection, dominance/submission, and restrictiveness/permissiveness are only some of the dimensions extracted while studying parenting. Gradually, parenting dimensions were combined in three primary parenting styles: authoritative, authoritarian, and permissive.

Baumrind (1978) suggested that a combination of warmth, responsiveness, affection, maturity demands, support in children's explorations, and pursuit of interests would constitute the authoritative parenting style and was generally considered the optimal style in terms of positive impacts on child development. Authoritarian parenting describes parents who are neither warm nor responsive to their children, they have high maturity demands, but are strict, expect obedience, and assert power when their children misbehave. Lastly, Baumrind (1978) suggested that permissive parents are mixed in responsiveness (i.e. some parents are high and some are low), but they have very low expectations and maturity demands of their children. Maccoby, Martin, Mussen, and Hetherington (1983) added a fourth style: indulgent

parenting, which is similar to permissive, but it is specifically high in support, reconceptualising Baumrind's parenting styles in the two orthogonal dimensions of demandingness and responsiveness (Smetana, 2017).

Despite the fact that the parenting literature presents remarkable consistency in some key findings such as the positive effects of authoritative parenting style (Barber, Chadwick, & Oerter, 1992; Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987; Gecas & Schwalbe, 1986; Lamborn et al., 1991), there have been some ambiguous, conflicting findings related to class, and ethnic and cultural background. Baumrind herself (1972) found that authoritarian parenting showed different results in the context of European-American and African-American children and more specifically girls. More recent studies and reviews of the literature have found that authoritative parenting does not have the same beneficial results in terms of academic outcomes in children and adolescents of different cultures, ethnicities and socio-economic status (Dornbusch et al., 1987; Lamborn et al., 1991; Spera, 2005).

Steinberg and Darling (1993) suggested that parenting style should be conceptualised as a "moderating context" in which more specific parenting practices, behaviours or dimensions should be studied separately in order to reveal the interactions with ethnicity and cultural backgrounds. Also, Smetana (2017) supports that styles and dimensions are deployed differently depending on domains, goals and beliefs.

3.1.3. Parenting dimensions

Parenting dimensions are derived from individual differences in parenting practices and behaviours, whereas parenting styles attempt to ascertain a typology of the combination of parenting dimensions (Power, 2013; Smetana, 2017). Empirical

research employing parenting dimensions –as opposed to typological parenting styles – has produced important findings. Parenting dimensions, such as autonomy and parental control, can explain cultural and class differences (Inguglia et al., 2016; McLeod & Shanahan, 1993; Spera, 2005). For example, authoritarian parenting might be an environmental adjustment to communities that are deprived and/or dangerous because the function of strict parental control is protective in that environment (Chao, 1994). Also, parenting dimensions allow the study of the complex interaction between race and socio-economic status without stereotyping or racialising parenting, that is authoritarian parenting is widespread in non-Western communities while in Western communities, lower socio-economic status is frequently linked to ethnic and cultural minorities (E. H. Lee et al., 2014).

Parenting dimensions seem to be more reliable measures as predictors of outcomes; at the same time, they do not conceptually contradict the parenting styles research. For example, the authoritative parenting style has been described as high levels of parental support and behavioural monitoring and low levels of psychological control. These dimensions are sometimes described with reference to their opposite negative pole, i.e., neglect/rejection/hostility, coercion and firm/lax control. However, there are inconsistencies in the literature regarding the best dimensional structure for describing parenting. Skinner et al. (2005) have reported evidence that unipolar dimensions are superior to bipolar dimensions i.e., measuring warmth/ acceptance separately from rejection rather than placing them on opposite ends of one scale. Also, the presence of parental warmth does not necessarily entail the absence of non-responsiveness or harshness (M.-T. Wang & Kenny, 2014). Cultural and social factors such as gender and socio-economic status play a significant role in the presence or absence of warmth as well as the level of harshness (Xing & Wang, 2017).

Examining each dimension as a separate predictor is an important comparative advantage of parenting dimensions versus parenting styles (Power, 2013). It has yielded important findings with regards to: links to psychopathology (Caron et al., 2006; Gadeyne et al., 2004; McKee et al., 2007; Pinquart, 2017b, 2017a; Rachelle et al., 2021; Sarıtaş et al., 2013; Stacks et al., 2009), psychopathology and academic achievement (Hindman & Morrison, 2012; Manongdo & Ramirez Garcia, 2007; Singh-Manoux, Fonagy, & Marmot, 2006; Spera, 2005), integration of moral values (Hardy et al., 2008), and ethnic and cultural diversity (Bean, Bush, McKenry, & Wilson, 2003).

In general, the literature on parenting dimensions demonstrates four themes that repeatedly emerge. The first covers positive parenting practices and is defined by warmth, support, and acceptance. The second relates to discipline and control with both positive and negative themes such as behavioural control, firm control, psychological control, parental involvement, consistent/inconsistent supervision, academic expectations and others. The third theme links to aggression, harsh parenting, psychological and physical abuse. The last theme extends from unresponsiveness to the extreme of neglect.

Warmth and support, behavioural control, and psychological control are three dimensions which originate from the work of Schaefer (1965) and Schludermann and Schludermann (1970) and are consistently selected for theory-driven hypotheses as well as empirically associated with adjusted psychological and social functioning. Skinner, Johnson, and Snyder suggested that there are three themes in the parenting dimensions literature: (a) parental support/acceptance/warmth, (b) autonomy, and (c) behavioural control (Skinner, Johnson, & Snyder, 2005). Similarly, Forehand and

Nousiainen (1993) describe these three dimensions of parenting of adolescents exhibited by mothers and fathers as acceptance, firm control (positive), and psychological control (negative). These dimensions were found to be predictive of adolescents' social functioning and they are consistent for African-American adolescents both for psychological functioning (self-esteem) and academic outcomes (Bean et al., 2003). Kuppens, Grietens, Onghena, and Michiels (2009) studied 600 children aged 8-to-10 years old and found the three dimensions to be reliably differentiated by fathers, mothers, and children. Similarly to Forehand and Nousiainen (1993), these were psychological control (referring to behaviours that result in the child feeling controlled), behavioural control (referring positive discipline and structure) and support. They found the positive dimensions associated with prosocial skills and the negative dimensions with conduct problems. Kawabata et al. (2011) performed a person-centred meta-analysis which revealed four clusters: positive parenting, psychologically controlling parenting, negative/harsh parenting, and uninvolved parenting linking positive parenting to less relational aggression.

Thus, there is convergent evidence that parenting is adequately represented by these four themes. However, these themes remain considerably broad and research studies usually include only one or two dimensions such as parental warmth or psychological control, thus excluding some of the themes. Also, the extreme ends of a theme (e.g. abuse and neglect) are frequently excluded (e.g. Forehand & Nousiainen, 1993; Kawabata et al., 2011; Kuppens et al., 2009). Comparatively little is known about how these different dimensions inter-relate and whether they are distinct dimensions or overlapping aspects of common dimensions.

Furthermore, positive aspects of parenting are not explored sufficiently because of an under-representation of corresponding items in family assessment questionnaires (Cassels et al., 2018). DeCato and colleagues (DeCato et al., 2002) reviewed twenty self-report measures of adolescent-parent relationship satisfaction and found none had assessed primarily positive aspects of the adolescent's relationship with their parent. Only the Parent–Child Areas of Change Questionnaire (Jacob & Seilhamer, 1985) assessed the adolescents' satisfaction with their relationship with their parent across multiple domains, but it focused largely on rules and discipline, neglecting more interpersonal aspects of the relationship. Moreover, the Mutual Dissatisfaction Inventory (Tarter et al., 1993), focused primarily on negative aspects of the relationship and areas where conflict occurs.

Alderfer and colleagues (Alderfer et al., 2008) reviewed 10 self-report measures of general family functioning and parent–child relationships, but none of them focused on positive child-parent relationships whilst also meeting the authors' criteria for being well-established psychometrically or through common use. Measures such as the Family Assessment Device (Epstein et al., 1983), the Family Assessment Measure-III (Skinner et al., 2000), the Family Relationship Index of the Family Environment Scale (Holahan & Moos, 1982), the Revised Children's Report of Parental Behavior Inventory (Schludermann & Schludermann, 1988), the Issues Checklist (Robin & Foster, 2003), and the Inventory of Parent and Peer Attachment (IPPA) (Armsden & Greenberg, 1987), all met the authors' criteria and were considered well-established, but their aim is to survey areas of difficulty and conflict. Thus, there are few validated measures of parenting focusing on positive aspects of parenting such as warmth, praise, emotional and material/ practical support, autonomy granting.

Simultaneously, there are a lot of studies on parental warmth and support, but it is usually measured with very short subscales that comprise of three or four items extracted by longer questionnaires. Parental warmth is considered to be a predictive factor of physical health (Caron et al., 2006; Schofield et al., 2016), adult achievement (Singh-Manoux et al., 2006), and a buffer of the effects of harsh discipline and abuse (Beckmann, 2021; Rachelle et al., 2021; Stacks et al., 2009; Walters, 2021; M. Wang, 2019; Y.-C. L. Wang et al., 2015; Xing et al., 2019; Xing & Wang, 2017). Equally, some studies employ measures of positive parenting which include warmth, praise, emotional and material/ practical support, autonomy granting, trust and other dimensions, similarly with short subscales these dimensions (Bean et al., 2003; Forehand & Nousiainen, 1993; Gadeyne et al., 2004; Huver et al., 2010; Kawabata et al., 2011; Kuppens et al., 2009; Luyckx et al., 2011; Manongdo & Ramirez Garcia, 2007; Smits et al., 2008).

In conclusion, there is a fragmented picture of the effects of parenting because the spotlight is directed on specific dimensions of parenting depending on the theoretical hypothesis of each study. Researchers mostly focus on some dimensions of parenting–e.g. warmth or acceptance, while harsh parenting, abuse and neglect are not included. Generally, it is not parenting as a whole that is examined, but specific parenting dimensions. When parenting styles are studied, on the one hand, it is found that they are reliable and cover a broader spectrum of practices than parenting dimensions, but they do not offer the specificity or the flexibility of parenting dimensions. There is an important gap in the literature in terms of understanding the multivariate structure of parenting which integrates all the major emerging themes of parenting, both positive and negative. This will broaden the examination of parenting

practices and will allow a more comprehensive integration of them as predictors of physical and mental health outcomes.

Simultaneously, specific parenting dimensions are selected to be examined as predictors of mental health outcomes, but this may be producing many false positive correlations since they are not being integrated into holistic multivariate models of parenting. The only exception – to my knowledge– has been McKinney and Renk (2008, 2011) who employed a multivariate approach to show the complex role that gender plays in the transitional period of adolescence and young adulthood. Their models show that father-to-son, father-to daughter, and mother-to-son parenting style has an indirect effect on late adolescent psychological adjustment through family conflict and other family environment characteristic. This shows that a multivariate approach can be beneficial and that an empirically-tested multivariate model of parenting could be pivotal in that direction. To date, there has been no attempt to investigate a multivariate model of parenting that captures frequently-used parenting dimensions as well as abuse, neglect, and positive parenting. Little is known about how these different aspects of parenting relate with each other and how they are best represented dimensionally.

3.1.4. Links between parenting and mental health outcomes

There are systematic reviews of parenting dimensions and parenting styles associating them with internalising and externalising psychological difficulties.

In a systematic review of the literature between the years 2010-2019, Gorostiaga et al. (2019) found that parental warmth, behavioural control, and autonomy granting have significant (overall small and moderate) inverse effects onto internalizing symptoms in adolescents. On the other hand, psychological control and

harsh control by parents are positively associated with adolescent anxiety, depression, and suicidal ideation.

A meta-analysis of studies that were completed before 2016 found that harsh control, psychological control, authoritarian, and, in part, neglectful parenting were associated with higher levels of internalizing and externalising symptoms, whereas parental warmth, behavioural control, autonomy granting, and an authoritative parenting style showed very small and small negative associations with internalising and externalising symptoms (Pinquart, 2017a, 2017b). A 2011 meta-analysis showed that more positive parenting was associated with less relational aggression and more harsh parenting and uninvolved parenting were associated with increased relational aggression (Kawabata et al., 2011).

There are many moderating variables such as age, ethnicity, child and parent gender and gender combination (mother-son/ father-son etc.). For example, paternal psychological control was positively related to relational aggression, whereas maternal psychologically control was not (Kawabata et al., 2011). Also, lower levels of externalizing behaviours were linked with mothers' higher levels of supportive parenting among girls but not among boys and higher levels of youth-reported depression were linked with mothers' higher levels of harsh parental control among boys but not among girls (Manongdo & Ramirez Garcia, 2007).

3.2. **The present study**

Considering the broad range of dimensions within the existing parenting literature, the multi-dimensional structure of parenting is examined in this chapter. In order to cover the breadth of themes that parenting research presents, two well-

established questionnaires are employed (the Alabama Parenting Questionnaire and the Measure of Parenting Style) as well as a new instrument that aims to redress the gap in positive parenting research (created and validated by members of this research group; Cassels et al., 2018). These questionnaires have been factor analysed before and are expected to cover parenting dimensions of warmth, support, acceptance, behavioural control, firm control, psychological control, parental involvement, consistent/inconsistent supervision, academic expectations, aggression, harsh parenting, psychological and physical abuse, and neglect. The approach that is taken here is data-driven on the item level, but the questionnaires were chosen in order to addresses the two main tensions in parenting literature: (a) the lack of balance between positive and negative dimensions of parenting and (b) the non-inclusion of abuse and neglect in the same model as positive dimensions.

In the first section of the chapter, a data-driven, bottom-up, approach is utilised to establish the dimensional structure of parenting in this sample of 14–24-year-olds. Both exploratory and confirmatory factorial approaches are used in order to define a wide-ranging multi-dimensional structure of parenting.

In the second section, I explore the longitudinal outcomes of parenting dimensions in young people's concurrent and prospective depression and anxiety symptoms. This will serve both as a validation of the parenting dimensions extracted in the first section and as a substantive extension of the existing literature. The multivariate parenting model presented in the first section covers a unique range of parenting dimensions which have never been studied together as predictors of depression and anxiety. Lastly, I will examine them as predictors of mental health symptoms together with covariates of age, gender and socio-economic status.

3.3. **Method**

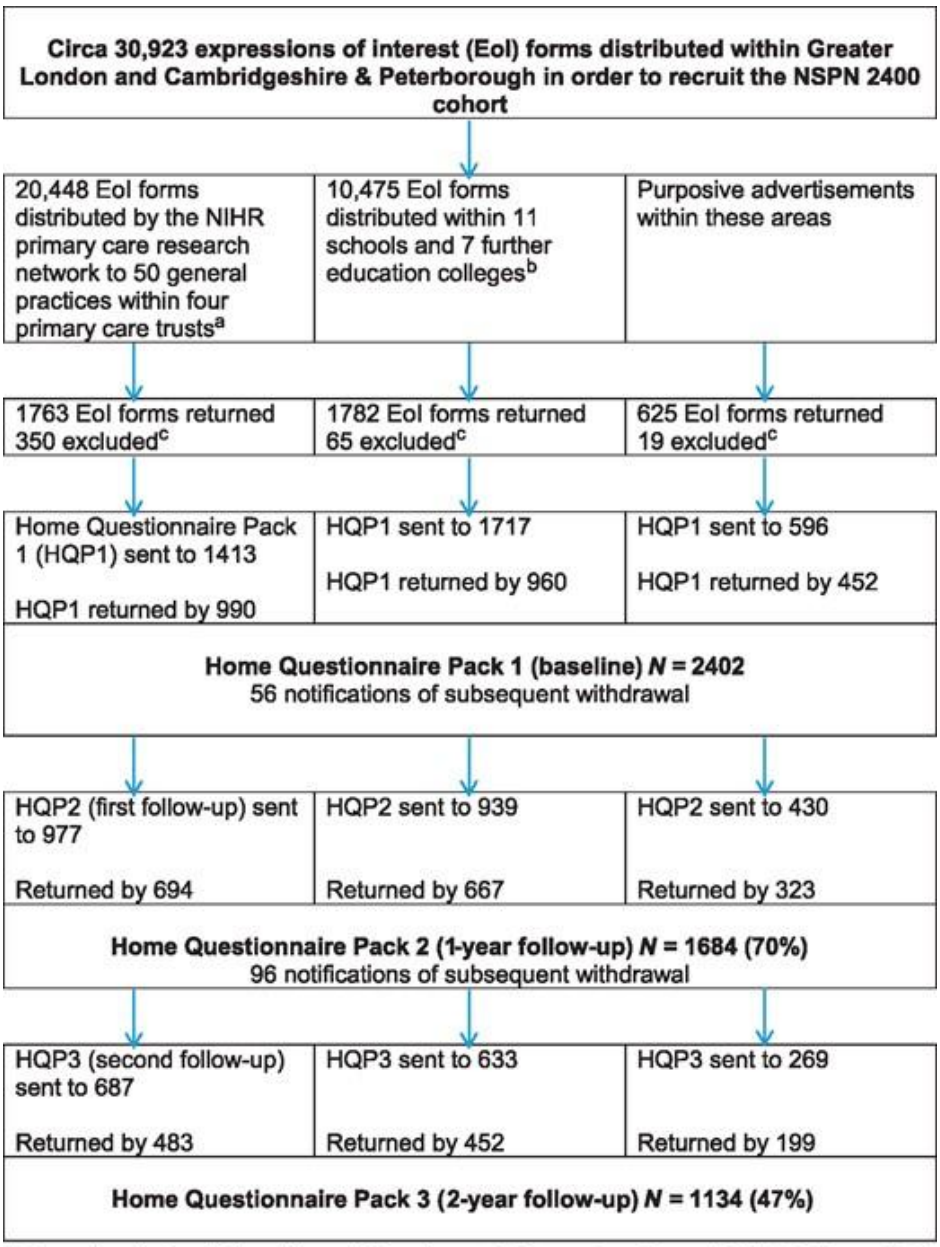
The data for this paper was collected as part of the Neuroscience in Psychiatry Network (NSPN), a large longitudinal cohort study. NSPN is a collaboration of research groups in UCL and Cambridge University with the aim to investigate typical and non-typical neuro-psychological development between the ages of 14-24 years.

All participants completed a pack of questionnaires sent to their homes, the Home Questionnaire Pack, and received £10 for completing it. They were followed up twice after ~12 months each time. The recruitment and follow-up process can be seen in figure 7.

If a participant was under the age of 18, parental consent was sought for them to participate in the study and complete the Home Questionnaire Pack. The Socio-economic Questionnaire was completed by the parent if the participant was under 16 (Kiddle et al., 2017).

Figure 7

The Recruitment and Data Collection Process; Kiddle et al. (2017)



[a]36 practices in Cambridgeshire and Peterborough Primary Care Trust (PCT), 8 in Barnet PCT, 3 in Camden PCT and 3 in Islington PCT.
[b]Schools in Barnet (2), Camden (4), Islington, Tower Hamlets, Haringey, Lambeth and Redbridge (all 1 each), and colleges in Cambridgeshire and Peterborough (6) and Islington (1).
[c]Excluded due to current age beyond scope.

3.3.1. Sample

In total, 2454 young people (2k cohort) in the age range 14–24 years (min=13.95, max=24.99) were recruited in London and Cambridgeshire through schools, universities and the wider community, 1858 young people provided a second

Home Questionnaire Pack at 12-month follow-up, and 1307 at the 2-year follow-up. Discrepancies in numbers from figure 7 are due to publication time. Of the detailed profile of the cohort can be found at Kiddle et al. (2017).

3.3.2. Demographics

This primary cohort was stratified into five contiguous age-related strata: 14–15 years inclusive, 16–17 years, 18–19 years, 20–21 years and 22–24 years. Recruitment within and between stratums was evenly balanced for sex (males = 1129, 46%) and age group. Table 8 summarises the age distribution in each stratum of the sample.

Table 8

Sample Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age bin 1	491	13.95	15.99	15.03	0.56
Follow-up 1	412	14.98	18.68	16.01	0.72
Follow-up 2	301	16.05	19.18	17.14	0.67
Age bin 2	549	16.00	17.99	17.07	0.54
Follow-up 1	415	16.80	2.96	18.22	0.70
Follow-up 2	272	17.27	2.90	19.56	0.63
Age bin 3	470	18.00	19.99	18.87	0.59
Follow-up 1	331	19.01	22.76	2.17	0.78
Follow-up 2	242	2.12	23.07	21.28	0.65
Age bin 4	455	2.00	21.99	2.95	0.57
Follow-up 1	332	2.98	24.78	22.01	0.69

Follow-up 2	231	21.96	24.76	23.16	0.70
Age bin 5	488	22.00	24.99	23.45	0.84
Follow-up 1	368	22.94	26.75	24.41	0.84
Follow-up 2	261	23.89	27.68	25.56	0.87

Ethnicity and Socio-Economic Status were the same as reported in the previous chapter.

3.3.3. Measures

The Positive Parenting Questionnaire (PPQ). The PPQ is a questionnaire created and validated by NSPN researchers in order to address the gap in the literature regarding positive parenting (Cassels et al., 2018). It is a self-report questionnaire comprising 26 items similar to existing measures for parent/child and family relationships. The responder is required to state frequency of the statement while living at home and response categories are *always*, *mostly*, *sometimes*, or *rarely.* For a full list of items and descriptive statistics for our sample, see Table 9. As stated by the authors "*Items are related not only to positive parenting in general, but also to the concept of attachment, assessing the child's confidence that their parents will respond to their needs, both emotional (Items 3, 5, 6, 10) and physical (Items 4, 12, 13, 18, 19, 20, 22). Additionally, [*the questionnaire addresses] *family organization (Items 2, 4, 12, 13, 16, 17, 18, 19, 26), cohesion (Items 1, 2, 6, 8, 9), communication (Items 6, 8, 11, 12, 14, 15, 20), affective environment (Items 3, 5, 6, 10), and problem-solving ability (Items 4, 5, 6, 7, 12, 21, 23, 24, 25). Some items are more general (e.g., Item 11: I felt listened to), while others are fairly specific (e.g., Item 19: I was given pocket money)."* The authors factor analysed the questionnaire and identified three subscales: Warmth and Support (items 1–16), Material Support/Generosity (items 17–

20), and Motivation and Academic expectations (items 21–26). The complete list of can be seen in Table 9.

Table 9

List of Items and Subscales of the Positive Parenting Questionnaire

Warmth and Support
1. We spent quality time together.
2. They attended school and social events which were important to me.
3. I received physical affection (lots of hugs etc.).
4. I knew they would come and get me from places if needed.
5. They comforted me when I felt sad.
6. If I was angry, I was still listened to.
7. They praised me when I did well.
8. My ideas and interests were encouraged and supported.
9. I felt I was a priority to them.
10. I felt loved by them.
11. I felt listened to.
12. I could contact them whenever I needed to.
13. My home was safe and secure.
14. My opinions were valued.
15. We talked about things I considered important.
16. My privacy was respected.
Material Support/ Generosity
17. My friends were welcomed in our home.
18. I was provided with clothes, toys, and other equipment I needed.

19. I was given pocket money.

20. I could ask for things without difficulty.

Motivation and Academic expectations

21. I was encouraged to achieve.

22. I was cared for when physically unwell.

23. I learned skills from them.

24. I received helpful advice to problems or questions I had.

25. I was encouraged to learn at school.

26. An interest was taken in my educational progress.

The Alabama Parenting Questionnaire (APQ). The short form APQ (Elgar, Waschbusch, Dadds, & Sigvaldason, 2007) comprises 15 items about parenting style. Participants were asked to rate how frequently each item occurred or used to occur in their family home. Ratings were on a five-point scale from "never" to "always". There are five subscales reported: Positive Parenting, Inconsistent Discipline, Poor Supervision, Parental Involvement, and Corporal Punishment. Table 10 shows the list of items in each subscale. Although this questionnaire was developed as a parent-report measure, it shows high congruence when used as a child-report measure (Parent et al., 2014).

Table 10

List of Items in Each Subscale of the Alabama Parenting Scale

Positive Parenting

1. Your parents tell you that you are doing a good job.

9. Your parents compliment you when you have done something well.

10. Your parents praise you for behaving well.

Inconsistent Discipline

---

2. Your parents threaten to punish you and then do not do it.

5. You talk your parents out of punishing you after you have done something wrong.

12. Your parents let you out of a punishment early (like lift restrictions earlier than they originally said.

Poor Supervision

---

3. You go out without leaving a note or letting your parents know where you are going.

7. You stay out in the evening past the time you are supposed to be home".

11. Your parents do not know the friends you are with.

Parental Involvement

---

4. You play games or do other fun things with your parents.

6. Your parents ask you about your day in school.

8. Your parents help you with your homework.

Corporal Punishment

---

13. Your parents spank you with their hand when you have done something wrong.

14. Your parents slap you when you have done something wrong.

15. Your parents hit you with a belt or other object when you have done something wrong.

The Measure of Parenting Style questionnaire (MOPS). The MOPS (Parker et al., 1997) is a 15 item self-report measure comprising three subscales: indifference (items 5, 8, 10, 11, 12, 13, N=), over-control (items 1, 3, 4, 6), and abuse (items 2, 7, 9, 14, 15). Each item is answered separately for the mother and the father and the single maximum score was used (i.e., the most negative response given for mother or father).

This instrument was developed and validated with an adult sample and its validity with adolescents has not been extensively tested. It has however been used to show retrospective links between parenting styles and suicide attempts among women (Alanko et al., 2008), and psychiatric symptoms among people who exhibited gender atypical behaviours as children (Ehnvall et al., 2007). The subscales show adequate to excellent internal consistency in the present sample (alphas: over-control = .76, abuse = .86, indifference = .92). Table 11 shows a full list of items.

Table 11

List of Items in Each Subscale of the Measure of Parenting Style Questionnaire

My mother/father:
Indifference
5. ignored me
8. was uncaring of me
10. was rejecting of me
11. left me on my own a lot
12. would forget about me

13. was uninterested in me

Over-control

1. was overprotective of me
3. was over-controlling of me
4. sought to make me feel guilty
6. was critical of me

Abuse

2. was verbally abusive of me
7. was unpredictable towards me
9. was physically violent or abusive to me
14. made me feel in danger
15. made me feel unsafe

Mood and Feelings Questionnaire (MFQ).The Moods and Feelings Questionnaire (MFQ) (Costello & Angold, 1988) a child self-report measure of depressive symptoms following the DSM-III-R which is frequently used both for preliminary screening and to monitor change in symptomatology. It has been found to have high internal validity (.95) (Burleson Daviss et al., 2006), test-retest reliability (.72)(Costello & Angold, 1988). The MFQ has 33 items and asks the subject to rate recent depressive symptoms on a Likert scale (0= never, 1= sometimes, 2= mostly, 3= always) with wording simple enough for younger children as well as adolescents. The questionnaire can be seen in Appendix II.

Revised Children's Manifest Anxiety Scales (RCMAS).the Revised Children's Manifest Anxiety Scales (RCMAS) which is a measure of manifest anxiety

adapted for children from the Taylor's Manifest Anxiety Scale (Reynolds & Richmond, 1978). The RCMAS was combined with the MFQ in one questionnaire meaning that the subject was asked to respond similarly on a Likert scale (0= never, 1= sometimes, 2= mostly, 3= always). The measure normally has 37 items including 28 items measuring anxiety symptoms and 9 items measuring social desirability (Dadds, Perrin, & Yule, 1998). I only included the anxiety items. The questionnaire can be seen in Appendix II.

3.3.4. Questionnaire descriptive statistics.

The tables below show all the descriptive statistics for the parenting questionnaires.

Table 12

Descriptive Statistics of Individual PPQ Items

Item	Response frequencies (%)				Missing	N	Mean	Std. Deviation	Skewness
	0	1	2	3					
1. We spent quality time together.	14.4	34.1	35.8	14.9	.7	2437	1.52	.917	-.027
2. They attended school and social events which were important to me.	8.9	17.4	29.6	43.4	.7	2439	2.08	.982	-.734
3. I received physical affection (lots of hugs etc.).	14.2	22.9	28.4	33.8	.7	2437	1.83	1.055	-.378
4. I knew they would come and get me from places if needed.	5.1	1.0	23.6	6.8	.6	2440	2.41	.865	-1.366
5. They comforted me when I felt sad.	6.8	17.6	27.6	47.2	.8	2436	2.16	.950	-.805
6. If I was angry, I was still listened to.	14.9	25.3	32.2	27.0	.5	2442	1.72	1.023	-.254
7. They praised me when I did well.	5.2	16.1	28.9	49.2	.5	2442	2.23	.903	-.891
8. My ideas and interests were encouraged and supported.	6.7	16.9	31.0	44.8	.5	2443	2.15	.932	-.792
9. I felt I was a priority to them.	6.4	15.9	29.8	47.2	.7	2439	2.19	.927	-.864

10. I felt loved by them.	2.6	8.6	21.9	66.4	.5	2442	2.53	.762	-1.574
11. I felt listened to.	7.2	19.6	28.9	43.8	.6	2441	2.10	.957	-.694
12. I could contact them whenever I needed to.	3.1	8.6	22.2	65.5	.6	2441	2.51	.782	-1.563
13. My home was safe and secure.	1.5	3.9	14.8	79.2	.6	2441	2.73	.608	-2.477
14. My opinions were valued.	5.8	20.4	30.0	43.3	.6	2440	2.11	.928	-.666
15. We talked about things I considered important.	8.4	19.3	29.5	42.1	.7	2437	2.06	.975	-.669
16. My privacy was respected.	8.1	17.6	33.7	40.0	.7	2439	2.06	.949	-.696
17. My friends were welcomed in our home.	3.7	11.5	25.5	58.6	.6	2440	2.40	.835	-1.246
18. I was provided with clothes, toys, and other equipment I needed.	.6	3.4	15.0	80.4	.7	2439	2.76	.532	-2.420
19. I was given pocket money.	10.9	16.0	18.1	54.4	.7	2439	2.17	1.058	-.895
20. I could ask for things without difficulty.	5.4	19.6	32.2	42.3	.5	2443	2.12	.909	-.672
21. I was encouraged to achieve.	1.7	5.3	14.9	77.7	.4	2445	2.69	.650	-2.260
22. I was cared for when physically unwell.	.7	3.7	16.5	78.8	.3	2448	2.74	.554	-2.268
23. I learned skills from them.	4.0	13.2	26.8	55.9	.2	2450	2.35	.854	-1.117
24. I received helpful advice to problems or questions I had.	5.0	14.1	28.8	51.8	.2	2449	2.28	.886	-1.005

25. I was encouraged to learn at school.	1.4	4.3	12.1	81.9	.3	2448	2.75	.599	-2.630
26. An interest was taken in my educational progress.	2.2	6.4	14.7	76.4	.4	2446	2.66	.695	-2.125

Table 13

Descriptive Statistics of Individual APQ Items

	Response frequencies (%)										
Item	1	2	3	4	5	Missing	N	Mean	Std. Dev.	Skew.	Kurt.
1. Your parents tell you that you are doing a good job. (r)	14.0	39.4	32.9	9.2	4.0	.4	2444	2.50	.980	.503	.057
2. Your parents threaten to punish you and then do not do it.	38.6	27.5	23.3	8.5	1.7	0	2444	2.07	1.053	.648	-.471
3. You go out without leaving a note or letting your parents know where you are going.	42.1	25.2	16.0	11.0	5.3	.4	2444	2.12	1.220	.840	-.379
4. You play games or do other fun things with your parents. (r)	4.4	22.2	41.7	2.7	10.7	.5	2443	3.11	1.011	0.144	-0.409
5. You talk your parents out of punishing you after you have done something wrong.	40.4	27.6	22.2	7.3	1.8	0.8	2435	2.02	1.042	0.737	-0.279
6. Your parents ask you about your day in school. (r)	33.5	32.5	19.4	7.3	6.6	0.7	2438	2.20	1.174	0.853	-0.055

7. You stay out in the evening past the time you are supposed to be home.	38.9	25.9	20.9	9.8	3.1	1.3	2422	2.11	1.130	0.725	-0.413
8. Your parents help you with your homework. (r)	5.6	17.4	29.8	19.2	26.5	1.4	2420	3.44	1.217	-0.187	-0.988
9. Your parents compliment you when you have done something well. (r)	31.7	34.8	22.0	7.7	3.3	0.5	2442	2.16	1.061	0.746	-0.028
10. Your parents praise you for behaving well. (r)	20.4	28.3	26.9	13.8	9.5	1.0	2430	2.63	1.226	0.365	-0.772
11. Your parents do not know the friends you are with.	27.9	30.0	26.2	11.6	3.5	0.9	2434	2.32	1.107	0.477	-0.572
12. Your parents let you out of a punishment early (like lift restrictions earlier than they originally said).	31.4	20.0	30.9	11.6	4.6	1.6	2416	2.37	1.177	0.371	-0.793
13. Your parents spank you with their hand when you have done something wrong.	78.5	11.1	7.4	1.7	0.7	0.7	2438	1.34	0.743	2.403	5.645
14. Your parents slap you when you have done something wrong.	80.3	11.6	5.4	1.4	0.7	0.6	2440	1.29	0.694	2.720	7.821
15. Your parents hit you with a belt or other object when you have done something wrong.	91.9	4.6	2.0	0.6	0.4	0.5	2442	1.12	0.486	4.908	27.337

Table 14

Descriptive Statistics of Individual MOPS Items

	Response frequencies (%)									
Item	0	1	2	3	Missing	N	Mean	Std. Dev.	Skew.	Kurt.
My mother/father:										
1. was overprotective of me	15.6	32.3	31.9	19.8	0.4	2444	1.56	0.978	-0.037	-1.004
2. was verbally abusive of me	68.8	18.0	8.6	4.1	0.4	2444	0.48	0.819	1.674	1.872
3. was over-controlling of me	44.4	28.7	17.4	8.9	0.5	2443	0.91	0.986	0.747	-0.595
4. sought to make me feel guilty	59.2	23.0	11.9	5.5	0.5	2443	0.63	0.895	1.244	0.493
5. ignored me	64.4	20.0	9.4	5.7	0.4	2444	0.56	0.881	1.476	1.133
6. was critical of me	45.1	29.7	15.5	9.2	0.5	2443	0.89	0.983	0.812	-0.468
7. was unpredictable towards me	57.7	22.4	12.4	6.8	0.6	2440	0.68	0.937	1.173	0.227
8. was uncaring of me	77.3	12.3	5.8	4.2	0.4	2444	0.37	0.776	2.183	3.861
9. was physically violent or abusive to me	81.2	11.6	4.5	2.2	0.5	2443	0.27	0.649	2.593	6.374

10. was rejecting of me	79.8	10.9	4.9	4.0	0.5	2443	0.33	0.747	2.391	4.877
11. left me on my own a lot	64.0	17.9	10.2	7.4	0.5	2443	0.61	0.943	1.384	0.683
12. would forget about me	79.3	11.5	4.3	4.4	0.4	2444	0.34	0.759	2.391	4.868
13. was uninterested in me	72.9	14.7	6.1	5.8	0.5	2443	0.45	0.849	1.906	2.571
14. made me feel in danger	88.4	5.9	3.0	2.3	0.5	2443	0.19	0.594	3.444	11.529
15. made me feel unsafe	85.8	7.9	2.8	3.0	0.4	2444	0.23	0.643	3.120	9.293

3.4. **Section 1**

3.4.1. Data analysis

The data analysis had three stages: (a) exploratory factor analysis (EFA), (b) confirmatory factor analysis (CFA), (c) factor correlations, (d) hierarchical modelling.

The exploratory and confirmatory factor analyses were conducted in MPlus software (Muthén & Muthén, 2010). First, an exploratory factor analysis (EFA) was conducted on the item level using an exploratory sample (random selection of 35% of the participants). Then, a confirmatory factor analysis was conducted (CFA) using the validation sample (65% of the sample). Following this, the factor correlations are presented, and, lastly, a hierarchical model of parenting is estimated.

Concerning the criteria of model fit, there are not specific gold standards (Rushton & Irwing, 2009). Here, several indices of fit are used that are commonly accepted. Due to the relatively large sample size, chi-square test was likely to be significant, thus it was used as a relative measure of fit rather than an independent one, i.e. if one model is better than another rather than if a model is a good fit to our data (Jöreskog, 1993; Kenny, 2015)

A root-mean square error of approximation (RMSEA) of <0.05 is widely considered an indicator of good fit. For the Comparative Fit Index (CFI) (Bentler, 1990) and for the Tucker- Lewis Index (TLI) (Tucker & Lewis, 1973) the >0.95 level is usually adopted (Lai & Green, 2016). In this study, the indices are used comparatively and the models with minimum RMSEA and maximum CFI and TLI are selected.

As it can been seen in the descriptive statistics tables, there were minimal missing data and those cases were not included in the analysis.

This is the first multivariate model of parenting constructed with multiple measures of parenting including positive and negative dimensions. All three measures of parenting have been factor-analysed before allowing this study to replicate and extend the previous findings in this unique sample of more than 2500 14–24-year-olds.

3.4.2. Section 1 – Results

3.4.3. Exploratory factor analysis

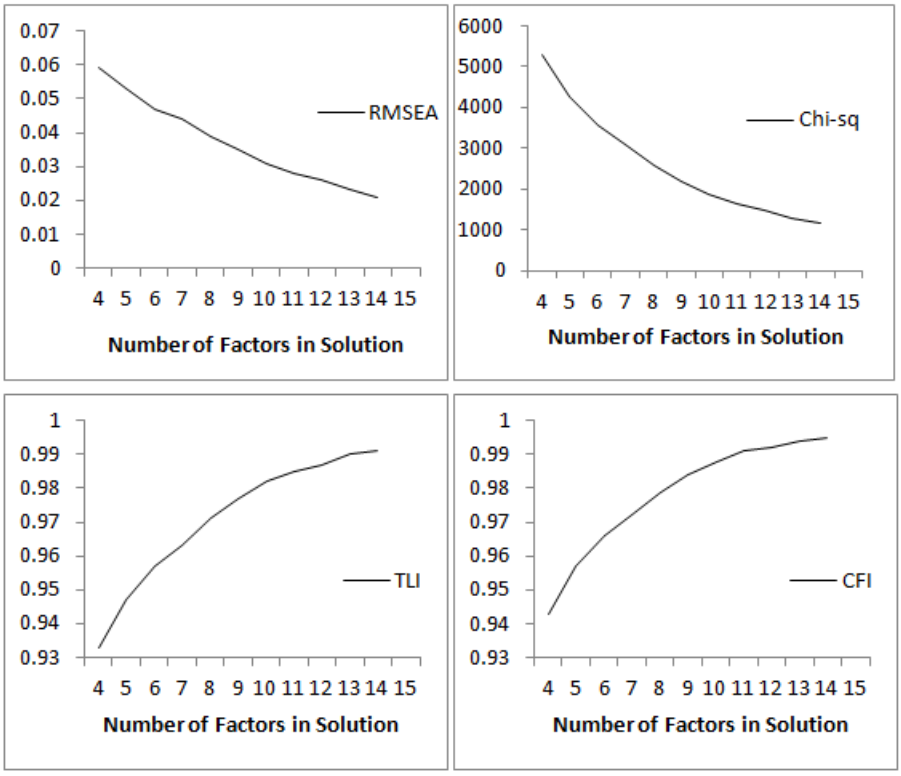
A data-driven approach was employed initiating an exploratory bottom-up analysis of data in the item-level. An EFA was performed using an exploratory sample (N=856) (random selection of 35% of the participants) of the baseline data in the MPlus software Version 6 (Muthén & Muthén, 2016).

The WLSMV (Weighed Least Square for categorical data mean and variance adjusted) estimator was used with oblique geomin rotation. Solutions with four up to twenty factors were explored, but there was no convergence for models with more than 14 factors. In figure 8, the goodness-of-fit indices are shown as a function of factor numbers in each solution.

Detailed results for each solution can be found in the Appendix I. The 14-factor solution was the one with the best fit, χ^2 (847) = 1175.973, p <.01; RMSEA = .021, CFI = .995, TLI = .991.

Figure 8

Plots of Fit Indices for Each EFA Solution



The 14 factors were interpreted according to their strongest item loadings and were as follows:

Factor 1 was called Praise; corresponding to the Alabama Praise subscale (items 1, 9, 10) and item 7 from the Positive Parenting Questionnaire: “They praised me when I did well”.

Factor 2 was named Parental Involvement corresponding to the Alabama Parental Involvement scale (items 4, 6, 8).

Factor 3 was called Warmth/ Support; corresponding to the PPQ items from the relevant scale (items 1-16) found in Cassels et al. (2018) excluding item 7 of the PPQ " They praised me when I did well".

Factor 4 was called Material Support corresponding to the Material Support/ Generosity scale from the PPQ (items 17, 18, 19, 20) (Cassels et al., 2018).

Factor 5 was called Motivation and Academic expectations corresponding to the PPQ Motivation and Academic expectations scale (items 21-26) (Cassels et al., 2018).

Factor 6 was called Neglect; corresponding to the MOPS neglect subscale (items 5, 8, 10, 11, 12, 13) (Parker et al., 1997),

Factor 7 was called Psychological Control comprising of two items from the MOPS over-controlling sub-scale (items 1 and 3).

Factor 8 was called Abuse and it included the MOPS abuse subscale (items 2, 9, 14, 15) as well as the remaining two items from the MOPS over-controlling scale (Items 4 "sought to make me feel guilty" and 6 "was critical of me") which conceptually fit with emotional abuse.

Factor 9 was called Corporal Punishment corresponding to the Alabama Corporal Punishment subscale (items 13, 14, 15).

Factor 10 was named Inconsistent Discipline comprising of the Alabama subscale (items 2, 5, 12).

Factor 11 was named Poor Supervision; which corresponds to the Alabama Poor Supervision subscale (items 3, 7, and 11).

Factor 12 included only one item, namely item 16 from the PPQ (the factor loading was.486): "My privacy was respected."

Factor 13: Items 23 and 24 from the PPQ loaded on this factor (with factor loadings.444 and.322 respectively), however these items also loaded onto factor 5 with higher loadings (Motivation and Academic expectations; .541 and.503 respectively).

Factor 14: This factor comprised of only 1 item (item 15 from the MOPS Abuse subscale; .512), which also loaded on factor 8 with a higher loading (Abuse: .734).

3.4.4. Confirmatory Factor Analysis

The items that loaded on factors 12, 13, and 14 in the Exploratory Factor Analysis loaded more highly on other factors and contained few items. Therefore, in order to reduce model complexity and to retain scale reliability, these three factors were excluded from the final confirmatory model which was left with 11 factors. Then, Factor 8 (Abuse) and Factor 9 (Corporal Punishment) were combined, because items 14 and 15 had negative residual variance and because items referring to physical abuse (MOPS9 "was physically violent to me") were included in both factors. This led to a final 10 factor model.

A confirmatory factor analysis of the model with 10 factors was conducted on the confirmatory sample (N=1599), the model fit the data well; χ^2 (1439) = 7935.5, p <.01; RMSEA = .053, CFI = .945, TLI = .941

Table 15 shows the 11-factor model that was confirmed in the control sample.

Table 15

Confirmatory Factor Analysis; 10 factors

Item		Estimate
Factor 1: Praise		
APQ	1. Your parents tell you that you are doing a good job. (r)	.812
APQ	9. Your parents compliment you when you have done something well. (r)	.878
APQ	10. Your parents praise you for behaving well. (r)	.773
PPQ	7. They praised me when I did well.	.946
Factor 2: Parental involvement: comprising from the Alabama Involvement scale		
APQ	4. You play games or do other fun things with your parents. (r)	.778
APQ	6. Your parents ask you about your day in school. (r)	.714
APQ	8. Your parents help you with your homework. (r)	.634
Factor 3: Warmth/ Support		
PPQ	1. We spent quality time together.	.748
PPQ	2. They attended school and social events which were important to me.	.703
PPQ	3. I received physical affection (lots of hugs etc.).	.723
PPQ	4. I knew they would come and get me from places if needed.	.684
PPQ	5. They comforted me when I felt sad.	.859
PPQ	6. If I was angry, I was still listened to.	.836
PPQ	8. My ideas and interests were encouraged and supported.	.850
PPQ	9. I felt I was a priority to them.	.853
PPQ	1. I felt loved by them.	.901
PPQ	11. I felt listened to.	.923
PPQ	12. I could contact them whenever I needed to.	.794
PPQ	13. My home was safe and secure.	.782
PPQ	14. My opinions were valued.	.902

PPQ	15. We talked about things I considered important.	.893
PPQ	16. My privacy was respected.	.676
Factor 4: Material support		
PPQ	17. My friends were welcomed in our home.	.785
PPQ	18. I was provided with clothes, toys, and other equipment I needed.	.751
PPQ	19. I was given pocket money.	.537
PPQ	2. I could ask for things without difficulty.	.847
Factor 5: Motivation and Academic expectations		
PPQ	21. I was encouraged to achieve.	.851
PPQ	22. I was cared for when physically unwell.	.829
PPQ	23. I learned skills from them.	.848
PPQ	24. I received helpful advice to problems or questions I had.	.939
PPQ	25. I was encouraged to learn at school.	.855
PPQ	26. An interest was taken in my educational progress.	.872
Factor 6: Neglect		
MOPS	5. ignored me	.922
MOPS	8. was uncaring of me	.950
MOPS	10. was rejecting of me	.929
MOPS	11. left me on my own a lot	.788
MOPS	12. would forget about me	.884
MOPS	13. was uninterested in me	.947
Factor 7: Psychological Control		
MOPS	1. was overprotective of me	.342
MOPS	3. was over-controlling of me	.734
MOPS	4. sought to make me feel guilty	.895
MOPS	6. was critical of me	.861

Factor 8: Abuse		
MOPS	2. was verbally abusive of me	.921
MOPS	7. was unpredictable towards me	.888
MOPS	9. was physically violent or abusive to me	.881
MOPS	14. made me feel in danger	.978
MOPS	15. made me feel unsafe	.965
APQ	13. Your parents spank you with their hand when you have done something wrong.	.532
APQ	14. Your parents slap you when you have done something wrong.	.697
APQ	15. Your parents hit you with a belt or other object when you have done something wrong.	.659
Factor 9: Inconsistent Discipline		
APQ	2. Your parents threaten to punish you and then do not do it.	.961
APQ	5. You talk your parents out of punishing you after you have done something wrong.	.606
APQ	12. Your parents let you out of a punishment early (like lift restrictions earlier than they originally said).	.503
Factor 10: Poor supervision		
APQ	3. You go out without leaving a note or letting your parents know where you are going.	.577
APQ	7. You stay out in the evening past the time you are supposed to be home.	.531
APQ	11. Your parents do not know the friends you are with.	.773

3.4.5. Correlations between factors

All correlations among the factors in the confirmatory analysis can be seen in Table 16 below. All factors were significantly correlated; some factors were correlated very highly (r>.8), thus a hierarchical model with higher order factors was indicated.

Table 16

Correlations of the 10 Factors; high correlations are indicated in grey colour

	Neglect	Psychological Control	Abuse	Inconsistent Discipline	Poor Supervision	Praise	Parental Involvement	Warmth	Material Support
Neglect	–								
Psychological Control	.806**	–							
Abuse	.846**	.880**	–						
Inconsistent Discipline	.161**	.241**	.236**	–					
Poor Supervision	.504**	.518**	.514**	.506**	–				
Praise	-.589**	-.614**	-.558**	-.099**	-.526**	–			
Parental Involvement	-.657**	-.637**	-.591**	-.082**	-.617**	.928**	–		
Warmth	-.686**	-.680**	-.665**	-.151**	-.601**	.891**	.927**	–	

Material Support	-.612**	-.655**	-.640**	-.139**	-.554**	.739**	.763**	.876**	–
Academic Expectations	-.649**	-.564**	-.603**	-.156**	-.552**	.807**	.862**	.908**	.836**

**. Correlation is significant at the.01 level (2-tailed).

3.4.6. Hierarchical model of parenting

Due to the highly correlated factors, a hierarchical model was estimated that included two second-order factors; one named Positive Parenting which included Praise, Warmth/Support, Parental Involvement, Material Support, and Academic Expectations and a another second-order factor named Negative Parenting which included Psychological Control, Abuse, and Neglect. Item 2 from the Alabama Parenting Questionnaire ('Your parents threaten to punish you and then do not do it.') had to be excluded as it created measurement problems with the model.

Inconsistent Discipline and Poor Supervision were not included in the final model of the second-order factors because they were not highly correlated with the first-order factors (see table 16) and because conceptually they cannot be strictly categorised as positive or negative parenting. They have been linked to the permissive/indulgent parenting style, but there are conflicting findings about whether this style of parenting is positive or negative (Lamborn et al., 1991) and, importantly, whether the adoption of this style of parenting depends more on child behaviour rather than parenting styles (parents responding to child temperament rather than the opposite) (Smetana, 2017).

The model (Figure 9) fit the data well; χ^2 (1166) = 7753.8, p <.01; RMSEA = .056, CFI = .948, TLI = .946.

Table 17 show the parameter estimates of the model.

Figure 9

Hierarchical Model of Parenting Factors

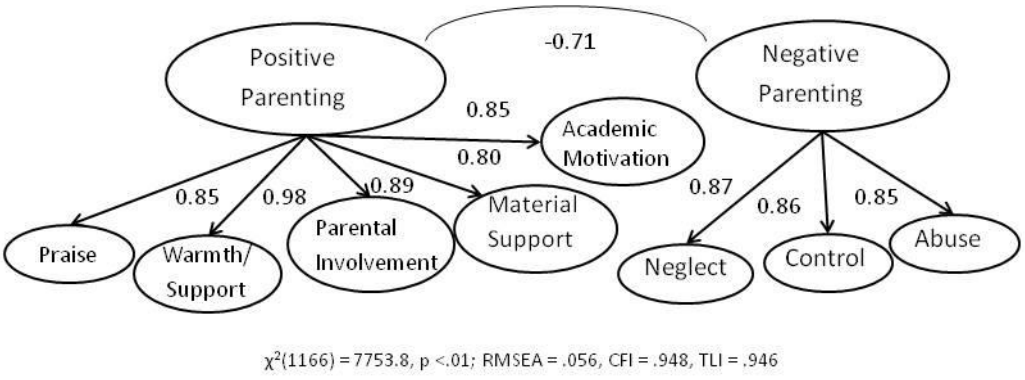


Table 17

Parameters of the Hierarchical Model for Parenting

Positive Parenting	Estimate	Sig
Praise	0.856	0.000
Parental Involvement	0.89	0.000
Warmth	0.982	0.000
Material Support	0.809	0.000
Academic Expectations	0.855	0.000
Negative Parenting		
Neglect	0.871	0.000
Psychological Control	0.857	0.000
Abuse	0.855	0.000
		0.000
Negative Parenting		

Positive Parenting	-0.717	0.000

3.5. **Section 2**

3.5.1. Data Analysis

In Section 2, two growth curve models of psychopathology are presented with parenting factors as predictors. Psychopathology was measured three times 12 and 18-24 months apart (i.e., three measurements: baseline, follow-up 1 and follow-up 2). The factor loadings of the hierarchical parenting model that were presented in Section 1 were extracted and used as predictors of the latent growth curve of internalising symptoms with gender, age, and socio-economic status as covariates.

I used three waves of data (baseline, follow-up 1 and follow-up 2) as three time points, in order to explore how internalising symptoms, develop in time. I used age, gender, and socio-economic status as covariates for the three measurements of psychopathology.

In order to do this, the Latent Growth Curve Modelling framework was employed, an extension of structural equations modelling, using the MPlus software (Muthén & Muthén, 2010). The objective of Latent Growth Curve Modelling is to describe non-linear change across time. It provides a representation of variation in growth parameters through a polynomial model by estimating latent continuous population parameters such as intercept and slope (deRoon-Cassini, Mancini, Rusch, & Bonanno, 2010; Mäkikangas, Bakker, Aunola, & Demerouti, 2010; Ram & Grimm, 2009).

The zero-time score for the slope growth factor (i.e., the baseline measurement of internalising symptoms) defines the intercept (i.e., the initial level of the dependent variable). The slope describes individual differences in a constant rate of mean-level change across measurement points, hence, the factor loadings for the slope growth factor are fixed at 0, 1, 2 to define the linear model (Mäkikangas et al., 2010). The coefficients of the intercept growth factor are set to 1 as part of the standard parametrisation of the growth model (Muthén & Muthén, 2016). By default, the residual variances of the outcome variables are allowed to be different across time (Muthén & Muthén, 2016).

The parameters of the LGC model were estimated with the robust maximum-likelihood estimator which is robust to non-normality of outcomes and non-independence of observations (Muthén & Muthén, 2016) and is widely endorsed (deRoon-Cassini et al., 2010). Goodness-of-fit was tested using the Root Mean Square of Approximation (RMSEA) (Steiger, 1990), the Comparative Fit Index (CFI)(Bentler, 1990), and the Tucker- Lewis Index (TLI) (Tucker & Lewis, 1973). For the RMSEA, values of .05 or less indicate good fit, for CFI and TLI values above .95 indicate acceptable fit(Muthén & Muthén, 2016).

3.5.2. Section 2 – Results

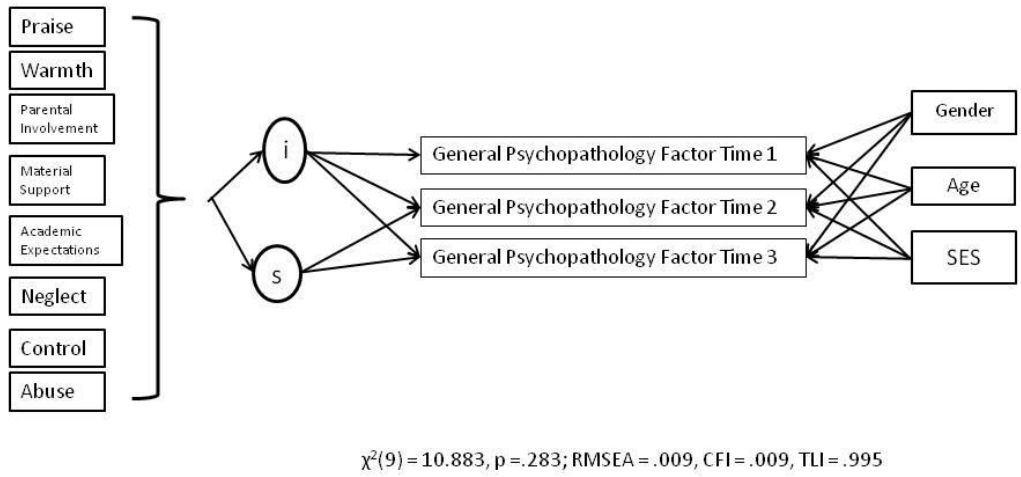
3.5.3. Latent Growth Curve Model of psychopathology and the 8 parenting factors

The 8 specific (first-order) parenting factors were used as predictors regressed on the latent variables (intercept and slope) of psychopathology. The model fit the data very well. The fit indices were as follows: χ^2 (9) = 10.883, p =.283; RMSEA =

.009, CFI = .009, TLI = .995. Figure 10 shows the Latent Growth Curve model with the 8 parenting factors as indicators of internalising symptoms.

Figure 10

Latent Growth Curve Model of Psychopathology with the 11 Parenting Factors as Predictors of the Latent Variables of the Curve

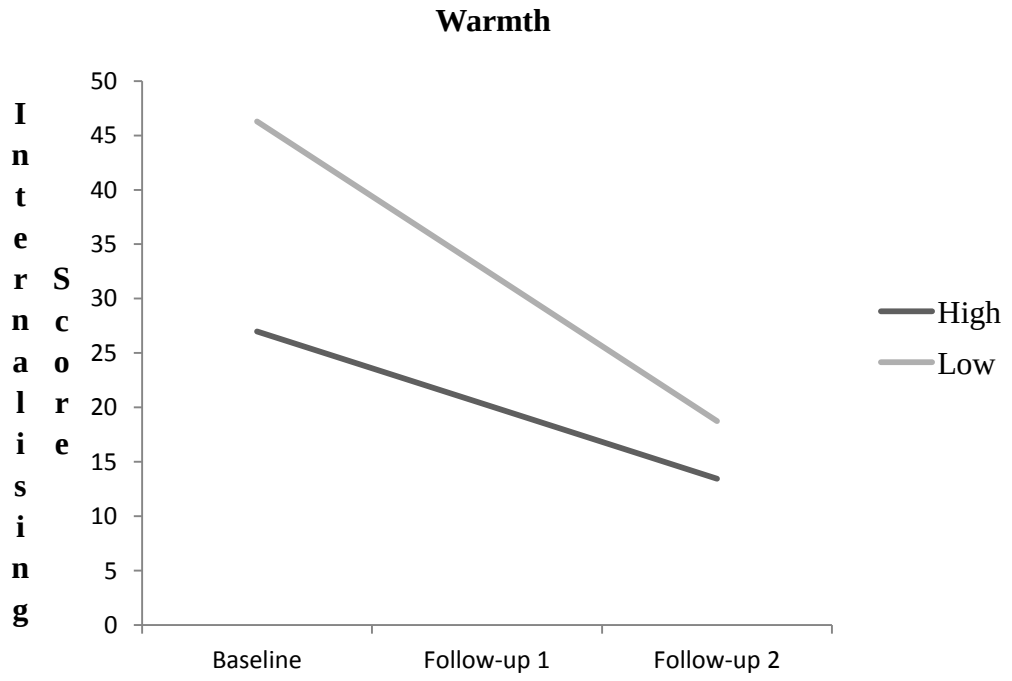


A significant effect was found between Warmth (Estimate: -.425, S.E.:.091, p<.001) and Psychological Control (Estimate: .264, S.E.:.052, p<.001) in relation to the intercept. This finding indicates that higher levels of warmth and lower levels of psychological control are associated with lower levels of depression and anxiety symptoms. The slope was significantly associated with Warmth (Estimate: -.425, S.E.:.185, p=.022) and Psychological Control (Estimate: .264, S.E.:.095, p=.028). This result indicates that individuals who have report having received parenting with higher levels of warmth have a lower rate of decrease of depression and anxiety symptoms. The opposite is true for individuals who report higher levels of psychological control. This is because high warmth individuals have low levels of depression and anxiety leading to smaller decrease of these symptoms. Figure 11

depicts internalising symptom scores over the three time points for high and low warmth according to the latent growth curve model.

Figure 11

Estimated Curve of Internalising Symptom Scores Over the Three Time Points for High and Low Warmth According to the Latent Growth Curve Model.



It is important to note that if each parenting factor is entered individually into the model as a predictor variable, they are significantly associated with internalising scores (see Table 19 unadjusted estimates), but when all 8 are entered in one model, only Warmth and Psychological Control remain significant. Table 19 shows adjusted and unadjusted estimates for each parenting factor. Table 18 shows the model estimates for age, gender and socio-economic status.

Table 18

Model Estimates (age, gender, SES, intercept, and slope) for the Latent Growth Curve Model of Internalising Symptoms with the 8 Parenting Factors as Predictors

	Baseline Estimate	Sig.	Follow-up 1 Estimate	Sig.	Follow-up 2 Estimate	Sig.
Age	-.047	.008	-.022	.214	.021	.372
Gender	.140	.000	.151	.000	.129	.000
SES	-.028	.145	-.051	.015	-.022	.419
I	.798	.000	.809	.000	.857	.000
S	n/a	n/a	.295	.000	.626	.000

Table 19

Coefficients and Unadjusted Coefficients of Each Parenting Factor as a Predictor of Internalising Score

	Coefficients with all parenting factors included as indicators in the model				Coefficient for each parenting factor used as an indicator individually			
	Intercept		Slope		Intercept		Slope	
Predictor	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.
Praise	0.072	0.173	-0.071	0.471	-0.418	0.000	0.195	0.000
Parental Involvement	0.059	0.439	-0.166	0.272	-0.459	0.000	0.212	0.000
Warmth	-0.425	0.000	0.423	0.022	-0.494	0.000	0.250	0.000

Material Support	-0.020	0.679	0.079	0.411	-0.448	0.000	0.238	0.000
Motivation and Academic Expectations	0.064	0.277	-0.161	0.139	-0.438	0.000	0.201	0.000
Neglect	0.088	0.095	-0.040	0.673	0.472	0.000	-0.240	0.000
Psychological Control	0.264	0.000	-0.201	0.028	0.498	0.000	-0.263	0.000
Abuse	-0.018	0.729	0.061	0.522	0.461	0.000	-0.229	0.000

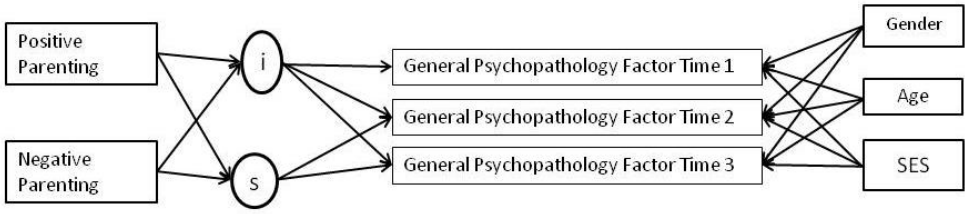
Note. The unadjusted coefficients were produced by estimating the model with each parenting factor separately.

3.5.4. Latent Growth Curve Model of psychopathology and Positive and Negative Parenting super-factors

For this second model, the positive and negative parenting factor scores from the hierarchical model were used as predictors of the latent variables (intercept and slope) as well as age, gender, and socio-economic status as covariates. The model fit the data very well. The fit indices were as follows: χ^2 (3) = .295, p=.96, RMSEA=.000, CFI=1.000, TLI=1.011. Figure 12 shows the Latent Growth Curve model with positive and negative parenting factors as indicators of internalising symptoms.

Figure 12

Latent Growth Curve Model of Psychopathology with the Two Super-Factors of Parenting as Predictors of the Latent Variables of the Curve



$\chi^2(3) = .295$, p=.96, RMSEA=.000, CFI=1.000, TLI=1.011

A significant effect for both Positive Parenting (Estimate: -.207, p< .001) and Negative Parenting (Estimate: .356, p< .001) on the intercept was established. Negative Parenting was significantly associated with the slope of the model (Estimate: -.201, p=.004). This result indicates that individuals who report higher levels of negative parenting have a steeper slope of decrease of anxiety and depression scores. This is likely due to the higher levels of symptomatology at baseline. Figure 13 depicts the model estimated growth lines of internalising symptom scores over the three time points for high and low Negative Parenting.

Model estimates for all of the variables can be seen in Tables 20 and 21.

Figure 13

Estimated Curve of Internalising Symptom Scores over the Three Time Points for High and Low Negative Parenting According to the Latent Growth Curve Model.

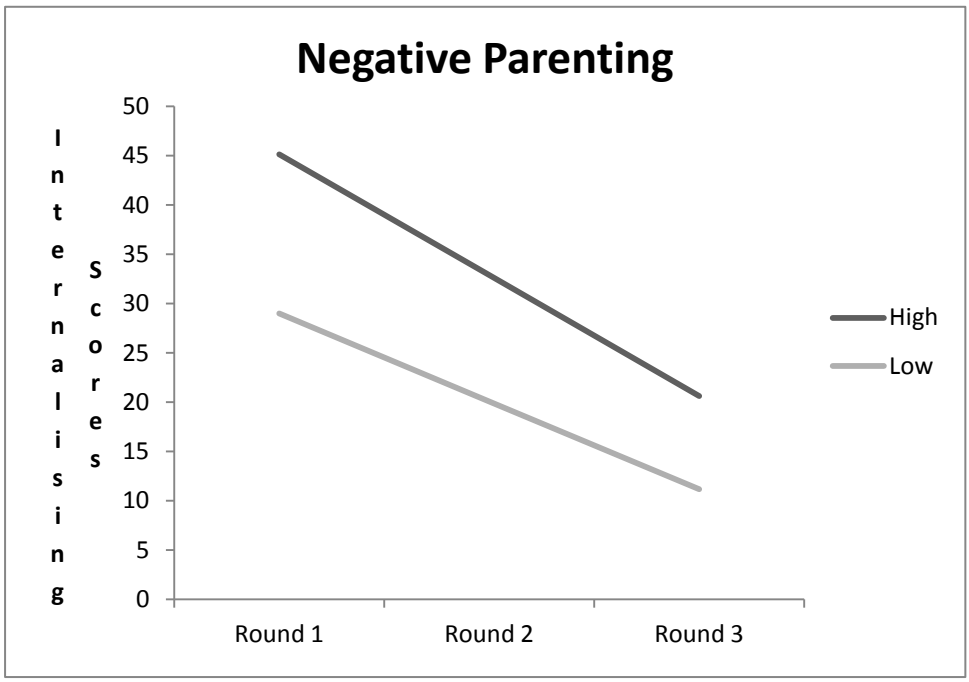


Table 20

Coefficients of Positive and Negative Parenting as Predictors of Internalising Symptoms

	Intercept		Slope	
Predictor	Estimate	Sig.	Estimate	Sig.
Positive Parenting	-.207	.000	.083	.246
Negative Parenting	.356	.000	-.201	.021

Table 21

Model estimates (age, gender, SES, intercept and slope) for the Latent Growth Curve of Internalising Scores with Positive and Negative Parenting as Predictors

Baseline	Estimate	Sig.	Follow-up 1	Estimate	Sig.	Follow-up 2	Estimate	Sig.

Age	-.052	.003	Age	-.023	.326	Age	.023	.326
Gender	.153	.000	Gender	.153	.000	Gender	.130	.000
SES	-.048	.288	SES	-.048	.022	SES	-.023	.381
I	.799	.000	I	.810	.000	I	.858	.000
S	n/a	n/a	S	.297	.000	S	.629	.000

3.6. **Discussion**

Parenting is of central research interest for a wide variety of reasons including public health, the promotion of psychological well-being, prevention of child abuse and more. For many years, parenting practices have been studied under a typology of parenting styles or separately as parenting dimensions and employed in order to identify which practices result in preferable outcomes for the families and children. This chapter explores a multivariate model of parenting that is inclusive of a wide range of parenting dimensions, frequently examined individually, such as dimensions of positive parenting (e.g., warmth and support) and others of negative parenting (e.g. abuse and neglect). Also, the parenting dimensions were used as predictors of longitudinal mental health outcomes of adolescent-to-adult population. This replicates and extends the literature and is, therefore, both a validating process for the parenting model as well as an important addition to the research in developmental psychopathology of 14–24-year-olds.

The exploratory factor analysis initially indicated the extraction of fourteen factors. For the confirmatory analysis, I retained the following ten factors: Praise, Warmth/ Support, Material support, Motivation and Academic expectations, Parental involvement, Neglect, Psychological Control, Abuse, Inconsistent Discipline, and

Poor supervision. The four factors that were excluded were (a) consisting of single items which were loading more highly on one of the other factors and (b) the factor of Corporal Punishment had to be combined with the initial Abuse factor in order to arrive at a converging model. Some of these factors were very highly correlated (>.85) and, therefore, a hierarchical model was estimated which introduced two super-factors named Positive and Negative Parenting (r= -.71). Positive Parenting was measured by Praise, Warmth/ Support, Material support, Motivation and Academic expectations, and Parental involvement. Negative Parenting was measured by Neglect, Psychological Control, and Abuse.

Overall, the findings indicate that a hierarchical model of parenting dimensions is an appropriate and helpful way of understanding and measuring parenting and longitudinal outcomes.

3.6.1. Multivariate structure of Parenting

The first goal of the study, namely the estimation of the factorial structure of parenting, led to an initial bottom-up approach which revealed a multivariate structure consistent with factor analyses in the existing literature while extending the findings to this large cohort of 14–24-year-olds. Specifically, the Exploratory Factor Analysis produced the exact factors that have emerged previously in different samples from the Alabama Parenting Questionnaire and the Measure of Parenting Style instruments – i.e. Parental Involvement, Psychological Control, Abuse, Neglect, Inconsistent Discipline and Poor Supervision. Praise, Warmth/Support, Material support and academic expectations/motivations stemmed from the Positive Parenting Questionnaire which was created by NSPN researchers to facilitate systematic research of positive parenting through a validated instrument (Cassels et al., 2018)

Praise, Warmth/Support, and Parental Involvement are some of the most researched parenting dimensions, repeatedly found to be measured by two or even one question asked to the participants.

Material support and academic expectations/motivations are frequently either omitted or investigated separately from warmth, support, praise, and parental involvement (Spera, 2005). The confirmatory factor analysis conducted on this sample of more than 2400 adolescents and young adults suggests that it is important to construct a model of parenting that includes the experience of material provisions available to children and the attitudes and practices that encourage learning and academic progress as well as the emotional environment that parenting creates (warmth, praise, parental involvement).

It is known that material deprivation, socio-economic status and social position are associated with emotional deprivation, but this is not a simple causal or a linear relationship (K. A. McLaughlin & Sheridan, 2016; Peverill et al., 2021; Stansfeld et al., 2008). Emotional warmth, praise and support can be present in conditions of material deprivation and in order to study these complex relationships, it is essential to disaggregate between emotional and material deprivation. The effects of material deprivation, socio-economic adversity and its psychological consequences have been studied extensively (Haushofer & Fehr, 2014; K. A. McLaughlin & Sheridan, 2016; Peverill et al., 2021; Sarriera et al., 2015; Ziegler et al., 2020), but material support and generosity as a subjective experience of parenting have not been included in multidimensional parenting models or statistical models that predict psychological difficulties before. Similarly, academic expectations and encouragement may or may not be a parental priority depending on expectations and

values, but it is important to have a model of parenting that includes these dimensions without fusing them together obscuring the different sources of variance.

Another important issue is the combination of APQ Corporal Punishment with MOPS Abuse scales. This decision was both data-driven and supported by the previous literature. The physical abuse items of the Corporal Punishment Scale (APQ 13: 'Your parents spank you with their hand when you have done something wrong', APQ 14: 'Your parents slap you when you have done something wrong', and APQ 15: 'Your parents hit you with a belt or other object when you have done something wrong' had a negative residual variance. Also, the MOPS Abuse subscale includes both physical and emotional abuse items (e.g. MOPS 2: 'was verbally abusive of me', 7: 'was unpredictable towards me', and 9: 'was physically violent or abusive to me'). The experiences of psychological and physical abuse are frequently measured together –e.g., in the Children's Trauma Questionnaire, one of the most frequently used instruments for clinical and research purposes in the United Kingdom.

Re-validating the model both in the general population as well as comparing this structure to clinical population would be a very important future project. This would also address issues of directionality of parenting, namely that parenting changes depending on the needs and temperament of the child. There is some evidence that parental gender, dyadic gender interactions (i.e., mother-son versus mother daughter) and bidirectional effects are significantly associated with certain aspects of parenting that have to do with conflict and discipline. These were not investigated and there is significant evidence that these are important, particularly in adolescence and young adulthood (McKinney & Renk, 2008, 2011).

All factors were significantly correlated. There were two groups of factors which were very highly correlated (>.85) and these were combined into two second-order factors, name Positive and Negative Parenting. Positive Parenting was measured by Praise, Warmth/ Support, Material support, Motivation and Academic expectations, and Parental involvement. Negative Parenting was measured by Neglect, Psychological Control, and Abuse. Poor Supervision and Inconsistent Discipline were the factors with the smallest correlations, although consistently positive and negatively correlated with the respective parenting factors (-.617>r>.518). This may be explained by the idea that Poor Supervision and Inconsistent Discipline were not always experienced by the participants as a problematic parenting practice or that it indicates a certain level of trust in the children or that it is less important in adolescent and post-adolescent age groups. Generally, the hierarchical model fit the data well and produced a coherent structure of highly correlated but discrete factors: two general and 8 specific factors of parenting.

3.6.2. Parenting Outcomes

With regards to the longitudinal effects of reported parenting, initially, I estimated a latent growth curve model of internalising symptoms measured by depression and anxiety score at three time points which were ~12 months apart. The latent variables of the intercept and slope were regressed on the 8 parenting factor scores. The second model was similar, but the latent variables were regressed on the two super-factors of Positive and Negative Parenting.

Warmth and Psychological Control significantly and independently predicted the intercept indicating that they are associated with the concurrent level of

psychopathology (respectively negatively or positively). This replicates the existing literature which links psychological control with internalizing symptoms and warmth with positive outcomes (Bean et al., 2003; Forehand & Nousiainen, 1993; Kuppens et al., 2009; Pinquart, 2017b, 2017a). Positive and Negative Parenting also predicted the initial level of internalising symptoms indicating that more positive parenting is associated with less internalising symptoms and vice versa.

The slope of the model was associated with Warmth, Psychological Control, and Negative Parenting indicating that individuals who have received higher levels of Psychological Control and Negative Parenting reduce their internalising scores at a higher rate whereas individuals with high levels of Warmth decline at a lesser rate. This is likely because of the higher initial levels of internalising symptoms in individuals who report high Psychological Control and Negative Parenting. Adolescents and young adults, who report higher levels of Warmth, also have lower levels of depression and anxiety leading to smaller decrease of these symptoms. Adolescents generally reduce their internalising scores from 13 years onwards (K. A. McLaughlin & King, 2015), this was replicated in this study. However, because of the lower or (higher respectively) initial levels of psychopathology in people with higher Warmth (or Psychological Control and Negative Parenting respectively), the slope was less steep (or steeper respectively).

Concurrent negative parenting has been linked to higher adolescent anxiety, depression, aggression, lower self-esteem, and school satisfaction, whereas concurrent positive parenting (i.e. parent support, parent–child future orientation, and parent education support) was significantly associated with less depression and higher self-esteem, future optimism and school satisfaction (Fan, 2011; Hashimoto et al.,

2011; Smokowski et al., 2015). These findings, thus, replicate previous research and show that negative parenting is closely linked to depression and anxiety scores in a general population of 14–24-year-olds.

Furthermore, longitudinal research is less frequent than cross-sectional research on parenting and psychopathology and these findings extend our understanding of how negative parenting might be having an important effect on the development of internalising symptomatology over adolescence/young adulthood. As described above, neglect and abuse and do not singularly predict the slope of the growth curve of psychopathology. However, if Neglect, Psychological Control, and Abuse are combined in one general factor, it is predictive of both the intercept and the slope indicating that individuals with higher negative parenting exhibit steeper decline of their symptoms. This suggests that Negative Parenting does not play a role in the decline of internalising symptoms and that the initial level of symptoms is more important. However, one limitation of this study – that also constitutes a future research suggestion – is that it did not assess externalising symptomatology which might be linked to Negative Parenting or different parenting dimensions such as Parental Involvement and Abuse. Externalising symptoms have been previously linked to Neglect and Abuse which were not associated with mental health outcomes in this case.

A significant contribution of the multivariate structure of parenting presented here is that it offers the opportunity of a global parenting assessment. Importantly, the first-order parenting factors (namely Praise, Parental Involvement, Warmth, Material Support, Academic Expectations, Psychological Control, Neglect, and Abuse) represent the most frequently used parenting dimensions in the literature. However,

either one (usually warmth) or two of them (e.g. Warmth and Control/ Harsh Discipline) are used at each study creating a significant chance of Type I error. In this paper, I was able to comparatively use them both together and each single one as a predictor of internalising symptoms. When they are used as predictors of internalising symptoms individually, they are all significantly associated with both intercept and slope. It is only when they are used together that their unique contribution can be measured. This is an important finding because it could change some of the outcomes of studies conducted using some of these parenting factors individually.

Also, it is important to note that this model might have different measurements and correlations in a different population and this would be an addition with important clinical and educational implications. Equally, this model relies on adolescents' and young adults' own reports of parenting, as opposed to third party observations or comparative reports of the parents/teachers etc. This limits the findings to an one-sided model of reported parenting and leaves significant gaps for future investigation.

In conclusion, the hierarchical model of parenting factors presented in this chapter is the first comprehensive multivariate model of parenting. It has significant implications for parenting research because it opens up the field of parenting research to an approach which can identify the unique parenting practices that could make a difference in a lot of young people's lives.

There are also significant conceptual and theoretical considerations that need to be addressed in the future. Future research on parenting should be conducted to investigate whether the reason that negative parenting is significantly associated with the rate of the development of psychopathology is the cumulative effect of Psychological Control, Neglect, and Abuse – thus measuring intensity and gravity of

negative parenting and cumulative life stress– or whether different dimensions have different neuro-developmental and psychological effects as it has been suggested by the "Threat-deprivation model" (Ellis et al., 2022) which outlines different trajectories for early life stress that is associated with threat (e.g. Abuse) and a different effect of deprivation (e.g. Neglect).

4. The effects of parenting on adolescent trust and cooperation

4.1. **Introduction**

Building on the work of the previous chapters, this chapter will utilise the Trust Game in order to explore the role parenting plays in adolescents' engagement in reciprocal interactions and in trust development. Other factors such as age, gender, and socio-economic status are included here, because they play an important role in that development. This chapter presents the first game-theoretical study of parenting as a predictor of behaviour in the Trust Task.

First, the literature will be reviewed with the aim of understanding the links between parenting and trust. I also briefly review the studies that have explored age and gender differences in the Trust Task because there is a rich body of work on these factors and they are very important in developmental psychology. Parenting differs for children of different ages, different genders, and socio-economic status. Although age, gender, and socio-economic status, each have their own independent effect on trust, parenting is also influenced and adapted according to those. For this reason, this chapter presents an empirical study of parenting – after having looked at and controlled for the effects of age, gender, and socio-economic status – as a predictor of behaviour in the Trust Task.

4.1.1. Parenting

Parenting has been shown to play an important role in developing cooperative and trusting behaviour (Borawski et al., 2003; Rotenberg, 1995; D. Wang & Fletcher, 2016; Wray-Lake & Flanagan, 2012). Reciprocity and the capacity to trust and cooperate with others start developing very early in life (Brazelton et al., 1975;

Crivello et al., 2021; Koenig & Harris, 2005; Stenberg, 2013). Children rely on adults in order to learn or collect information about the environment (Harris & Corriveau, 2011) and in order to feel safe.

This is evident in definitions such as Erik Erikson's Basic Trust who refers to a very early sense of faith in one's self and the world (Erikson, 1993). According to Erikson, if parents are reliable and nurturing, their children will assume a general openness and trusting attitude towards other and the world, conversely they become mistrusting in the opposite context (Rotenberg, 1995).

According to John Bowlby's Attachment theory, children internalise a mental representation of their attachment figure (i.e. their caregiver) and tend to feel more or less inclined to explore their surroundings depending on the trustworthiness of that representation (Bowlby, 1969). Therefore, the more sensitive, accepting, and co-operative the caregiver, the more safely attached the child will be. This leads to a generalised sense of trust to others and the world which influences relationships in the long term. Conceptualisations that draw from cognitive and social learning theory such as Bandura (1977) and Earl (1987) also place importance on observation, imitation, and modelling of behaviour and, therefore, having a reliable parent from whom to source behaviours is essential.

Rotenberg (2010a) highlights the importance of attachment and the prototype caregiver-child relationship by analysing the concept of trust in three bases (reliability, emotional trust, and honesty), three domains (cognitive-affective, behaviour-dependent, and behaviour-enacting), and two targets (specificity and familiarity). These aspects of trust can be used in order to analyse the phenomenology of trusting behaviour. Namely, a reliable, trusting, and honest parent-child prototype

relationship forms the base of a trusting individual. Trust can be seen in the cognitive-affective domain or as exhibited depending on one's own and others' behaviour. Lastly, trust depends on the specificity of the situation, e.g., to trust someone in a game versus trusting a doctor with your healthcare, as well as the familiarity of (how well one knows) the person or situations that requires the trust.

Fonagy et al. (Bo et al., 2017; Fonagy, Campbell, et al., 2017; Fonagy & Allison, 2014) have suggested that attachment and parenting play a crucial role in acquiring the ability to mentalise the self and other. The caregiver is required to mirror the child's emotions in a contingent (mirror sadness with sadness) and marked (clearly mirrored by the parent but not the parent's) manner. Failure to adequately represent and mirror mental states results in the child not developing the capacity to mentalise, misinterpret actions, and intentions. Humans have developed to learn from trusted others through what is called epistemic trust, i.e. the capacity to identify reliable sources of information including social and emotional information in the context of trusting relationships (Fonagy & Allison, 2014; Fonagy & Campbell, 2017). Harris & Corriveau (2011) have shown that children are "quite selective in choosing whom to believe" (epistemic trust) and that attachment style plays a significant role in that choice, particularly before the age of 4 when reliability and congruency with their group beliefs also start playing a significant role.

Supportive parenting is associated with greater interpersonal trust and parental rejection correlated with lower interpersonal trust (Benn et al., 2005). Rotenberg (1995) showed that mothers shape their children's trust beliefs whereas fathers shape their children's trusting behaviour in a play context using a Prisoner's Dilemma task that found that (a) mother's promise fulfilment to their children and their children's

trust beliefs in mothers, fathers, and teachers and (b) mothers' trust beliefs and their children's trust beliefs in teachers are positively correlated.

More specifically, maternal acceptance, but not behavioural control, have been linked to more willingness to trust peers (D. Wang & Fletcher, 2016). There are indications that parental modelling of certain behaviours is a stronger predictor of child behaviours than parenting style or practices. This has been studied in relation to child delinquency (Trinkner et al., 2012) and social trust at the neighbourhood level (Wray-Lake & Flanagan, 2012), but not for interpersonal trust.

4.1.2. Gender

In real life situations and self-report measures, female individuals have consistently been shown to be more willing to trust others and to be helpful (Rotenberg et al., 2005). According to Schniter & Shields (2020), "Gender differences in dishonesty and mistrust have been reported across cultures and linked to stereotypes about females being more trustworthy and trusting. Interestingly, the opposite is true in game theoretical paradigms" (van de Groep et al., 2020). This has been interpreted as something that relates to risk-avoidance differences between the two genders (Irwin et al., 2015), a socio-cultural difference in gender roles that promotes "agentic" (i.e. instrumental and efficient) behaviour (van de Groep et al., 2020), and differences in equity and efficiency preferences (Meuwese et al., 2015).

Studies overwhelmingly find that males are more willing to trust (i.e. more willing to make decisions that involve more risk taking or less risk-avoidance). Derks, Lee, and Krabbendam (2014) used a five-trial one-shot Trust Task in an adolescent sample (14.1-16.5 years old) and found that boys were more trusting than girls, but there were no gender differences in trustworthiness (i.e., the willingness of the

opponent to invest when the player is playing as a trustee). They also measured social value orientation (i.e., the preference to maximize one's own outcomes, called proself orientation, or both the outcomes of self and other, called prosocial orientation) and found that individuals who were more prosocial were more trusting and trustworthy than those who were less more self-oriented. Gender and social value orientation were independent predictors of trust (but not trustworthiness) showing that the higher levels of trust in boys are not the result of a gender difference in prosocial orientation. The same finding was seen in van de Groep et al. (2020) who employed the Trust Task with adolescents 12-18 years old.

There is only one study employing the Trust Task that reports no gender differences (van den Bos et al., 2010), but Lemmers-Jansen et al., 2017 investigated brain activation in 16-27 year-olds using a multi-round trust task with two different trustees (one fair and one unfair) and showed that trust and reciprocity differences between genders only occur in the unfair condition. This difference in the unfair condition is due to more reactive play by males, that is males trust more in their initial investment (linking it to less risk avoidance) and reduce their investments more when playing an unfair partner (linking it to less equity seeking).

Although there are differences when one-shot versus multi-round tasks are used, overall, these findings suggest that there are gender differences in trust/cooperative behaviour, with more risk-avoidance and more equity-seeking in female participants. Croson & Gneezy (2009) posit this might be explained by the fear that others will exploit them. Similarly, what has been interpreted as more trust by males could be a stronger gains-oriented preference and willingness to even exploit others' cooperation (Eagly, 2009; Simpson, 2003; van de Groep et al., 2020).

4.1.3. Age

Evidently, perspective-taking and other cognitive abilities are essential components of trusting behaviour(van den Bos et al., 2011). Developmental research ought to take into account age-related changes in these abilities.

There is methodological diversity in the studies that have compared young and older participants (children and adults) to assess the potential influence of age on trust game investing. The original version of the Trust Task, called the Investment Game, by Berg, Dickhaut, and McCabe (1995) was created as an one-round task. The participant was asked to decide whether or not they want to trust a certain amount of their coins to their partner, the "Trustee". The trustee receives triple the coins that the "Investor" offers and returns as many as they choose. When participants play with the same partner for more than one round, they can develop a longer interaction which allows them to explore more perspectives and have more opportunities to break and repair the exchange.

Three of these studies used the one-shot Trust Task (Holm & Nystedt, 2005; Rieger & Mata, 2013; Sutter & Kocher, 2007), three used consequent trials of the one-shot Trust Task with different partners (Bailey et al., 2015; van de Groep et al., 2020; van den Bos et al., 2010), and two used the multi-round Trust Task (A.-K. J. Fett et al., 2014; King-Casas et al., 2008c). This variability in the setup of the task can influence the results.

Two of the one-shot studies (Holm & Nystedt, 2005; Rieger & Mata, 2013) found no age related differences in the amounts of money invested in the trust game looking at 17 to 92 year olds. However, when the multiple-round task was used (Bailey et al., 2015; A.-K. J. Fett et al., 2014; King-Casas et al., 2008c, p.; Sutter &

Kocher, 2007; van den Bos et al., 2010) older participants were found to be more likely than young participants to invest more money. This is consistent with evidence outside of the trust game which supports that trust in the form of investments or positive expectations increases in older adults at least up to 85 years (Bailey et al., 2015).

Van den Bos, Westenberg, van Dijk, and Crone (2010) used a version of the Trust Task, similar to a prisoner's dilemma, which they called the Simultaneous Trust Game (STG). The participant had to decide whether to trust or not trust their partner (trust meant risking larger gain or losing their coins, no trust meant receiving a smaller amount and ending the game). Then, the partner had to decide whether to reciprocate the trust (i.e., both players would win double the coins they had in the first round) or to exploit their partner and receive the largest share of the coins. They tested a sample with broad age range (9-25 years old) divided over four age groups (late childhood- *M* age = 9.43, *SD* = .59, early adolescence- *M* age = 12.35, *SD* = .56, middle adolescence- *M* age = 15.65 SD = .58, and late adolescence- *M* age = 22.3, *SD* = 2.4) and found that both trust and reciprocity increased with age. Young adults (Mean age=22.3) were the only group that trusted less and reciprocated similarly to the younger group of 16-year-olds. No gender and IQ differences were found in these studies. Van de Groep et al. (2020) used a similar one-shot Trust Task and found that trust increases with age, while reciprocity (i.e. sharing the gains) reduces with age (12-18 years old). They suggest that this is because adolescents develop more refined social skills during this time. Taken together, the results of these studies suggest that having a sample with a small age range might give a partial representation of trust development and that more studies are needed in order to replicate the results in

adolescents. Also, one-shot games might be exacerbating competition and do not account for the perspective taking and social values development.

Perspective-taking becomes more sophisticated with age and is one of the potential explanations of investments' increase. MRI studies of adolescent brain development (Blakemore, 2008) as well as studies using the Trust Task specifically (van den Bos et al., 2011) have suggested that the maturation of areas in the medial and dorso-lateral prefrontal cortex that is happening during this time is underlying better perspective-taking and results in more investments in older adolescents.

Perspective-taking has been repeatedly linked to “trusting” others in the Trust Task (A.-K. J. Fett et al., 2012a, 2014). Fett and her colleagues (2014) suggest that perspective-taking tendency in adolescence is associated with specific mechanisms of trust and reciprocity, because they found that adolescents with a higher perspective-taking tendency demonstrate (a) greater trust through giving higher contributions and (b) sensitivity to the other's perspective reducing their contributions drastically when treated unfairly by their counterpart.

An additional explanation for why trust increases with age is prosociality. Derks, Van Scheppingen, Lee, and Krabbendam (2015) examined social value orientation (i.e., the preference to maximize one's own outcomes, called proself orientation, or both the outcomes of self and other, called prosocial orientation) and mindreading (measured by the Reading the Mind in the eyes test), and trust in an adolescent sample (14.1-16.4 years old). They found that social value orientation moderates the relationship between mindreading and trust indicating that the proself participants employ mentalising abilities (mindreading) in order to assess whether they can trust their partner, whereas prosocial participants do not. Van den Bos, van

Dijk, Westenberg, Rombouts, and Crone (2009) looked at social value orientation and found that the temporal-parietal-junction (rTPJ), bilateral anterior insula and anterior cingulate cortex (ACC) were modulated by differences in social value orientation. These are important findings because they support the idea that the Trust Task is measuring both perspective-taking and social values when operationalising "trust".

The development of emotion regulation in adolescence also plays a role in reciprocal interactions in the Trust Task. It has been shown that, when 10, 16, and 21 year olds play the Simultaneous Trust Game, feelings of anger and punishment decrease with older players as well as that feelings of anger mediate willingness to punish (van den Bos et al., 2012).

Also, Belli, Rogers, and Lau (2012) created two conditions in a multi-round Trust Task: in the first period of the game, the trustee played with a normative Investor, and in the second, there was a period of social rupture caused by reduced investments. They demonstrated that in the condition of an interaction without ruptures adolescents (aged 13-14) were seeking equality, whereas young adults (aged 19-35) overcompensated the investor to their own cost; in the condition of social rupture adults have more polarised responses than adolescents.

4.1.4. The present study

This study set out to investigate how parenting shapes the development of trust and reciprocity in the context of the multi-round version of the Trust Task while considering effects of age, gender, socio-economic status, and IQ. There are very few empirical studies that involve parenting and game-theoretic tasks of trust while there are numerous studies employing exclusively self-report measures of parenting. The sample of this study included individuals in adolescence and young adulthood from

14 to 24 years to capture the period of late developmental social changes. Based on the literature, negative parenting dimensions such as abuse, and neglect were hypothesised to result in less trust because they are likely to contribute to a generalised mistrusting attitude. It is hypothesised that individuals who have undergone early adversity will be less trusting and investing less in the trust game. Also, I hypothesised that individuals who have had an experience of warmth, praise and positive parental involvement will be more trusting. In order to explore how parenting affects behaviour in the Trust Task, I employed the factors from the parenting model described in Chapter 3.

Also, an age-related increase in the first investment (trust before interactions) was expected, namely that older individuals would generally be investing more coins. I also expected that male participants and those coming from higher socio-economic status might entrust more coins to their virtual partner. Considering the complexity of the task, the developmental stage of the sample and evidence from the literature, IQ measures were included in the analyses expecting it to be an important predictor of behaviour in the task.

First, a latent growth curve model of investments across the ten rounds of the multi-round Trust Task is presented with age, gender, socio-economic status, and IQ as predictors of the intercept and the slope of investments. Then, I estimate a model of the latent growth curve of investments across the ten rounds of the multi-round Trust Task with parenting as the predictor and age, gender, socio-economic status and IQ as the covariates.

4.2. **Method**

The data for this paper were collected as part of the Neuroscience in Psychiatry Network (NSPN), a large longitudinal cohort study. NSPN is a collaboration between several research groups in UCL and Cambridge University with the aim to investigate typical and non-typical neuro-psychological development between the ages of 14-24.

All participants (N=2454) completed a pack of questionnaires sent to their homes, the Home Questionnaire Pack, and received £10 for completing it. Twelve months later, a subsample of the 2k cohort (N=807) was invited to participate in an in-unit assessment. This included completing another Home Questionnaire Pack, a battery of cognitive tasks, and a clinical assessment. I describe the relevant parts of this assessment in the Design and Procedure section below. For this they received £10/hour plus travel and lunch expenses. In this paper, I will only use data used from this subsample.

If a participant was under the age of 18, parental consent was sought for them to participate in the study and complete the Home Questionnaire Pack. The Socio-economic Questionnaire was completed by the parent if the participant was under 16 (Kiddle et al., 2017).

4.2.1. Sample

In this study, the data of 786 individuals between the ages of 13.99-24.99 years is presented. As in previous chapters, they were recruited though the NeuroScience in Psychiatry Network in London and Cambridgeshire through schools,

universities and the wider community. A detailed profile of the cohort can be found at Kiddle et al. (2017).

4.2.2. Demographics

Table 22 summarises the age distribution of the sample relative to their age-related strata: 14–15 years inclusive, 16–17 years, 18–19 years, 20–21 years and 22–24 years.

Table 22

Sample Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age bin 1	193	14.01	15.99	14.84	.58
Age bin 2	174	16.01	17.99	17.05	.52
Age bin 3	129	18.01	19.99	18.90	.63
Age bin 4	162	2.00	21.95	2.89	.57
Age bin 5	128	22.00	24.82	23.21	.77

The gender, ethnicity, and socio-economic status distributions of the sample were the same as in previous chapters. The sample is not homogenous in socioeconomic status among the strata. The youngest age group differs significantly from the rest of the group in socio-economic status $F(4,781) = 6.18$, $p < .000$. Differences have been controlled for.

4.2.3. Design and procedure

The participants attended In-Unit-Assessments, these took part in two sessions, usually a morning and an afternoon session. In the first session, they completed the follow-up Home Questionnaire Pack (see pack in Appendix II) and a battery of computerised cognitive tasks including the Trust Task. In the second session, they completed a clinical assessment. In the interest of space and simplicity, I only include the measures and the task relevant to this paper. The full description of the procedure can be found in Kiddle et al. (2017).

4.2.4. Measures

The measures were: (a) a sociodemographic questionnaire, (b) the Positive Parenting Questionnaire (PPQ) (Cassels et al., 2018), (c) the short Alabama Parenting Questionnaire (APQ) (Elgar, Waschbusch, Dadds, & Sigvaldason, 2007), (d) the Measure of Parenting Style questionnaire (MOPS) (Parker et al., 1997), (e) the Wechsler Abbreviated Scale of Intelligence, Second Edition (WASI-II) (Wechsler, 1999), subtests of vocabulary and matrix reasoning which was administered by a research assistant, and (f) the Trust task.

The socio-demographic questionnaire. This questionnaire (see Appendix II) was built by the NSPN researchers in order to collect information regarding the participant's age, gender, siblings, ethnicity, highest maternal and/or paternal qualification, current postcode, employment status etc. (Kiddle et al., 2017). I measure socioeconomic status through parental education; this is a composite score that incorporates mother's and father's educational level and when appropriate mother's and/or father's partner's educational level.

Parenting measures. I used the factor scores that have been extracted from an 8-factor parenting model. The 8 factors of the model were: Praise, Warmth, Parental Involvement, Material Support, Motivation and Academic expectations, Neglect, Psychological Control, and Abuse. Three parenting questionnaires were employed in order to create this multivariate model of parenting; (a) the Positive Parenting Questionnaire (PPQ) (Cassels et al., 2018), (b) the short Alabama Parenting Questionnaire (APQ) (Elgar, Waschbusch, Dadds, & Sigvaldason, 2007), and (c) the Measure of Parenting Style questionnaire (MOPS) (Parker et al., 1997). The detailed model and analysis of the parenting questionnaires can be found in Chapter 3.

The parenting questionnaires used were:

The Positive Parenting Questionnaire (PPQ) (Cassels et al., 2018) which was created and validated by NSPN researchers in order to address the gap in the literature regarding positive parenting. The responder is required to state frequency of the statement while living at home and response categories are always, mostly, sometimes, or rarely. As stated by the authors "Items are related not only to positive parenting in general, but also to the concept of attachment, assessing the child's confidence that their parents will respond to their needs, both emotional (Items 3, 5, 6, 10) and physical (Items 4, 12, 13, 18, 19, 20, 22). Additionally, [...] family organization (Items 2, 4, 12, 13, 16, 17, 18, 19, 26), cohesion (Items 1, 2, 6, 8, 9), communication (Items 6, 8, 11, 12, 14, 15, 20), affective environment (Items 3, 5, 6, 10), and problem-solving ability (Items 4, 5, 6, 7, 12, 21, 23, 24, 25). Some items are more general (e.g., Item 11), while others are fairly specific (e.g., Item 19)."

The short Alabama Parenting Questionnaire (APQ) (Elgar, Waschbusch, Dadds, & Sigvaldason, 2007) which comprises of 15 items about parenting style.

Participants were asked to rate how frequently each item occurred or used to occur in their family home. Ratings were on a five-point scale from "never" to "always". There are five subscales reported: Positive Parenting (items 1, 9 and 10, N=2424, alpha=.848), Inconsistent Discipline (items 2, 5 and 12, N=2408, alpha=.673), Poor Supervision (items 3, 7 and 11, N= 2411, alpha=.614), Involvement (items 4, 6 and 8, N=2413, alpha=.707), and Corporal Punishment (items 13, 14 and 15, N=2434, alpha=.813). Although this questionnaire was developed as a parental measure, it shows high congruence when used as a child measure (Parent et al., 2014).

The Measure of Parenting Style questionnaire (MOPS) (Parker et al., 1997) which is a 15-item self-report measure comprising three subscales: indifference (items 5, 8, 10, 11, 12, 13), over-control (items 1, 3, 4, 6), and abuse (items 2, 7, 9, 14, 15). Each item is answered separately for the mother and the father.

The computerised multi-round Trust Task. Our version of the computerised multi-round Trust Task was first created and used by King-Casas et al. (2005). The participants (investors) start each round with 10 play coins and are asked to "trust" some or all of their coins to their partner. The amount the participant invests triples in the hands of the trustee who in turn can give back from 0 to all of the coins that they have. The trustee was simulated by the computer using the algorithm described by King-Casas et al. (2008). In order to avoid biases the participant is told that they will be playing with someone that they do not know and who is in another room/lab.

4.3. **Data Analysis**

Mean differences between age groups and genders are presented. Following this, correlations between age, gender, socio-economic status, IQ, and the ten parenting factors are shown.

In order to explore the large number of parameters and the effect of covariates and predictors in the growth of trust across the 10 rounds, Latent Growth Curve Modelling framework was used. Other indices studied in Chapter 2 such as initial investment, mean investments, and classes of participants would not have provided the opportunity to explore the temporal element of the repeated interactions.

First, a model that shows the impact of age, gender, socio-economic status and IQ on decision-making in the Trust task is estimated. Following this, age, gender, socio-economic status were used as covariates regressed on the investments of each round of the task and the 11 parenting factors as predictors regressed on the latent variables (intercept, slope, and quadratic slope).

The 10 rounds of the iterated Trust Task were used as ten data (time) points, in order to explore how behaviour trajectories, unfold during the task. Latent Growth Curve Modelling is an extension of structural equations modelling. MPlus software was used (Muthén & Muthén, 2010). The objective of Latent Growth Curve Modelling is to describe non-linear change across time. It provides a representation of variation in growth parameters through a polynomial model by estimating latent continuous population parameters such as intercept and slope (deRoon-Cassini, Mancini, Rusch, & Bonanno, 2010; Mäkikangas, Bakker, Aunola, & Demerouti, 2010; Ram & Grimm, 2009).

The basic growth curve model for the Trust Task has already been estimated previously and will be briefly described below (see Chapter 2).

The zero-time score for the slope growth factor (i.e., the first round of the task) defines the intercept (i.e., the initial level factor). The slope describes individual differences in a constant rate of mean-level change across measurement points, hence, the factor loadings for the slope growth factor are fixed at 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 to define the linear model and at 0, 1, 4, 9, 16, 25, 36, 49, 64, and 81 for the quadratic model (Mäkikangas et al., 2010). The coefficients of the intercept growth factor are set to 1 as part of the standard parametrisation of the growth model (Muthén & Muthén, 2016). By default, the residual variances of the outcome variables are allowed to be different across time (Muthén & Muthén, 2016).

The parameters of the LGC model were estimated with the robust maximum-likelihood estimator which is robust to non-normality of outcomes and non-independence of observations (Muthén & Muthén, 2016) and is widely endorsed (deRoon-Cassini et al., 2010). Goodness-of-fit was tested using the Root Mean Square of Approximation (RMSEA) (Steiger, 1990), the Comparative Fit Index (CFI)(Bentler, 1990), and the Tucker- Lewis Index (TLI) (Tucker & Lewis, 1973). For the RMSEA, values of .05 or less indicate good fit, for CFI and TLI values above .95 indicate acceptable fit(Muthén & Muthén, 2016).

For the model to converge the residuals of each round's investments were allowed to be correlated in pairs.

4.4. **Results**

4.4.1. Descriptive statistics and means

Descriptive statistics are shown in the tables and figures below. Table 23 shows the frequencies, means and standard deviations of each age group for Gender, Socio-Economic Status and IQ.

Table 23

Sample Frequencies and Means of Gender, Socio-Economic Status and IQ for Each Age Group

Female			SES				IQ			
	N	% of the sample		N	Mean	Std. Dev.		N	Mean	Std. Dev.
14-15	103	.53	14-15	193	6.12	3.24	14-15	193	110.34	10.85
16-17	88	.51	16-17	174	4.89	3.34	16-17	174	108.95	10.65
18-19	67	.52	18-19	129	4.67	3.29	18-19	127	108.76	11.47
20-21	82	.51	20-21	162	4.81	3.15	20-21	161	111.23	12.67
22-24	64	.50	22-24	128	4.88	2.85	22-24	128	114.89	10.26
Total	404	.51	Total	786	5.14	3.24	Total	783	110.70	11.38

Table 24 shows the sample means and standard deviations of each parenting factor for each gender and age group.

Table 24

Sample Means of each Parenting Factor for Each Gender and Age Group

	Neglect		Psychological Control		Abuse		Inconsistent Discipline		Poor Supervision		Praise		Parental Involvement		Warmth		Material Support		Academic Expectations		Positive Parenting	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	S
Male	.06	.71	.014	.25	.08	.70	.06	.48	.12	.48	-.02	.71	-.02	.63	-.02	.63	-.06	.65	-.06	.70	.06	.
Female	.08	.77	.012	.28	.07	.76	-.04	.52	-.09	.49	.00	.79	.01	.71	.00	.71	.03	.68	-.02	.77	.05	.
14-15	-.12	.70	-.05	.26	-.08	.73	.04	.49	-.18	.46	.15	.74	.20	.65	.14	.66	.08	.65	.10	.71	-.12	.
16-17	.08	.71	.02	.27	.09	.71	.08	.54	.06	.47	-.13	.72	-.12	.61	-.12	.63	-.11	.61	-.13	.68	.08	.
18-19	.18	.72	.06	.26	.17	.72	.03	.50	.09	.48	-.11	.76	-.12	.67	-.11	.66	-.10	.66	-.16	.75	.16	.
20-21	.07	.75	.01	.26	.07	.73	-.04	.49	.05	.51	.00	.76	-.01	.68	.01	.70	.00	.69	-.04	.77	.05	.
22-24	.15	.80	.03	.28	.14	.75	-.08	.48	.01	.52	.07	.76	.04	.70	.07	.72	.07	.70	.03	.77	.09	.

4.4.2. Correlations

Table 25 shows the correlations between age, gender, IQ, and parenting factors.

Table 25

Correlations between Age, Gender, Socio-Economic Status and Parenting Factor

	Age	Gender	SES	IQ	Neglect	Psychol. Control	Abuse	Praise	Parental Involvement	Warmth	Material Support	Academic Expect.	Positive Parenting
Gender	-0.003												
SES	-.088**	-0.029											
IQ	.136**	-.123**	.300**										
Neglect	.107**	0.018	-.106**	-.082*									
Psychol. Control	.080**	0.000	-.066**	-0.063	.826**								
Abuse	.083**	-0.004	-.095**	-.081*	.845**	.857**							
Praise	-0.009	0.015	.150**	.087*	-.599**	-.603**	-.589**						
Parental	-.045*	0.016	.223**	.123**	-.659**	-.644**	-.636**	.876**					

Involvement														
Warmth	-0.004	0.010	.177**	.122**	-.684**	-.672**	-.672**	.889**	.941**					
Material														
Support	0.018	.065**	.145**	.099**	-.613**	-.621**	-.621**	.772**	.824**	.876**				
Academic														
Expectations	-0.013	0.028	.182**	.131**	-.635**	-.597**	-.619**	.810**	.870**	.909**	.825**			
Positive														
Parenting	-0.010	0.015	.182**	.122**	-.697**	-.686**	-.685**	.907**	.954**	.997**	.889**	.922**		
Negative														
Parenting	.086**	0.003	-.112**	-.089*	.941**	.938**	.942**	-.698**	-.751**	-.785**	-.714**	-.719**	-.798**	

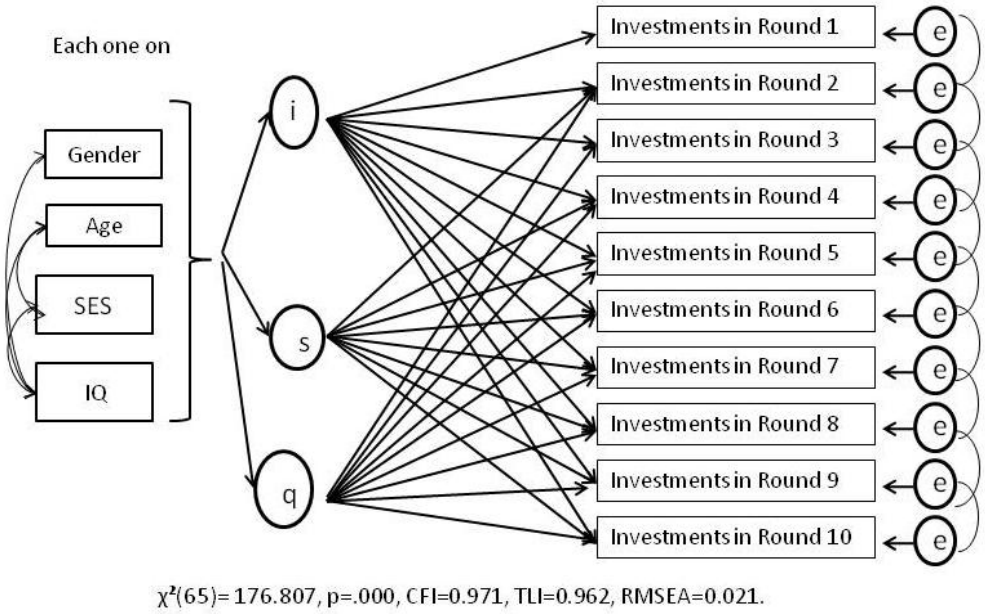
Note. Correlations note with ** are significant at the .01 level (2-tailed). Correlations noted with * are significant at the .05 level (2-tailed).

4.4.3. Model 1: Age, gender, SES, IQ, and the Trust Task

Firstly, a Latent Growth Curve Model of the Trust Task was estimated with age, gender, socio-economic status and IQ regressed on the latent variables. The model estimates the intercept, slope and quadratic slope, because this was found to be the best fit when it was first estimated in Chapter 2. The model fit the data well. The fit indices were: χ^2 (65) = 176.807, p=.000, CFI=.972, TLI=.962, RMSEA=.021. Figure 14 shows a diagrammatic depiction of the model and Table 26 shows the model estimates. Age, gender, SES, and IQ were also allowed to be correlated; the correlations are presented in Table 27.

Figure 14

Latent Growth Curve Model with Age, Gender, Socio-Economic Status and IQ as Predictors



Note. Model estimates have been omitted for simplicity.

Table 26

Model Estimates for Each Covariate

	Intercept	Sig.	Slope	Sig.	Quadratic Slope	Sig.
Age	.170	.000	-.023	.694	.042	.506
Gender	-.181	.000	-.091	.121	.078	.209
SES	.033	.428	-.067	.264	.084	.185
IQ	.261	.000	.128	.026	-.139	.025

Table 27

Model estimates for predictor correlations.

	Age	Gender	SES	IQ
Age	–			
Gender	-.003	–		
SES	-.088**	-.029	–	
IQ	.147**	-.125**	.304**	–

The figures 15- 18 below show the effects of age, gender, socio-economic status and IQ on the growth curve of investments across the ten rounds of the Trust Task.

Figure 15

Estimated Latent Growth Curves Showing Older Participants as One Standard Deviation above Mean Age and Younger Participants as One Standard Deviation below Mean Age

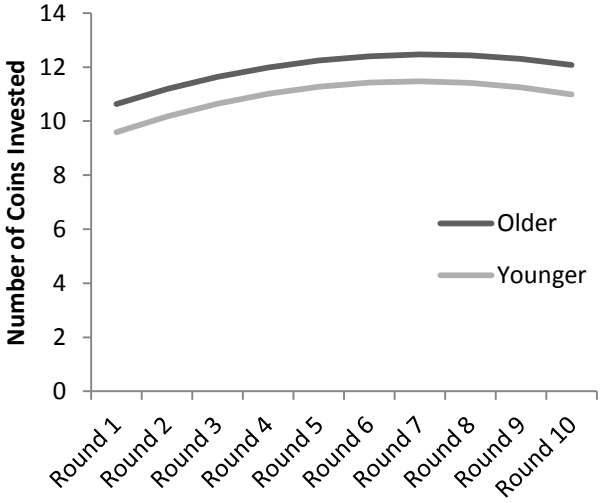


Figure 16

Estimated Latent Growth Curves for Each Gender

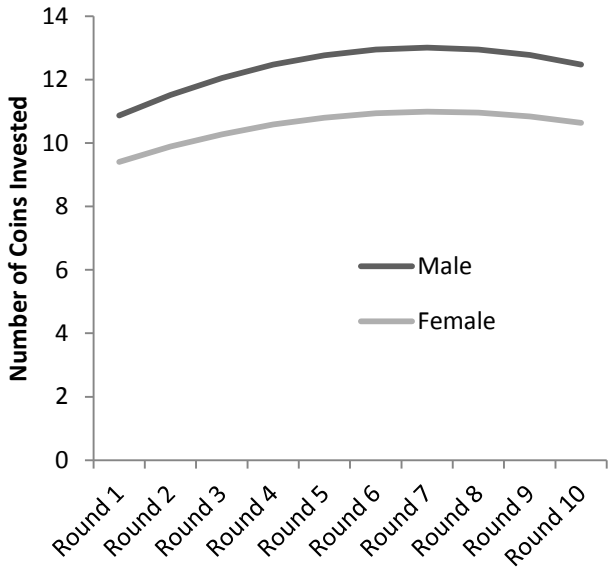


Figure 17

Estimated Latent Growth Curves Showing High SES as One Standard Deviation above Mean SES and Low SES as One Standard Deviation below Mean SES

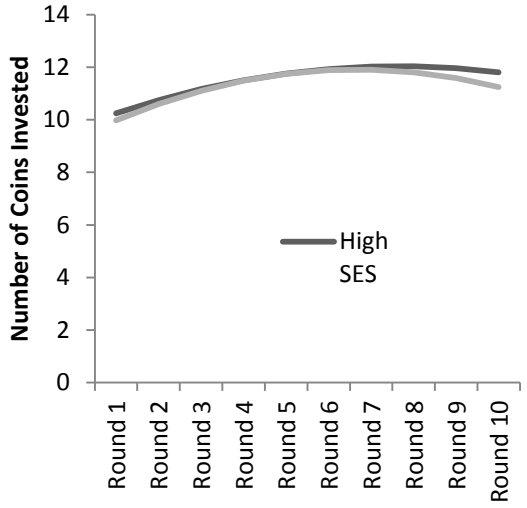
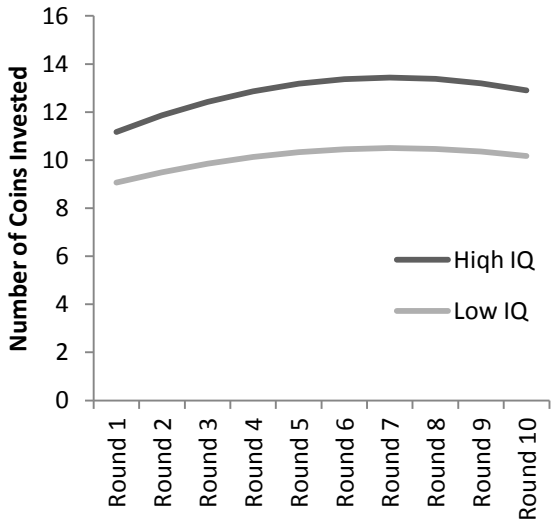


Figure 18

Estimated Latent Growth Curves Showing High IQ as One Standard Deviation above Mean IQ and Low IQ as One Standard Deviation below Mean IQ



4.4.4. Model 2: Parenting and the Trust Task

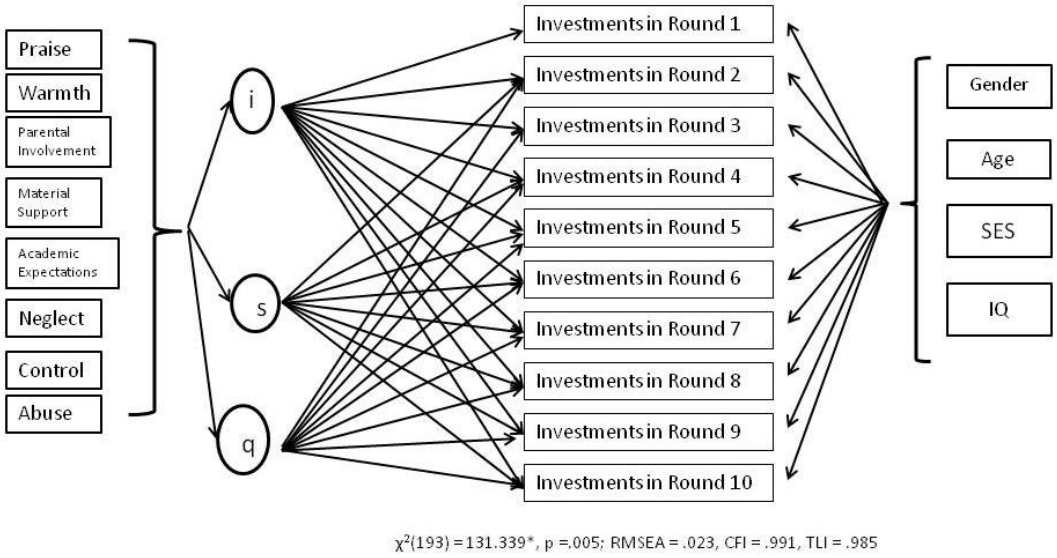
For this second model, the 8 parenting factors and the 2 general factors were used as predictors of the latent variables (intercept, slope, and quadratic slope) of the

growth curve of investments of each round of the task. Age, gender, socio-economic status, and IQ were used as covariates regressed on the latent variables. This model did not converge. Then, the general Positive and Negative Parenting Factors were added as predictors to the model, but they did not have a significant effect on any of the latent growth curve variables.

Finally, the 8 specific parenting factors were used as the predictors. The model is shown diagrammatically in Figure 19.

Figure 19

Latent Growth Curve Model with Covariates and Parenting Factors as Predictors



Note. Model estimates have been omitted for simplicity.

The model fit the data well. The fit indices were as follows: χ^2 (193) = 131.339*, p =.005; RMSEA = .023, CFI = .991, TLI = .985. The model estimates can be seen in Table 28 below.

Parental involvement (estimate: -.324, p=.016), Neglect (estimate: .197, p= .038) and Abuse (estimate: -.193, p=.046) were found to be significantly associated with the intercept of the latent growth curve of investments. Interestingly, Parental

Involvement and Abuse were inversely related to the initial level of investments while higher Neglect was associated with higher initial investments. Figures 20-22 below show the effects of these parenting factors on the estimated growth curve of investments across the ten rounds of the Trust Task.

Table 28

Trust Latent Growth Curve Model Parenting Estimates

					Quadratic	
	Intercept	Sig.	Slope	Sig.	Slope	Sig.
Praise	-0.001	0.99	0.039	0.751	-0.049	0.693
Parental Involvement	-0.324	0.016	0.183	0.319	-0.232	0.219
Warmth	0.169	0.267	-0.127	0.591	0.187	0.449
Material Support	0.073	0.391	-0.052	0.659	0.031	0.806
Motivation and Academic Expectations	0.102	0.296	0.014	0.917	-0.028	0.845
Neglect	0.197	0.038	0.051	0.678	-0.132	0.314
Psychological Control	0.013	0.89	0.141	0.258	-0.098	0.463
Abuse	-0.193	0.046	-0.142	0.276	0.168	0.228

Figure 20

Estimated Latent Growth Curves Showing High and Low Parental Involvement against the Number of Coins Invested in each Round

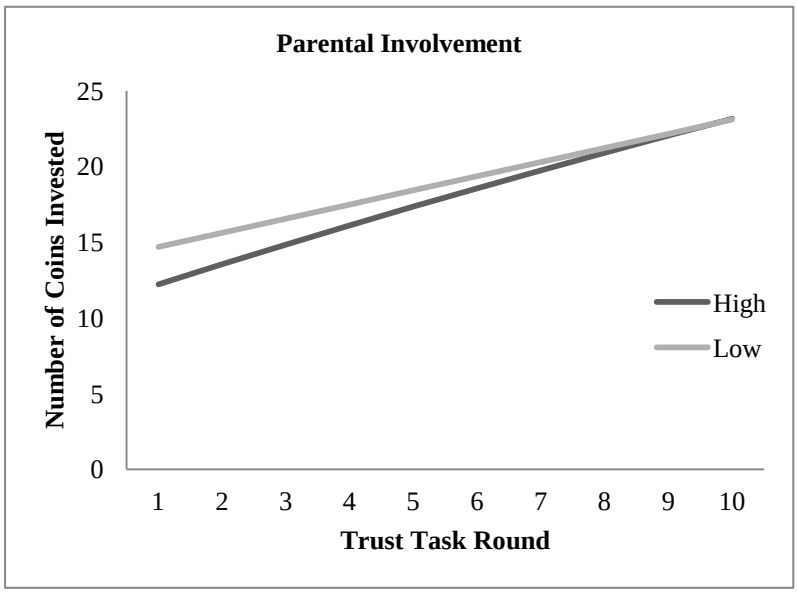


Figure 21

Estimated Latent Growth Curves Showing High and Low Neglect

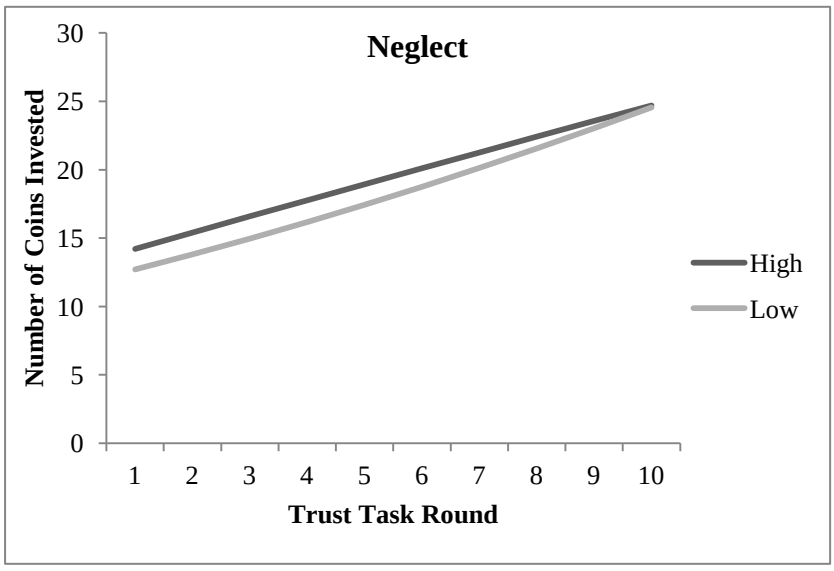
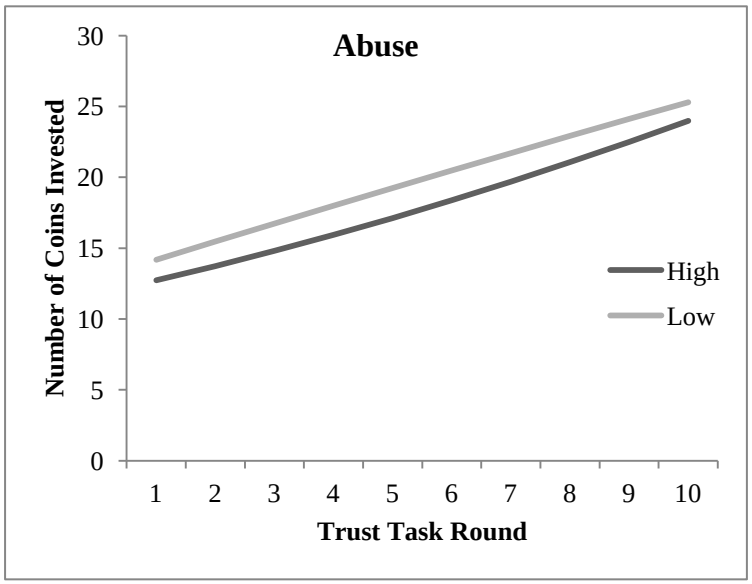


Figure 22

Estimated Latent Growth Curves Showing High and Low Abuse



4.5. **Discussion**

In the present study, parenting as well as important factors for psychosocial development –i.e. age, gender, IQ, socio-economic status are explored as predictors of trust and cooperation in an attempt to enhance our understanding of how the family environment alongside other factors might play a role in the development of trusting and cooperative behaviour.

This chapter utilised and built on the studies presented in previous chapters by extending the latent growth curve model that has been described in Chapter 2 and by using the factor scores of the multivariate model in Chapter 3. Here, two models are presented; (a) one to account for the effects of age, gender, socio-economic status, and IQ on trust and (b) a second model to study the influence of parenting on trust while controlling for these factors. The latent growth curve models estimate latent variables that describe the development of a certain observed variable through time. In this case, the focus of interest is the development of trust in the course of the 10 rounds of the game. The number of coins entrusted to the partner in each of the ten rounds of the task (each round it a time point for latent growth curve) was used as a measure of trust. This particular operationalisation of trust was shown to be equally indicative as other simpler measures, but it has the additional advantage of retaining information for the temporal development of trust as opposed to measures such as the mean of investments or classes of participants showing distinct patterns of behaviour.

4.5.1. Age

In the latent growth curve model presented, the intercept for age was statistically significant (β=.170, p=.000). This is in agreement with most of the

reviewed literature that has shown that older players generally invest more. It is important to note that this has been consistently found to be true for ages between 9-25 (Bailey et al., 2015; A.-K. J. Fett et al., 2014; King-Casas et al., 2008c; Sutter & Kocher, 2007; van den Bos et al., 2010, 2012), but not for adult populations aged 20-92 years old (Holm & Nystedt, 2005; Rieger & Mata, 2015) in which the findings between age groups are more mixed. This is in line with the findings from structural and functional MRIs which show that social cognition develops in childhood through to adolescence and young adulthood and plateaus after that (Blakemore & Choudhury, 2006).

Behaviour in the Trust Game has been associated with perspective-taking and its development with age. Based on the previous literature, it was expected that investments would not only start higher in older participants (which was confirmed), but that they would have an increasing growth (a statistically significant positive slope) affected by the development of perspective-taking in adolescents. The hypothesis that the age slope (and quadratic slope) in the model would be statistically significant reflecting the changes in perspective-taking and reciprocity in different age groups has not been confirmed. This may be because the sample of the study is in late adolescence to young adulthood (14-24 years) and it may be too late to examine the change in perspective-taking abilities.

One other explanation for this might be the study design with regards to the opponent. The setup of the algorithm of the "opponent produces a trustee selected from a database of real responses mimicking a "typical" player. The studies that have found significant differences in reciprocity have compared between groups of players who were playing reciprocally and groups that ruptured behavioural norms; this was

either virtual opponents designed to be punishing or borderline personality patients who are diagnosed due to interpersonal issues(A.-K. J. Fett et al., 2014; King-Casas et al., 2008c). It is likely that a greater level of variance in trustee responses is necessary in order to investigate age differences (and individual differences more generally).

4.5.2. Gender

Similar to previous findings, our results have confirmed the gendered behavioural difference that suggests that male participants have a higher level of initial trust compared to female participants.

4.5.3. Socio-economic status

There are many interesting studies that have looked into how socio-economic status relates to trust and prosocial behaviour (Amir et al., 2018; Piff et al., 2010; Safra et al., 2016; Stamos et al., 2020). None of these studies have employed the multi-round Trust Game, but they have found very interesting results with the Dictator Game. In this study, it was hypothesised that individuals who have lower SES might seek quicker gains by keeping more coins in the Trust Game and investing less.

This was based on studies that employed the Dictator Game and Stamos et al. (2019) who used the Interpersonal Trust Scale (Rotter, 1967) and found that childhood socioeconomic adversity affects trust and that this relationship is mediated by the adoption of different life-history strategies. Life-history is a theory that explains the biological advantages of different strategies. According to this theory, adverse environments are associated with quick strategies such as relative lack of

self-control and the focus on immediate gratification because of the scarcity of resources and lack of safety (Stamos et al., 2019). Quick strategies offer an evolutionary advantage in adverse environments.

Here, socio-economic status differences did not have a significant effect on the initial level of investments or the temporal pattern of investments in the course of the 10 rounds. This is likely because socio-economic status affects decision-making in a way that is not captured by the latent growth model and that is more complex than the level of initial investment or the slope of the curve. Employing the NSPN cohort data, Hula et al. (2020b) found that socio-economic deprivation was linked with greater depth of planning and more defensive play, two of the seven parameters of the computational model, that was described in Chapter 2.

4.5.4. IQ

It is important to examine the role of IQ in game theoretical tasks because they can be very demanding cognitively. The model presented here showed that IQ is an important indicator of all three latent variables; IQ levels are significantly associated with the initial level of investment as well as the slope of the latent curve indicating that the higher the IQ the higher the initial investments and the higher and more curved the relationship in the course of the ten rounds of the game. Figure 16 depicts the curve of high and low IQ participants.

Importantly, IQ is either not measured in studies that investigate age differences (which may be a serious omission) or it is investigated in order to eliminate the variance stemming from IQ differences. This is done in order to focus on the parameter of interest that is being studied e.g., age and trust, but it results in obscuring an important factor that plays a role in real life interactions.

Within the Neuroscience in Psychiatry Network, Moutoussis et al.(2021) found that decision-making can be reduced in a completely separate factor compared to IQ and associated with different neural networks of resting-state functional connectivity. This shows that it is a separate process to IQ and it is important because differences can start to be disaggregated between the ones due to neural and social maturation, psychosocial factors, and the ones that have to do with a specific cognitive ability to make decisions. Until now IQ was associated with specific dimensions of decision-making i.e., rational thinking, cognitive abilities of analysing and synthesising, observation and language skills. This may still be true, but it seems important for future projects to be designed in order to investigate these different factors. For example, Fett et al. (2014) estimated cognitive ability (verbal IQ) and linked it to perspective-taking and the expression of trust and reciprocity towards others. Earlier work showed that higher IQ is associated with more pro-social behaviour (Gill & Prowse, 2013; Millet & Dewitte, 2007; Shaw, Vasquez, & LeClair, 2013). Similarly, in this study I have no parameter (observable or latent) to describe decision-making itself.

IQ is associated with factors such as motivation (see Breuning & Zella, 1978, Duckworth et al, 2011, Borghans et al, 2013) as well as education, socio-economic factors (see Baker et al, 2015) and even the context in which people from different countries and ethnicities grow up. Because the study took place over the course of a day and participants are young people, it is important to include in the interpretation of initial level of investments and IQ the motivational aspect. It is possible that IQ is associated with motivation levels rather than a reflection of a simple calculative process of how costly each interaction might be. The latter might be expected under a simplistic assumption that IQ only reflects cognitive ability.

4.5.5. Parenting and trust

To this day, parenting has never been investigated with regards to the Trust Task and it is rarely used as an explanatory variable for game theoretical tasks. With regards to early adverse environments, parenting is a defining factor together with socio-economic status (Gershoff et al., 2007). Drawing from attachment theory and a biopsychosocial approach to human development, I hypothesised that parenting heavily influences the internal model humans create for themselves and others (Collins et al., 2000; Gershoff, 2016) and that this is going to be evident in their decision preferences in any economic exchange game and in the Trust Game in particular.

According to Bowlby (1969, 1973) and Ainsworth's (1989) extension of attachment theory, children use attachment figures (parents and/or surrogate figures) both as a *safe haven* when they feel distressed and threatened as well as a *secure base* from which they can explore and venture out to interact with others and the environment. Parenting represents the response that children have received when seeking safe haven and secure base. Similar to socio-economic status, it can affect access to resources (emotional and material) and the sense of safety and security that one feels (M. D. S. Ainsworth et al., 2015; Bowlby, 1969) . Growing up in an environment that induces stress or causes harm is likely to result in certain patterns of thinking, emotion (dys)regulation and behaviour (Gershoff, 2016; K. A. McLaughlin & Sheridan, 2016). Alternatively, a family environment that provides a general sense of safety and stability as well as the skills to navigate the world is likely to result in good social adjustment, resilience, and the ability to recover from adversity (M. D. S. Ainsworth et al., 2015; Betts et al., 2013; Bowlby, 1969; Fonagy

& Campbell, 2017; Stacks et al., 2009). Trust is an important part of this picture because it is the result of a warm and supporting relationship with a primary caregiver (Stacks et al., 2009; Y.-C. L. Wang et al., 2015; Wray-Lake & Flanagan, 2012; Xing et al., 2019; Xing & Wang, 2017).

In this chapter, the factors from the multivariate parenting model in Chapter 3 were utilised as predictors of behaviour in the Trust Task, so that the relationships of parenting with Trust can be explored. Higher levels of Abuse and Parental Involvement contributed to statistically significant lower initial trust, but Neglect was associated with higher initial investments in the Trust Game. Additionally, as mentioned before, the participants played as the Investor in the game and had to make the first move. This shows that the difference is not linked to their response patterns in the interaction, but the *a priori* expectations of the other player.

Individual dimensions of parenting are frequently investigated as indicators of behaviour, but not as indicators of behaviour in socio-economic games and decision-making. Interestingly, the direction of the relationship between initial investments in the task and parenting does not follow the positive and negative parenting categorisation. Namely, Abuse and Parental Involvement, one negative and one positive parenting dimension are both associated with lower investments, whereas higher Neglect was associated with higher initial investments.

This may seem as a conflicting finding and, indeed, replication is required before arriving at firm conclusions. However, this is a large sample which allows some confidence in affirming that there is a weak, but significant relationship between parenting and initial investments in the Trust Task. One possible explanation may be that the young people who have reported higher levels of Abuse

and those who reported higher Parental Involvement invest less initially because they are both more risk averse, namely they are less trusting in the other's reciprocity or prefer to play in a more conservative way risking less. This suggests that two very different experiences of parenting qualitatively may have similar effects in quantitative terms in the game. This equifinality (the property of having the same effect or result from different starting points) might be a useful concept with regards to explaining the discrepancies between self-report and game-theoretical tasks that show some people reporting higher-levels of trust, but investing less in the tasks (Rotenberg et al., 2005).

Additionally, both abuse and parental involvement might result in less exploration behaviours; the former because it may cause more protective withdrawal behaviours. As Bowlby explained, anger is usually functional in protecting the attachment relationship and to deter the loved one from repeating the dangerous behaviour (Bowlby, 2005). However, abuse and harsh physical punishment, despite being a maladaptive version of anger expression which is owed to personality development, intergenerational, cultural, and socio-economic factors (Eamon, 2001; Eamon & Zuehl, 2001; Vittrup et al., 2006), results in compliance and reduction of the unwanted behaviour (Larzelere & Kuhn, 2005). Equally, parental involvement (here expressed by items that show parental involvement in homework and playtime) might be associated with less exploration because safety is linked to parental presence rather than a safe internal model that encourages curiosity and interaction with others.

Only part of my initial hypothesis with regards to Abuse was confirmed. It stated that participants who had higher levels of negative parenting (thus more

adverse early experiences) and who were playing with someone that they did not know would be more risk averse and hypervigilant to threats. Abuse is associated with strict and harsh discipline, violence, and traumatic levels of stress. (Gershoff, 2016). Ultimately, slapping, spanking and hitting are types of punishment that are painful and humiliating. They do not help the child mentalise and learn how to regulate their emotions and they lead to the perpetuation of aggression and externalising symptoms (Gershoff, 2002; Pinquart, 2017a; Stacks et al., 2009; Ward et al., 2020).

Neglect was shown to have a direct relationship to initial investments. It is important to analyse the parenting dimension of Neglect before interpreting the result further. The MOPS subscale consisted of the following items: MOPS 5: 'ignored me', MOPS 8: 'was uncaring of me', MOPS 10: 'was rejecting of me', MOPS 11: 'left me on my own a lot', MOPS 12: 'would forget about me', MOPS 13: 'was uninterested in me'. These items do not refer to neglect to a level of deprivation that might be seen in institutionalised children, as it is seen frequently in the literature. It refers to a rejecting and uncaring parent.

Some theories concerning the effects of abuse and neglect suggest that they may both result in hypervigilance to threat, irregular emotion recognition and regulation, and low responsivity to rewards (Jaffee, 2017). In the current study, emotion recognition and emotion regulation do not play a role because the participants are not seeing their partners and the effect is associated with the initial investments in the game. Hypervigilance to threat or suspiciousness and epistemic distrust have been associated with only abuse, and not neglect, in self-reported data (Driehuis, 2021).

Life history theory predicts that hypervigilance to threat and rewards responsivity will be adapted in individuals who grow up in environments of high unpredictability and morbidity, because they have evolved to adopt strategies that promote early reproduction; one of these is the focus on quick and higher-risk rewards (Ellis et al., 2022; Stamos et al., 2019). This would explain why individuals who report higher levels of Neglect might invest more initially aiming for quicker and higher gains.

McLaughlin (2020) has suggested a dimensional model of Early Life Stress (ELS) that assumes different emotional, social, cognitive, and neurobiological pathways that underpin the different dimensions of early life stress such as abuse and neglect and predict different psychopathology outcomes for each one. That is, abuse leads to altered emotional development, adaptive to environmental danger in order to facilitate threat detection, whereas neglect leads to deficits in executive functioning, language acquisition and more (K. A. McLaughlin et al., 2015; K. A. McLaughlin & Lambert, 2017; K. A. McLaughlin & Sheridan, 2016). McLaughlin (2020), however, refers to extreme deprivation due to neglect, where there are no opportunities for learning because the caregiver is absent.

Taken together, Neglect has the opposite effect to Abuse and Parental Involvement. This would support a dimensional framework of early life stress and may be interpreted as a 'focus on the present' strategy for the former and a higher expectation of threat and lower confidence leading to more risk aversion in the case of the latter. Of course, physical abuse has been associated with higher levels of conduct problems, impulsivity and risk-taking in order to achieve quick rewards –

i.e. delayed rewards discounting (Romer, 2010; Sujan et al., 2014; White et al., 2014).

Lastly, in this study the 8 parenting factors that were used cover the large majority of parenting dimensions that are typically employed in parenting research, usually used independently. Having them as predictors in one model allows us to discern which dimension of parenting is the one that is likely to have a significant effect on trust and cooperation. It also allowed for some new hypotheses regarding how similar patterns of decision-making might be stemming from very different internal working models, motives and expectations. Additionally, the general factors of Positive and Negative Parenting did not have a significant association with the intercept or the slope of the latent growth curve of investments in the Trust Task. This further supports the idea that it is not stress generally that influences decision-making and other aspects of development, but distinct dimensions of life-stress which have specific effects.

5. The relationship of trust with concurrent and future psychopathology.

5.1. **Introduction**

Psychosocial adjustment is arguably inextricably linked with interpersonal trust (Betts et al., 2013; Rotenberg, 2010b). Psychological distress and psychopathology are also associated with interpersonal trust and the ability to cooperate and sustain a mutual interaction (King-Casas et al., 2008c; Rotenberg et al., 2021). Several researchers posit that trust increases adolescents' resilience to the effects of stress, thus protecting them from psychopathology (Clarke et al., 2021; Delaruelle et al., 2021; Rotenberg et al., 2021; van den Bos et al., 2012). Most studies to-date, however, utilise cross-sectional designs. A longitudinal study of the long-term effects of the capacity to trust and sustain mutually beneficial interactions may be particularly important in order to reveal the protective properties of these abilities.

The study presented in this chapter was designed to fill this gap by examining how preferences and development of trust during the multi-round Trust Game might be associated with concurrent and future psychopathology in adolescents and young adults 14-24 years old. The study was based on Attachment Theory and previous research showing that adolescents' trust beliefs are negatively associated with interpersonal stress and internalising psychopathology, thus hypothesising that higher levels of trust in others (exhibited through investments in the Trust Game) would be reversely linked with internalising symptoms of depression and anxiety.

5.1.1. Internalizing Psychopathology during Adolescence

Adolescence is a period of rapid development of social skills reflected in the development of particular areas in the brain (Blakemore, 2008; Blakemore & Choudhury, 2006). It is also a period of increased vulnerability for the emergence of many psychological difficulties (Abela & Hankin, 2008; K. A. McLaughlin & King, 2015). Internalising symptoms such as anxiety and depression most frequently commence during adolescence when interpersonal relationships and academic demands become more and more complex (Hampel & Petermann, 2006; K. A. McLaughlin & King, 2015). McLaughlin & King (2015) report that the rates of depression and anxiety double from childhood to adolescence. Other longitudinal studies suggest that adolescents with an anxiety disorder are at risk of future depression (Copeland et al., 2009) and that major depression prevalence culminates between 15 and 18 years, with a particular increase of depressive symptoms for girls between 13 and 15 years old (Abela & Hankin, 2008; Hankin et al., 1998; Twenge & Nolen-Hoeksema, 2002).

Since the 1970's there is growing interest in resilience science in Psychology; "*Resilience is defined for scalability and integrative purposes as the capacity of a dynamic system to adapt successfully through multisystem processes to challenges that threaten system function, survival, or development"*(Masten et al., 2021). Although, resilience is a complex science and it is beyond the scope of this dissertation to focus on it, the approach adopted here aims to ascertain risk and resilience factors for the fostering of mental health and psycho-social adjustment of children and youth. The core hypothesis of this paper is that adolescents and young adults who have a capacity to trust and cooperate in order to achieve mutual gains

will be more resilient to psychopathology. That is, since it is established that a percentage of adolescents will develop anxiety and depression symptoms, which will persist or even worsen over time, I hypothesised that the ones who are able to trust and maintain mutually beneficial interactions will be the ones who will present with lower scores of depression and anxiety and who will not increase these scores over time.

5.1.2. Trust, Attachment Theory, and Mentalising

Psychological difficulties are commonly understood and conceptualised through the lens of Attachment Theory which originated from the psychoanalytic school of thought (Bowlby, 1969; Brazelton et al., 1975) and expanded to cognitive, developmental and bio-psychological theories (M. D. S. Ainsworth et al., 2015). More contemporary theoretical developments have enhanced this approach with the concept of mentalising which is the ability to understand the self and the other with regard to mental states, emotions, thoughts and behaviours (Fonagy & Campbell, 2017).

Psychopathology has been linked with insecure and avoidant attachment style (Lee & Hankin, 2009) as well as mentalisation impairments (Hula et al., 2018; King-Casas et al., 2008c; Nolte et al., 2019). Early secure attachment has been meta-analysed and linked to greater socio-emotional adjustment (Groh et al., 2017) and less internalising symptoms (Madigan et al., 2013).

The capacity to trust has been associated both with Attachment Theory and Mentalisation because it is thought to be established on the basis of secure attachment and an ability to mentalise as opposed to *epistemic vigilance* or

petrification which prevent thinking and adapting and learning even if the source is trustworthy. The capacity to attribute mental states accurately and, thus, being able to trust and to repair ruptured interactions appropriately is described as the ability to mentalise. Mentalisation is associated with a secure attachment, without having it a necessary prerequisite. A secure attachment consists of an internalised sense that others are available, responsive, and willing to cooperate or have positive intentions, namely trust (Rotenberg et al., 2021).

Based on Attachment Theory, Rotenberg et al. (2021) has found that positive trust beliefs for others are a negative predictor of internalising symptoms. Employing the Trust Game and a game theoretical methodology, King-Casas et al. (2005, 2008c) showed that mentalising capacity (seen as a rupture and repair pattern in the game) has a specific neural substrate and that borderline patients – who are often considered the model for mentalisation impairment – have a difficulty to repair their interactions with their partners in the game. Hula et al. (2015, 2018) have also shown that certain abrupt behavioural shifts in the game are consistent with populations that have impaired mentalising capacity by creating a computational model that is able to predict behaviour in the game.

5.1.3. Use of Game Theory for the Study of Trust and Psychopathology

Game theory is the study of interactions between rational agents using mathematical models (Jeung et al., 2016). It has been shown, however, that humans do not always act rationally and there are various theories about why. Game theory expands the theory and applications of the use of cognitive tasks in psychology and neuroscience, creating an environment where complex social exchanges take place and decision-makers are presented with a variety of options regarding cooperation,

fairness, loss and gain, rupture and repair of reciprocity. Importantly, the behaviour can be examined as it's happening, offering an advantage of ecologically validity compared to research designs that employ self-report or interviews (Sharp, 2012). This approach offers promising field for the creation of endophenotypes associated with psychiatric disorders (King-Casas & Chiu, 2012; Montague, 2012; Sharp, 2012) informing clinical diagnostic categories and complementing the evidence base of self-report measures and interviews.

On this premise, I use a well-known and well-studied game, the Trust Task, in order to explore how behaviour might relate to psychopathology or predict its development at a future point in time.

For psychology, social and economic games provide an opportunity to study individual differences on co-operation and reciprocity. The studies that involve borderline patients and mentalisation deficits have already been mentioned above. Ong et al. (2017) found that people with mood disorders (bipolar I and major depressive disorder) were more cooperative trustees than healthy control participants. Caceda et al.(2014) also found that men who experience suicidal ideation exhibit much more reciprocity than healthy men. Fett et al. (2016) showed that basic trust i.e. initial investment was lower in patients with early psychosis than controls. However, when playing a cooperative partner, patients increased their trust towards the levels of controls, i.e., they were able to learn and to override initial suspiciousness, but they decreased their trust less than controls during unfair interactions.

It is very common to employ the case control design that is to use groups of established psychopathology categories in order to compare them with healthy

control groups. However, there are significant objections in the literature about the usefulness of diagnostic systems and psychopathology categories, both from the perspective of a more individualised, precision model for psychopathology which would be aligned with recent genetics and neuroscience findings (Cuthbert & Insel, 2013) and from a more critical, anti-stigmatising perspective (Johnstone & Boyle, 2018). From the perspective of the precision model, it is necessary to define psychopathology grounding it on neurobiology and behaviour, thus having valid and reliable categories and ways to diagnose disease. This is based on an evidence-based medical model for psychopathology. From the critical psychology perspective, it is important to determine the socio-political factors – and more specifically issues of power and inequality – and how these lead communities to ostracise and label individuals because they are not able to integrate them.

Both of these critical appraisals of the existing system of psychopathology categorisation are important. In addition, it is important to explore approaches of research design which examine behavioural patterns in the general population and investigate the longitudinal development and prevalence of certain difficulties. This approach is utilising links between behaviour with neurobiology and psychosocial development, in order to identify individuals at risk of developing psychopathology while employing a dimensional and skills-based approach to psychological functioning which is less stigmatising of mental illness. I hypothesised that, within a general population sample, certain patterns of behaviour would be exhibited when playing the Trust Task both by young people with concurrent emotional difficulties, but also by individuals who are at risk of developing these in the future. Based on this, it was predicted that these patterns might be able to predict future psychopathology.

5.1.4. The present study

This study set out to investigate how behaviour in the Trust Task might predict concurrent levels of psychopathology and the future development of psychopathology while controlling for effects of age, gender, IQ, and socio-economic status on behaviour in the multi-round version of the Trust Task. The sample included individuals in adolescence and young adulthood from 14 to 24 years who were followed up twice approximately every 12 months. I hypothesised that the ones who are able to trust and maintain mutually beneficial interactions will be the ones who will present with lower scores of depression and anxiety and who will not increase these scores over time.

I present two growth curve models of the multi-round Trust Task including covariates of age, gender, socio-economic status and IQ. The first model is a cross-sectional model testing if concurrent psychopathology predicts the latent growth curve of the investments in the game. The second is a longitudinal one testing if future and concurrent psychopathology predicts the latent growth curve of the investments in the game.

5.2. **Method**

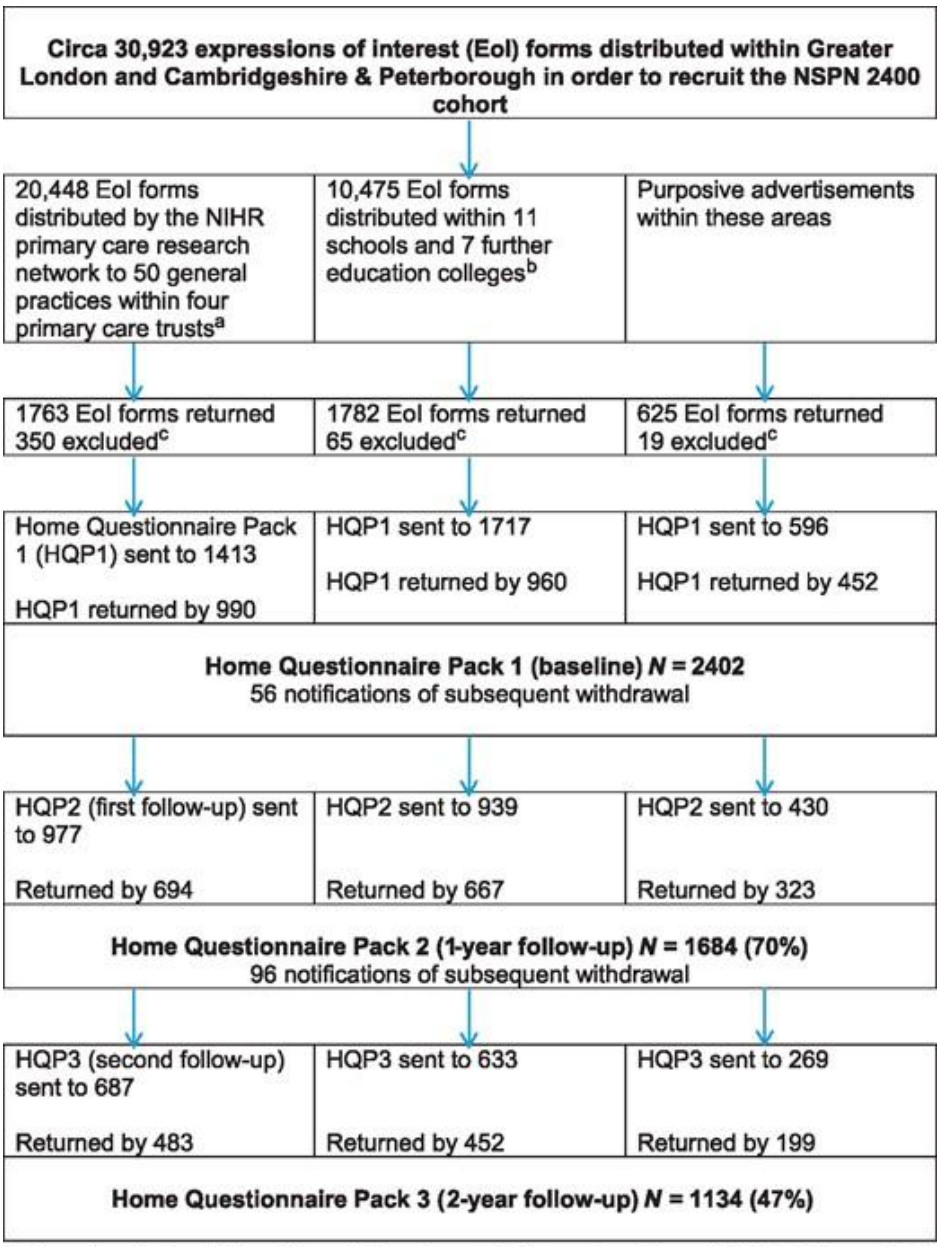
The data for this paper were collected as part of the Neuroscience in Psychiatry Network (NSPN), a large longitudinal cohort study conducted in Greater London and Cambridgeshire. NSPN employed an accelerated longitudinal design; namely, a large cohort of participants were recruited and invited to complete a questionnaire pack three times. Time 1 was the baseline measurement (N=2454); Time 2 was the first follow-up (N=1854), where the median interval was 12 months

(11-14 months); and Time 3 was the second follow up (N=1306), where the median interval was 13 months (12-16 months). Participants received £10 for completing each pack. Figure 23 shows the recruitment and data collection process as well as attrition as reported in Kiddle et al. (2017).

Following this, a part of the participants – called the cognition cohort – were invited for and assessment in the lab (In-Unit-Assessment – IUA), some of these assessments included an MRI scan – MRI cohort. Figure 24 depicts the Cognition and MRI cohort recruitment data. In this study, only data from this subsample and their follow-ups are used. The In-Unit Assessment included a Questionnaire Pack, a battery of cognitive tasks, and a clinical assessment. For this they received £10/hour plus travel and lunch expenses. If a participant was under the age of 18, parental consent was sought for them to participate in the study and complete the Home Questionnaire Pack. If the participant was under 16, the Socio-Demographic Questionnaire was completed by the parent or guardian (Kiddle et al., 2017).

Figure 23

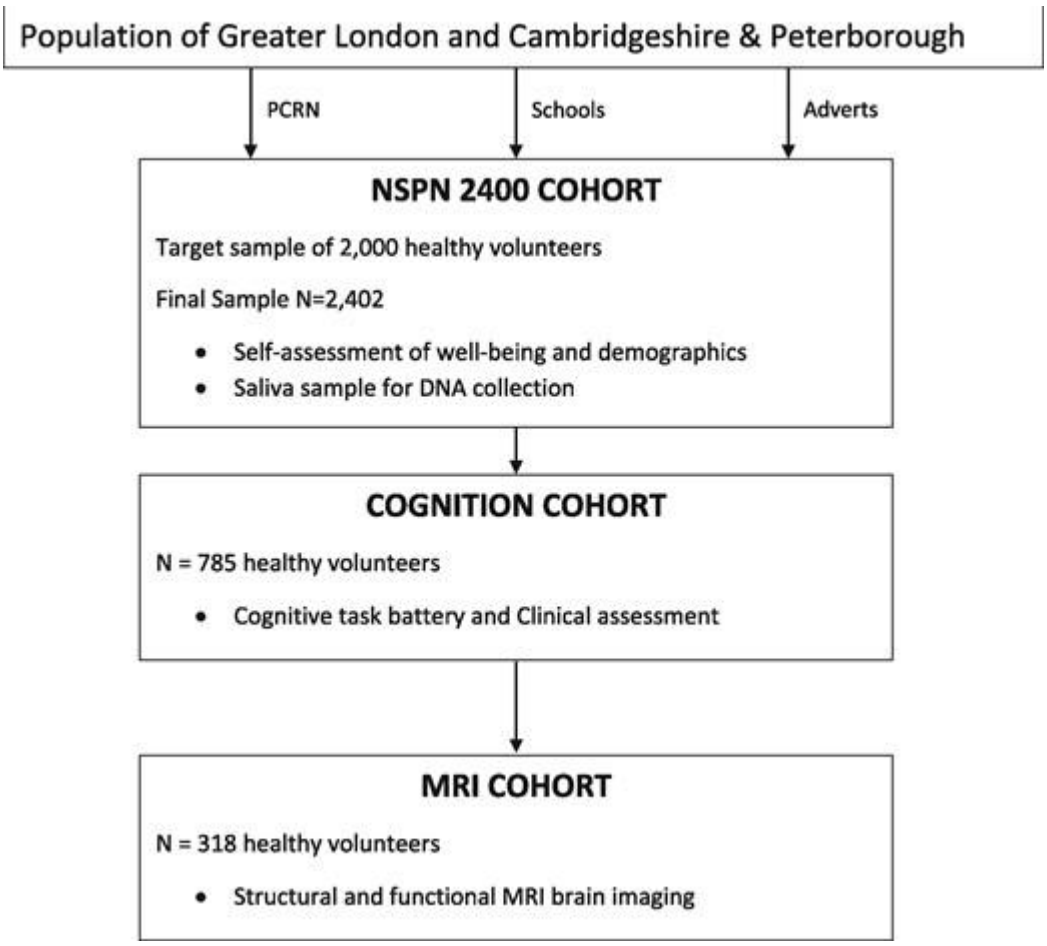
The Recruitment and Data Collection Process Kiddle et al. (2017)



[a]36 practices in Cambridgeshire and Peterborough Primary Care Trust (PCT), 8 in Barnet PCT, 3 in Camden PCT and 3 in Islington PCT.
[b]Schools in Barnet (2), Camden (4), Islington, Tower Hamlets, Haringey, Lambeth and Redbridge (all 1 each), and colleges in Cambridgeshire and Peterborough (6) and Islington (1).
[c]Excluded due to current age beyond scope.

Figure 24

Recruitment process for the In-Unit-Assessments (Cognition and MRI)



5.2.1. Sample

In total, 2454 young people (2k cohort) in the age range 14–24 years (min=13.95, max=24.99) were recruited in London and Cambridgeshire through schools, universities and the wider community. A detailed profile of the cohort can be found at Kiddle et al. (2017).

5.2.2. Demographics

This primary cohort was stratified into five contiguous age-related strata: 14–15 years inclusive, 16–17 years, 18–19 years, 20–21 years and 22–24 years who

were followed up three times. The age distribution for each stratum in each wave of data is summarised in Table 29. Recruitment within and between stratums was evenly balanced for sex (males = 1129, 46%) and age group.

Table 29

Sample Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age bin 1	491	13.95	15.99	15.03	.56
Of which in IUA	193	14.01	15.99	14.84	.58
Follow-up 1	177	14.98	18.68	16.01	.72
Follow-up 2	144	16.05	19.18	17.14	.67
Age bin 2	549	16.00	17.99	17.07	.54
Of which in IUA	174	16.01	17.99	17.05	.52
Follow-up 1	160	16.8	2.96	18.22	.70
Follow-up 2	129	17.27	2.9	19.56	.63
Age bin 3	470	18.00	19.99	18.87	.59
Of which in IUA	129	18.01	19.99	18.90	.63
Follow-up 1	115	19.01	22.76	2.17	.78
Follow-up 2	84	2.12	23.07	21.28	.65
Age bin 4	455	2.00	21.99	2.95	.57
Of which in IUA	162	2.00	21.95	2.89	.57
Follow-up 1	142	2.98	24.78	22.01	.69
Follow-up 2	107	21.96	24.76	23.16	.70
Age bin 5	488	22.00	24.99	23.45	.84
Of which in IUA	128	22.00	24.82	23.21	.77
Follow-up 1	111	22.94	26.75	24.41	.84
Follow-up 2	82	23.89	27.68	25.56	.87

Ethnicity and Socio-Economic Status (SES) were the same as reported in previous chapters. There were 1129 males (45.7%), 1325 females (53.7%).

5.2.3. Procedure

The study took place in three waves described below. In the interest of space and simplicity, only the measures relevant to this chapter are detailed. The full description of the procedure can be found in Kiddle et al. (2017).

Baseline: Participants completed an In-Unit Assessment. These assessments usually took part in two sessions, a morning and an afternoon session, three to four hours each. In the first session, they completed the Home Questionnaire Pack and a battery of computerised cognitive tasks. In the second session, they completed a clinical assessment including the Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999) . The measures and task that they completed are described in the Measures section below.

Follow-up 1: For this study, the first follow-up refers to the time point when the participant completed the follow-up questionnaire pack. Most of the participants completed this as part of their follow-up In-Unit Assessment and some completed it at home and sent it back. This happened due to the mass postage of questionnaires that followed time windows of the cohort follow ups.

Follow-up 2: This refers to the time point when the participant completed the follow-up questionnaire pack for the third time. The questionnaires were sent to the homes of the participants and posted back by freepost.

5.2.4. Measures

The socio-demographic questionnaire. It was built by the NSPN researchers in order to collect information regarding the participant's age, gender, siblings, ethnicity, highest maternal and/or paternal qualification, current postcode, employment status etc. (Kiddle et al., 2017). Socio-economic status was measured through parental education; this is a composite score that incorporates mother's and father's educational level and when appropriate mother's and/or father's partner's educational level.

Wechsler Abbreviated Scale of Intelligence. Second Edition (WASI-II) (Wechsler, 1999), subtests of vocabulary and matrix reasoning. The scale was administered and scored by the team of research assistants and the PhD student.

The psychopathology score. This was the sum score of two well-established questionnaires that measure depression and anxiety symptoms in children and adolescents:

1. Moods and Feelings Questionnaire (MFQ) (Costello & Angold, 1988) a child self-report measure of depressive symptoms following the DSM-III-R which is frequently used both for preliminary screening and to monitor change in symptomatology. It has been found to have high internal validity (.95) (Burleson Daviss et al., 2006), test-retest reliability (.72)(Costello & Angold, 1988). The MFQ has 33 items and it asks the subject to rate recent depressive symptoms on a Likert scale (0= never, 1= sometimes, 2= mostly, 3= always) with wording simple enough for younger children as well as adolescents.

2. The Revised Children's Manifest Anxiety Scales (RCMAS) which is a measure of manifest anxiety adapted for children from the Taylor's Manifest Anxiety Scale (Reynolds & Richmond, 1978).

The RCMAS was combined with the MFQ in one questionnaire meaning that the subject was asked to respond similarly on a Likert scale (0= never, 1= sometimes, 2= mostly, 3= always). The measure normally has 37 items including 28 items measuring anxiety symptoms and 9 items measuring social desirability (lie scale)(Dadds, Perrin, & Yule, 1998). Only included the anxiety items were included.

The multi-round Trust Game. The version of the computerised multi-round Trust Task was first created and used by King-Casas et al. (2005). The participants (investors) start each round with 20 play coins and are asked to "trust" some or all of their coins to their partner. The amount the participant invests triples in the hands of the trustee who in turn can give back from zero to all of the coins that they have. The trustee was simulated by the computer using the algorithm described by King-Casas et al. (2008b). In order to avoid biases the participants were told that they will be playing with another participant "like them" who is in another room/lab.

5.3. **Data Analysis**

The ten rounds of the iterated Trust Task were used as ten data (time) points, in order to explore how behaviour trajectories, unfold during the task (age, gender, socio-economic status and IQ are included as covariates). First, I estimate a model to explore how investments in the task are associated with concurrent psychopathology. Following this, the longitudinal measurements of psychopathology (baseline, T2, and T3) were regressed on intercept and slope of the model of Trust Task investments to

examine if certain behavioural patterns in the task would predict the development of psychopathology.

In order to do this, the Latent Growth Curve Modelling framework was used: an extension of structural equations modelling, employing the MPlus software (Muthén & Muthén, 2010). The objective of Latent Growth Curve Modelling is to describe non-linear change across time. It provides a representation of variation in growth parameters through a polynomial model by estimating latent continuous population parameters such as intercept and slope (deRoon-Cassini, Mancini, Rusch, & Bonanno, 2010; Mäkikangas, Bakker, Aunola, & Demerouti, 2010; Ram & Grimm, 2009).

The basic growth curve model for the Trust Task has already been estimated previously, thus will be briefly described below (see Chapter 2).

The zero-time score for the slope growth factor (i.e., the first round of the task) defines the intercept (i.e., the initial level factor). The slope describes individual differences in a constant rate of mean-level change across measurement points, hence, the factor loadings for the slope growth factor are fixed at 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 to define the linear model and at 0, 1, 4, 9, 16, 25, 36, 49, 64, and 81 for the quadratic model (Mäkikangas et al., 2010). The coefficients of the intercept growth factor are set to 1 as part of the standard parametrisation of the growth model (Muthén & Muthén, 2016). By default, the residual variances of the outcome variables are allowed to be different across time (Muthén & Muthén, 2016).

The parameters of the LGC model were estimated with the robust maximum-likelihood estimator which is robust to non-normality of outcomes and non-independence of observations (Muthén & Muthén, 2016) and is widely endorsed

(deRoon-Cassini et al., 2010). Goodness-of-fit was tested using the Root Mean Square of Approximation (RMSEA) (Steiger, 1990), the Comparative Fit Index (CFI)(Bentler, 1990), and the Tucker- Lewis Index (TLI) (Tucker & Lewis, 1973). For the RMSEA, values of .05 or less indicate good fit, for CFI and TLI values above .95 indicate acceptable fit(Muthén & Muthén, 2016).

For the model to converge, the residuals of each round's investments were allowed to be correlated in pairs.

5.4. **Results**

Firstly, concurrent psychopathology (baseline internalising symptoms scores) was regressed on the intercept and the slope of the latent growth curve using age, gender, socio-economic status and IQ as covariates. For the model to converge the regression of the quadratic slope on the psychopathology scores had to be removed. This model can be seen in figure 25. The model fit the data well, but there was no effect of psychopathology on the intercept or slope. The fit indices were: χ^2 (49) = 105.039*, p<.001, RMSEA=.037, CFI=.986, TLI=.972. Table 30 shows the model estimates.

Depression and anxiety scores were also tested separately; this did not reveal any significant effects.

Figure 25

Cross-sectional Latent Growth Curve Model with Concurrent Psychopathology Score Regressed on the Latent Variables

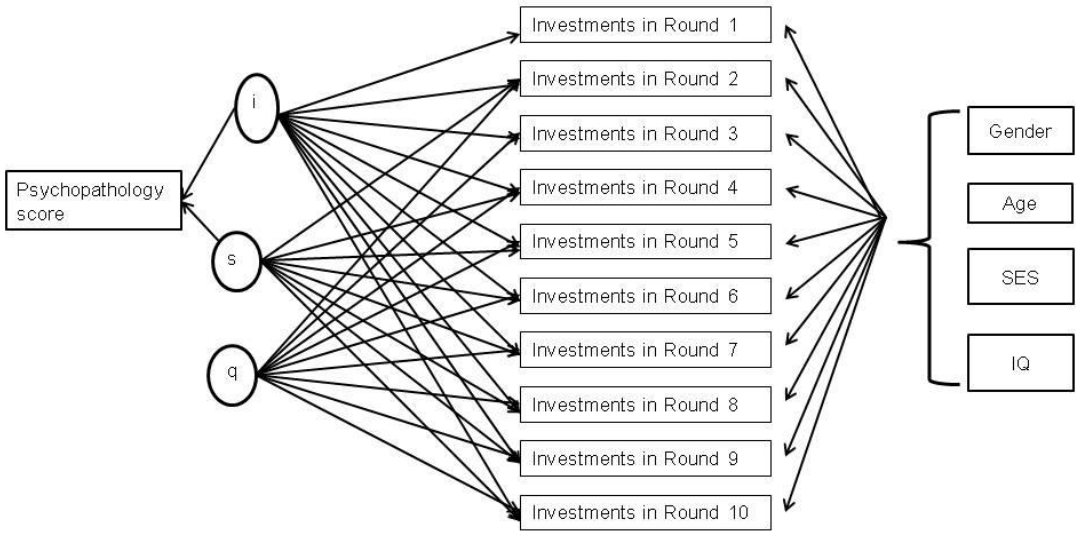


Table 30

Cross-sectional Model Estimates

	Baseline Psychopathology	
	Estimate	Sig.
Intercept	.053	.307
Slope	-.049	.438

The second LGC model tested whether the intercept and the slope predicted the three repeated measurements of psychopathology. For the model to converge the regression of the quadratic slope on the psychopathology scores had to be removed. The model fit the data well, but no predictor variable had a significant effect on psychopathology score. The fit indices were as follows: χ^2 (73) = 142.232, p<.001,

RMSEA=.034, CFI=.985, TLI=.973. Figure 26 shows the Latent Growth Curve model with psychopathology scores as indicators. Model estimates can be seen in table 31 below. The longitudinal slopes of depression and anxiety scores were also tested separately; this did not reveal any significant effects.

Figure 26

Longitudinal Latent Growth Curve Model with Repeated Measures of Psychopathology Scores Regressed on the Latent Variables

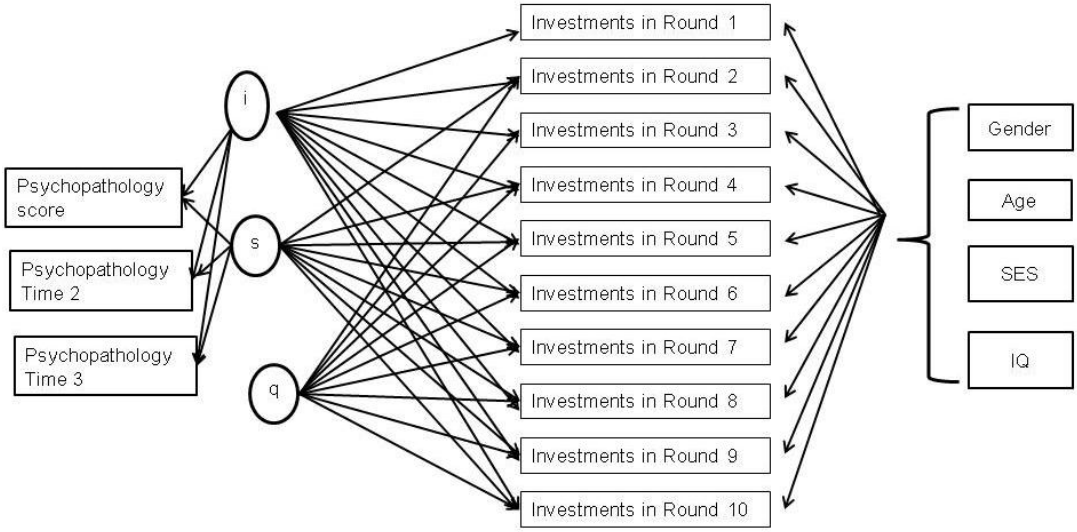


Table 31

Longitudinal Model Estimates

		Intercept	Slope
Baseline	Estimate	.052	-.05
Psychopathology	Sig.	.309	.427
Follow-up 1	Estimate	.019	.042
Psychopathology	Sig.	.697	.489
Follow-up 2	Estimate	-.015	.028

Psychopathology	Sig.	.759	.652

5.5. **Discussion**

In this chapter, the relationship of internalising symptoms with initial level of investments in the Trust Game and the growth of investments across the ten rounds of the game is examined. Socio-economic games provide a robust experimental design to improve our understanding of behavioural dimensions linked to psychological difficulties as well as a potential protective/risk factors for the future development of psychopathology.

The latent growth curve model that has been described in previous chapters was used because it captures the temporal development of trust in the game and because many variables can be modelled together with multidirectional relationship without compromising the robustness of the model. The growth curve models assume latent variables that describe the development of a certain observed variable through time. In this case, the number of coins entrusted by the investor in each of the ten rounds of the task (each round it a time point for latent growth curve) was used. The cross-sectional model tested whether the intercept and slope of the latent growth curve predict concurrent psychopathology, and the longitudinal model tested whether the intercept and the slope can predict future psychopathology scores from ~12 and ~24 months later.

Rotenberg et al. (2021) have shown that trust beliefs (measured by a questionnaire) are associated with concurrent internalising symptoms. It was hypothesised that initial level of investment and slope of growth curve of

investments are negatively associated with depression and anxiety scores. Being able to have a reciprocal exchange with mutual gain is essential in order to sustain mutually satisfying relationships and would result in less emotional difficulties. However, our hypothesis was not substantiated. I found no evidence that the intercept (representing the initial level of investment) or the slope of the curve of investments was associated with concurrent and future depression and anxiety scores. This may indicate that depression and anxiety are not linked to different level of initial trust or a variation of the capacity to sustain a reciprocal interaction. This robust study of a large and diverse sample supports the claim that cooperation and trust are not linked with internalising symptoms, specifically not the initial level of trust exhibited.

Previous studies have shown that individuals with mood disorders show less reciprocity (Ong et al., 2017) and individuals who are anxious and paranoid offer less initial investments (A.-K. Fett et al., 2016). With this particular design, the aim was to model normative behaviour as opposed to compare group differences. Following from this, it may not be sensitive enough as an instrument to detect differences in the general population with the levels of depression and anxiety present in the sample (i.e., not focusing on comparing a test and a control group).

One way to address this may be through the setup of the opponent algorithm. In order to bring investment differences and reciprocity differences to the foreground, the participants may have to respond to a harsher opponent or a period of rupture in the interaction. Being that the virtual opponent behaves the same way as the participant who is the investor, the level of reciprocity is established by the participant. This design focuses on how an individual leads an interaction, rather than

the way they respond to behaviour. However, it has been shown that reciprocity differences present when playing with unfair partners. King-Casas et al. (2005, 2008b) have shown that participants who played as trustees respond differently to more cooperative or more aggressive investors. This has been interpreted as an adaptive response to harsh and unpredictable environments. This indicates that it would be an important to retest this hypothesis with the participants as the trustee.

Another reason why evidence of an association between internalising symptoms and the latent growth curve was not found may be that the latent growth curve does not capture trusting behaviour as well as other measures such as the initial and mean investments or the rate of cooperation and repair that the participant exhibited. To explore this, I tested the simple linear regression of future psychopathology scores on initial investments and mean investments with similar results (Initial investment: $F(542,1)=526.745$, $p=.327$; Mean investments: ($F(542,1)=746.523$, $p=.244$) Repair and cooperation rates were also tested (mean number of coins when the participant was repairing- increase investment after defection- or cooperating-matching trustee's cooperation) with similar results (Repair: $F(542,1)=.243$, $p=.622$; Cooperation: $F(542,1)=2.167$; $p=.142$) .

Despite the limitations of this study, it is important to note that it offers an opportunity to develop research on psychological difficulties based on behavioural dimensions. In order to move from the traditional psychopathology categories into more meaningful and evidence-based behavioural and psychological dimensions, there is a need for more research on how to measure and operationalise these dimensions. Equally, in order to move from self-report measures – and beyond cognitive tasks – into socio-economic tasks that capture emotional, cognitive and

social abilities, it is essential to identify what each task measures and how that behavioural dimension might be contributing to the complex picture of individual vulnerability to psychopathology. In this context, this study has shown the importance of the specific role of the participant in the game, i.e., leader of the interaction or responder as well as that examining psychological and behavioural dimensions in a continuum requires very sensitive instruments or research designs that are able to elicit the target behaviour with specificity.

6. General discussion

6.1. **Structure and summary of empirical studies**

The present thesis consists of four empirical studies, drawing on data from a large-scale longitudinal study of adolescent mental health and neuropsychological development. The aim of the first study was to compare different operationalisations of cooperative behaviour that have been used when employing game theory and, more specifically, the Trust Task and to analyse the validity of the measurement (using suspiciousness as a criterion) as well as the advantages and disadvantages of each kind of measurement. The second study tested multivariate models of parenting and their relationships with psychopathology as an outcome, so that in later chapters the role of parenting could be examined in relation to adolescent trust and cooperation. The third study aimed to investigate the relationships of parenting with trust, while also considering age, gender, and socio-economic status. In the last empirical study, the relationship of behaviour in the Trust Task with concurrent and future internalising symptoms was explored.

In this general discussion, I summarise and discuss the findings of each empirical chapter. This is followed by a discussion of the implications and contribution of this project in our understanding of cooperative behaviour, trust and the ways to study those. I also discuss limitations of the project and future directions.

6.2. **Discussion of findings**

6.2.1. Measuring trust in the Trust Game

In the first empirical paper (Chapter 2), different measurements and operationalisations of trust and cooperative behaviour were compared using a game-theoretical perspective in order to set the basis from which its relationships with other variables can be assessed. The different measures of trust stemming from the iterated Trust Task were examined in relation to the Suspiciousness subscale of the Schizotypal Personality Questionnaire (Raine, 1991) as an external measure of mistrust. The Suspiciousness scale (the construct of suspiciousness) is not a golden standard for the measurement of trust and cooperative behaviour; however, suspiciousness is an established personality trait that can be used as an independent indicator. The key issue was to use an external criterion like this to decide among various possible metrics that could be extracted from the Trust task. The simple indices such as the initial investment made by the participant and mean investments were contrasted with more complex indices such as parameters that have been extracted from computational and growth curve models.

Simple indices. The initial investment made by the participant indicated how many coins they were willing to entrust to their partner. This functioned as an independent indication of how trusting an individual was before "getting to know" their partner. Initial investments had a small, but statistically significant contribution (R^2 change = .005, p=.013) in predicting suspiciousness when controlling for age, gender, SES, IQ, mood, anxiety, social anxiety. One important advantage of initial investments was that they provided a measurement of a prior belief. On the downside, it was not a direct measure of the social aspect of the interactions and it

did not capture the development of reciprocity, rupture and repair as the interaction unfolds.

Mean investments across the ten rounds of the task seem to express a more consistent preference to trust larger sums of money to the partner. The advantage of this index was that it is computationally cost-effective i.e., it is very easy to extract and it has comparable predictive power to more complex and difficult to extract indices. Also, mean investments capture information about the overall approach taken by participants across multiple rounds of interaction as opposed to one round.

The number of rounds that the subject cooperated, repaired a relationship, defected or retaliated were also examined as predictors of suspiciousness. Only the number of rounds that the participant was trying to "repair" their interaction was found to be predictive of suspiciousness. This finding is consistent with the findings in Borderline Personality Disorder and Psychosis (A.-K. Fett et al., 2016; King-Casas et al., 2008); in those studies patients were found to struggle particularly with repairing interactions compared to controls. It is important to note that this was the first time that a personality trait such as suspiciousness was linked to the capacity to repair interactions. This may be indicating that repairing a ruptured interaction is a specific indicator of a mental capacity to trust and sustain a mutually beneficial interaction that exists in a spectrum in the general population.

Computational Model Parameters. Hula et al. (2018) created a computational model of the iterated Trust Task and various parameters which was successful in simulating normative behaviour in the Task. The parameters were Risk Aversion, Guilt (which quantifies seeking equality in outcomes of the task), Planning horizon (which quantifies the number of future exchanges to be taken into account in

thinking forward), Irritability, Irritability awareness, Theory of Mind, and Temperature (Hula et al., 2018). It was hypothesised that Planning (how consistently an individual plays across rounds), Risk Aversion (a subject's preference for the kept amount of money compared to the money returned by the partner), Guilt (how eager a subject is to reach a fair outcome), Irritability (Parameter that governs a shift to an internal state with Theory of Mind 0, Planning 0 and Guilt 0-a state encouraging retaliation) and Irritation awareness (subject's individual beliefs on whether they consider the partner to be irritable) would be significant predictors of Suspiciousness.

Only Planning and Risk Aversion were found to be significant predictors of Suspiciousness. Risk Aversion, which expresses a tendency to not risk giving money to someone else, even when there is the possibility of gain, is a strong predictor of suspiciousness above and beyond other variables.

Importantly, the computational model parameters are part of one model and are meant to predict behaviour synergistically. The fact that I didn't find some of them to be predictive of willingness to trust does not mean that they are irrelevant to cooperating and decision-making in the Trust Task. However, they may be secondary in predicting this particular capacity or may be tapping into other dimensions that play a role in decision-making in the Trust Task.

Growth Curve Modelling. A Latent Growth Curve Model and a Mixture Growth Curve Model that described the growth (or decline) of investments in the ten rounds of the task were estimated. The intercept of the latent growth curve was found to be significantly associated with suspiciousness. Also, four classes of participants that exhibit different types of behavioural patterns in the game are described; two of them were investing significantly higher and lower amounts than the rest of

participants on the whole. Membership of a specific class was predictive of trust at a comparable level as other indices. The major advantage of the latent growth curve model is that it can incorporate multiple predictors without being prone to collinearity issues.

The results of the study on operationalisation of trust suggested that there are comparably effective measurements, but latent growth curve modelling is more appropriate for studies with multiple parameters (independent variables and covariates) which is essential for a concept as complex as trust.

One suggestion for future research was Discontinuous Latent Growth Curve modelling which would be able to model changes in the interaction by modelling different slopes of the latent growth curve after an event of rupture such as defecting. The results of the comparison of the different operationalisations of investments in the Trust Task and the existing literature suggest that it would further benefit the study of the interpersonal interactions and the development of trust in the multi-round game by focusing on the ability of an individual to maintain and repair interactions under the different conditions. On the contrary, for research questions that focus onto the internalisation of socio-cultural norms or an individual's a priori beliefs and how they affect their decision-making, it would be important to privilege indices that are unaffected by interacting with a specific, such as initial investments.

6.2.2. Parenting

In Chapter 3, a data-driven approach was adopted in order to create a multivariate model of parenting. Three questionnaires were used in order to cover the parenting dimensions and themes that have been frequently present in parenting research. Overall, the findings suggested that a hierarchical model of parenting with

8 first-order and two second-order dimensions was indicated. The model confirmed the dimensions used in existing scales remarkably well, showing that, for the most part, these dimensions were distinct, yet correlated features of self-reported parenting.

The initial data-driven exploratory factor analysis suggested the extraction of 14 factors; 11 of which have already been described in the literature and three that had to be eliminated for measurement and technical reasons that have been explained in detail in the chapter. The 11 remaining factors which were entered into the confirmatory analysis were: Praise, Warmth/Support, Parental involvement, Neglect, Psychological Control, Abuse, Corporal Punishment, Inconsistent Discipline, Poor supervision, Material Support, and Academic Motivation and Expectations. Abuse and Corporal Punishment had to be combined leaving 10 parenting factors.

A hierarchical model of parenting was also explored due to the high correlations of some of the factors. Two second-order factors were added which were Positive and Negative Parenting. Positive Parenting was measured by Praise, Warmth/Support, Parental involvement, Material Support, and Academic Motivation and Expectations. Negative Parenting was measured by Neglect, Psychological Control, and Abuse.

This hierarchical structure of parenting is the first multivariate model that incorporates most of the dimensions of parenting in the literature. This model can provide factor scores for a global assessment of parenting which would benefit many research and practical fields. Further studies will be required in order to replicate the model and extend it to different age groups. Studies linking parenting to child temperament and behaviour would reveal the directionality of the parenting process

showing to what extent the parent or the child is leading the process. Generational differences in parenting might also reveal different mental health outcomes.

In terms of psychological difficulties, a latent growth curve model of three time points of measurements of internalising symptoms (~12 months apart) was tested. Warmth (-.425, $p<.001$) and Psychological Control (.264, $p<.001$) significantly predicted the concurrent internalising scores and longitudinal growth curve of internalising symptoms (Warmth: .423, $p=.022$ and Psychological Control: -.201, $p=.028$) indicating that they are (respectively positively or negatively) linked to psychopathology. This replicates the existing literature which links psychological control and inconsistent discipline with negative outcomes such as internalizing symptoms and warmth with positive outcomes (Bean et al., 2003; Forehand & Nousiainen, 1993; Kuppens et al., 2009; Pinquart, 2017b, 2017a)

Also, the intercept of the growth curve of psychopathology was significantly associated with both Positive and Negative Parenting factor scores. Importantly, Negative Parenting was significantly associated with the slope indicating that negative parenting plays a role in future development of psychopathology.

6.2.3. Parenting, Age, gender, socio-economic status, and IQ as predictors of trust

Parenting plays an important role in psychological development, but it has been distinctly absent from the literature of socio-economic exchange games, and specifically the Trust Task. Because of the complex processes involved in the development of cognitive and social abilities, there are many factors involved through physiological and neurobiological development, social norms and expectations, personality traits and potentially prior beliefs about others. These

factors– i.e. age, gender, socio-economic status and IQ– have to be disaggregated from family relationships. In Chapter 4, the influence of parenting, age, gender, IQ, and socio-economic status on trust and cooperation in the context of the Trust Task was investigated. The latent growth curve model of the Trust Game that was described in Chapter 2 was employed in order to build two models (a) the first with age, gender, socio-economic status and IQ, and (b) the second with parenting as predictors of the latent growth curve of investments in the Trust Task.

Parenting had not been investigated with regards to the Trust Task and it is rarely used as an explanatory variable for game theoretical tasks. The parenting factors from the hierarchical model of parenting in Chapter 3 were used as indicators of the latent growth curve of investments in the Trust Task. This analysis revealed that Neglect, Abuse, and Parental Involvement were significantly associated with the intercept of the latent growth curve.

Interestingly, higher levels of Abuse and Parental Involvement contributed a statistically significant difference in initial trust, but in the opposite direction of Neglect. Higher levels of Abuse and Parental Involvement were associated with lower initial investments and Neglect with higher.

A possible interpretation of this result is that players choose higher initial investments for different reasons –i.e. either because they are more prone to risk-taking and take risks more impulsively (less risk aversion), or because they are expecting the other not to be trustworthy and reciprocating their generosity, thus protecting themselves from potential threats. The level of positive involvement of the parents was associated with lower initial investments indicating that a positive parenting practice could be resulting in more conservative play either due to risk

preferences or due to the unknown partner. This highlights the work that needs to be done in order to deepen our understanding of the ways family relationships and other factors affect decision making. Such discrepancies between self-reports and game decisions have been reported in the literature before (Rotenberg et al., 2005; Stamos et al., 2020).

Neglect was associated with higher levels of initial investments indicating that, in this case, rejecting and uncaring parenting lead to higher initial investments. It is possible that these individuals were more impulsively taking risks aiming at higher and quicker gains.

These are very interesting findings that would need to be replicated and validated. The initial hypothesis which was that that individuals who have undergone early adversity irrespective of whether it was abuse or neglect will be less trusting and investing less in the trust game was disproved. Further, only Parental Involvement, not Warmth or Praise, was shown to have a significant effect on investments (in the direction hypothesised). These results indicate that parenting dimensions might have a more nuanced effect than initially hypothesised.

Age was found to be a significant predictor of the intercept of the growth curve indicating that initial investments increased as the age of the participants increased. Age is important because certain cognitive and social capacities develop during certain periods, but also because social expectations and norms become important during certain periods of development. This might explain why young adults invest more than adolescents in the Trust Game i.e., perspective-taking is developing during adolescence and young adults are less risk-averse because of their greater social experience and ability to mentalise how their partner might be feeling.

Gender was also found to be a significant predictor of initial level of investments with males investing more than females. This is a well-replicated finding. Gender seems to be a fundamental source of variability related to the Trust Task. It is very hard to determine how gender affects decision-making in the Trust Task, but there seems to be an important link with gender-specific norms and behaviour. Social norms and expectations differ for different genders with regards to risk-taking, equity seeking, generosity and helpfulness and this might be what determines behaviour in the Trust Task.

Socio-economic status (measured through parental education here) was not found to be significant predictor of intercept or slope of the growth curve. Using the same dataset, Hula et al. (2021) found that socio-economic deprivation was linked with greater depth of planning and more defensive play. This suggests that socio-economic status does not affect the initial level of investments and the slope of the latent growth curve of investments, but it is associated with other parameters of behaviour.

Lastly, IQ was found to be a significant predictor of intercept, slope and quadratic slope of the growth curve. Both Hula et al. (2021) and the findings of this project show that risk aversion was lower on average in participants with higher IQ, controlling for age and socio-economic status. IQ is subject to factors such as motivation (see Breuning & Zella, 1978, Duckworth et al, 2011, Borghans et al, 2013), education, socio-economic factors (see Baker et al, 2015) and even the life context in which people from different countries and ethnicities grow up. Initial (level of) investments may be ascertaining the level of confidence and motivation, rather than reflecting a computation of risk and potential cost and gain in the game.

The latter might be expected under a simplistic assumption that IQ reflects essential cognitive capacity.

Fett et al. (2014) showed that verbal IQ is linked it to perspective-taking and the expression of trust and reciprocity towards others. Earlier work showed that higher IQ is associated with more pro-social behaviour (Gill & Prowse, 2013; Millet & Dewitte, 2007; Shaw, Vasquez, & LeClair, 2013). And, on the other hand, Moutoussis et al.(2021) have shown that decision-making is separate to IQ and that it is associated with different neural networks of resting-state functional connectivity.

6.2.4. Trust as a predictor of psychopathology

In the last empirical study, I investigated how latent growth curves of investments in the multi-round Trust Task predict concurrent and future psychopathology scores while controlling for age, gender, IQ, and socio-economic status. The latent growth curve model of the Trust Task which has been described in previous chapters was utilised in order to test how latent variables predict psychopathology scores.

Two models were estimated; in the first model, I tested whether the intercept and slope of the latent growth curve predict concurrent psychopathology, and in the second model the psychopathology scores from the follow up measurement of ~12 and ~24 months later were incorporated. It was found that neither the intercept (representing the initial level of investment) nor the slope of the curve of investments predicted concurrent and future depression and anxiety scores.

Previous studies have shown that individuals with mood disorders show less reciprocity (Ong et al., 2017) and individuals who are anxious and paranoid offer less

initial investments (A.-K. Fett et al., 2016). Here, there was no evidence that initial level of investments or slope of the growth curve were associated with concurrent or future levels of depression and anxiety. One explanation for this may be that externalising, not internalising symptoms might be associated with trust and cooperation or that the small variation in depression and anxiety levels in the general population sample does not allow the regression models to detect it. Reverting to a case-control design would be a solution to this, but the ethos and methodological approach of this project lead to solutions that will explore what changes can be made to the task in order to explore the behavioural profile of people who present with psychological difficulties.

For example, as seen in Chapter 2, introducing conditions that would produce more variance in the decisions made such as having the participant play both as the investor and the trustee or having partners with different levels of reciprocity and cooperation might be more effective.

6.3. **Discussion of the limitations and implications of the project**

One important limitation in this project has to do with measuring individual differences with a task that was created in order to study normative behaviour. Generally, reliability of a measurement increases as between-subject variability decreases. Essentially, the more obvious the solution of a problem the more people will be able to solve it making the task reliable in measuring it. It is very hard to create tasks that do not rely on problem-solving skills and expose the psychological functioning of a participant. This is a known issue from cognitive psychology and tasks that have been used for many years.

Economic games were initially created based on a theory that considered pure rationality – essentially cost-benefit balances – as the key determinant of decision making. Contemporary research utilises these tasks in order to examine individual differences and uncover what drives decision-making. As this task was designed to study normative behaviour originally, it probably does not serve the study individual and group differences. The question of how to alter or improve the design in order to study individual differences remains an open.

While employing a public goods game (a game that asks both participants to share a portion of their endowment to a common pool that is then multiplied and split in half between them), Gao et al. (2020) showed that time pressure and cognitive load decrease the delibarative process and increase intuitive decision making which is more influenced by past experiences measured by attachment style. This research indicates that one possible way to reveal individual differences owed to parenting style or personality traits is by reducing the influence of cognitive processes such as calculation of gains in the game.

Another consideration for future research would be to employ different games. For example, the prisoner's dilemma game introduces a condition where participants have to decide between cooperating or defecting with different payoffs depending on each combination of outcomes. It is a typical example of a non-constant sum game, namely the payoff depends on which strategy players decide to use each time. If both players defect, both get the least coins, if one cooperates and the other defects, the one who defected is rewarded with the maximum amount, and if they both cooperate they both get a medium size endowment. Also, it is a simultaneous game, thus offering the opportunity to study generosity and cooperation

without the influence of a sequential decision process. In addition, vindictive behaviour and break downs in cooperation can be studied more prominently making it appropriate for hypotheses linked to anger and epistemic petrification.

In their review of the use of games for social decision making, van Dijk and De Dreu (2021) propose that public goods games focus on the cooperation versus self-interest dimensions, contest games (where players aim to win a contest and invest to obtain a reward or avoid a punishment) focus on the winning or losing, ultimatum games emphasize coordination and self-interest whereas trust games emphasize coordination and distrust. These dimensions offer grounds for different psychological hypotheses. For example, the study of narcissistic or callus unemotional behaviour might be best served by public goods or contest games, whereas hypotheses linked to interpersonal trust and cooperation might be best served by games that create conditions of sequential coordination like rupture and repair.

Another important epistemological limitation has to do with the conceptualisation of human psychology and behaviour that is assumed by the evolutionary biological perspective and game theory. Namely, the underlying assumption of biological market theory is that fairness and cooperation can be explained by market-based exchanges, calculations of cost and benefit, and reciprocity based on mutual gain (Witteveen, 2021). The opposing theoretical and epistemological thesis would be to conceptualise collaboration as a key factor of evolution. As Tomaselo (2014) suggests “the changing ecological circumstances created tight interdependencies between early hominins, who became pressured to obtain a larger share of their food through active collaboration”. Namely, if our early

ancestors survived when they were able to hunt large game together and live in relatively large groups, this would drive selection for a capacity to put oneself into the shoes of one's partner, and to acquire a shared understanding of the roles that would be required for joint success. This approach would also explain why evolution privileges being able to mentalise and cooperate based on shared intentions and intentional states of mind, rather than due to the expectation of (mutual) benefits. Furthermore, this is in line with attachment and developmental research that shows the importance of ostensive cues, attunement, and secure attachment.

Finally, a critical limitation of the study of trust through socio-economic games is that they are domain-specific and largely influenced by the relationship of the individual with money. This is not limited to social class and socio-economic status, as it has been shown that trust and cooperation do not have a linear relationship with trust and cooperation (Côté et al., 2015; Korndörfer et al., 2015; Nettle et al., 2011). However, Rotenberg's (2010a) conceptualisation of interpersonal trust analytically explains that trust is a multi-faceted and highly complex capacity that is underpinned by a multitude of functions and dimension. Namely, according to Rotenberg, these can be organised in three bases; honesty, emotional, and reliability, three domains; the cognitive/affective, the behaviour-dependent, and the behaviour enacting, and two dimensions; specificity and familiarity. Following from this, studying trust and cooperation as one's preferences about volunteering, helping strangers in the street, being helpful to a teacher or a supervisor, offering practical or emotional support to friends and family might produce very different results compared to a study employing socio-economic games.

On the other hand, this project has contributed several significant findings with regards to the Trust Game and what it may be able to offer to psychopathology research.

The initial hypothesis driving this project was that parenting underpins and trust moderates/mediates psychopathology development. The findings show that both trust and psychopathology are associated with parenting which reaffirms the importance of further research on these issues and particularly the longitudinal effects of family relationships. Young people's peer relationships and other social relations (e.g., with teachers, coaches etc.) might be more closely associated with trust and cooperation than psychopathology. Alternatively, it may be externalising as opposed to internalising psychopathology that might relate to trust, indicating a certain type of reactive behaviour.

Furthermore, the measurement of trust in the game has been systematically studied and it the advantages of each operationalisation have been established. Secondly, a data-driven comprehensive model of parenting has been presented which can benefit multiple fields of research. Thirdly, the relationships of parenting, age, gender, socio-economic-status and psychopathology and behaviour in the Trust Game have been explored. There are many conclusions and future directions that stem from these conclusions.

More specifically, willingness to trust and reciprocity increase as age increases starting from the age of 12 years. Further research is needed in order to assess younger children's preferences as well as the interaction of age with other factors. One important problem for younger children is how to discern the ability to

take different perspectives and theory of mind from the active choice to cooperate. This would entail significant adjustments of the task and the experimental design.

Gender cultural norms appear to be affecting individuals' choices of trust and cooperation, but further work is required in order to discern what drives these choices i.e., risk avoidance, seeking fair outcomes, efficiency preferences etc.

An important inconsistency in the literature is the association of macro- and micro- environmental adversity, i.e., material deprivation, socio-economic status and positive or negative parenting, with cooperation and trust. Here, there are some interesting findings which may serve as hypotheses for future research on the relationship of prosocial behaviour with socio-economic status and parenting.

A comprehensive set of explanatory factors of trust and cooperation would need to include cultural, social and economic, psychological and neurobiological factors including:

1. Cultural norms dependent on ethnicity, gender, social class, age group and more.
2. Social learning linked to socio-economic adversity (such as delayed discounting), gender, race, social class, level of ability/disability etc.
3. Parenting and intra-familial relationships, known to have a crucial role in establishing trust in others, but they have not been systematically studied as potential explanatory factors in cooperativeness.
4. Individual differences and psychological states and traits influence how we trust and cooperate and are influenced by all the aforementioned factors.
5. The development of social and executive functioning, involving cognitive development inextricably linked with age.

6. Genetic heritability, hormones and neurotransmitters such as oxytocin and brain function.
7. And, lastly, how these have been investigated and what would be the best way to study them.

It is evident that there are many things that are not well understood around trust, cooperation and reciprocity, but this complex set of parameters enables the appraisal of what is known, the identification of what needs further investigation, and the limitations of both.

7. References

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Appendix I

Table 32

Exploratory Factor Analysis Item loadings for the selected solution of 14 factors

	Geomin Rotated Loadings													
	Factor													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Alabama Parenting Questionnaire														
1. "Your parents tell you that you are doing a good job"	**.68**	.11	.00	-.22	.04	-.03	.06	-.01	.03	.04	.01	.03	-.04	.00
2. "Your parents threaten to punish you and then do not do it"	.14	-.04	**.65**	-.09	.06	-.01	-.03	.11	.17	-.06	.03	.01	-.05	.03
3. "You go out without leaving a note or letting your parents know where you are going"	.09	**.72**	.01	-.02	-.01	.01	-.09	.10	-.14	.08	.03	.01	-.02	.05

4. “You play games or do other fun things with your parents”	.27	.02	-.01	-.03	.03	.36	.02	.01	.00	.03	-.02	.11	-.32	.29
5. “You talk your parents out of punishing you after you have done something wrong”	-.02	.08	**.78**	.22	-.02	-.05	.01	-.03	-.04	-.03	-.08	-.01	-.02	-.02
6. “Your parents ask you about your day in school”	.47	.03	-.11	-.06	.01	.32	.04	-.08	-.20	-.04	-.01	.02	.12	.03
7. “You stay out in the evening past the time you are supposed to be home”	.01	**.67**	.10	.04	.03	.01	.12	-.11	.02	-.02	-.11	.03	.04	-.05
8. “Your parents help you with your homework”	.24	.02	-.02	.01	-.16	.36	.02	.05	-.27	.01	-.05	.05	-.14	-.03
9. “Your parents compliment you when you have done something well”	**.79**	.03	.04	-.04	-.02	.07	.03	.08	-.05	-.04	-.02	-.02	.01	-.03
10. “Your parents praise you for behaving well”	**.76**	.00	-.02	-.01	-.01	.07	-.01	.09	-.04	-.01	-.03	-.07	-.02	-.03
11. “Your parents do not know the friends	-.01	.38	.07	-.03	.02	.25	-.04	.15	.10	-.10	-.01	-.03	-.10	.00

you are with”														
12. “Your parents let you out of a punishment early (like lift restrictions earlier than they originally said)”	-.02	.08	**.70**	-.03	-.03	.09	.06	-.02	-.03	.17	.02	.03	.10	.01
13. “Your parents spank you with their hand when you have done something wrong”	-.04	-.01	.00	.00	**.89**	-.04	.01	-.04	-.07	.03	-.02	.10	.00	.02
14. “Your parents slap you when you have done something wrong”	.02	.00	.10	-.04	**.90**	-.01	.03	.03	.01	.00	.05	.03	-.01	-.04
15. “Your parents hit you with a belt or other object when you have done something wrong”	.05	.21	-.04	-.01	**.80**	.02	.00	.10	.01	-.08	-.05	-.06	-.01	.06
Measure of Parenting Scale														
1. was overprotective of me	-.03	-.02	.04	.09	.07	.04	.01	.02	-.08	.01	-.02	**.71**	-.04	-.04
2. was verbally abusive of me	.08	-.01	.06	.01	.11	.03	-.01	**.74**	-.18	.02	-.04	.07	.03	-.03
3. was over-controlling of me	.00	.02	-.01	-.07	-.01	.02	-.02	**.50**	.08	-.10	.00	**.63**	.02	.00

4. sought to make me feel guilty	.08	.02	.01	-.08	-.02	-.06	.07	**.70**	.02	.03	-.02	.19	-.03	-.01
5. ignored me	-.01	-.01	-.02	-.09	.02	.04	**.88**	.08	.01	.03	-.01	.03	.03	-.14
6. was critical of me	.11	.03	.00	-.06	-.02	-.08	.19	**.56**	.03	-.02	-.03	.14	-.05	-.21
7. was unpredictable towards me	.02	.00	-.03	-.01	-.03	-.05	.29	**.58**	-.04	-.02	-.03	.06	-.03	.07
8. was uncaring of me	.02	.01	-.01	-.08	.05	-.01	**.76**	.16	-.04	.00	-.01	-.04	.04	-.03
9. was physically violent or abusive to me	.02	.04	-.03	.10	.21	.15	.08	**.69**	-.10	-.06	.00	-.03	.00	.05
10. was rejecting of me	.14	-.06	.06	.12	.09	.02	**.76**	.18	.02	-.06	-.02	.03	.01	.00
11. left me on my own a lot	-.04	.14	.03	-.05	-.06	-.02	**.61**	.11	-.06	.00	.04	.01	-.13	.10
12. would forget about me	-.01	.06	.00	.04	-.01	-.02	**.94**	-.05	-.01	-.06	.02	-.05	-.11	.06
13. was uninterested in me	.04	-.05	.01	-.03	-.01	.05	**.88**	.02	.00	.09	-.06	.02	.00	.04
14. made me feel in danger	-.06	-.01	-.03	.00	.03	.09	.15	**.69**	.00	-.05	.02	-.05	-.01	.44
15. made me feel unsafe	-.04	-.01	.05	-.02	.03	.00	.04	**.73**	-.03	.04	-.01	-.01	.04	**.51**
Positive Parenting Questionnaire														
1. We spent quality time together.	-.04	.00	-.03	.38	.07	-.34	-.03	.06	.00	.02	.01	.02	.31	-.23
2. They attended school and social events which were important to me.	-.07	-.04	.01	.40	.05	-.18	-.06	.04	.17	.15	-.10	-.03	.00	-.04

3. I received physical affection (lots of hugs etc.).	-.06	-.06	.01	**.61**	-.02	-.26	-.01	.01	-.02	.09	-.16	-.03	.00	-.02
4. I knew they would come and get me from places if needed.	.00	-.10	.00	**.55**	-.02	-.04	-.02	.02	.04	.33	-.04	.00	-.17	.00
5. They comforted me when I felt sad.	.03	.04	-.04	**.77**	-.03	-.33	.09	-.16	.02	-.03	.00	.03	.00	.09
6. If I was angry, I was still listened to.	.02	.08	-.02	**.72**	-.01	-.21	.01	-.09	.02	-.03	.12	.05	.04	.14
7. They praised me when I did well.	-.51	.04	-.07	.46	-.05	.03	.00	-.03	.02	.05	.00	.06	.00	.05
8. My ideas and interests were encouraged and supported.	-.24	.04	-.03	**.58**	-.07	.03	-.01	.06	.12	.01	.09	-.07	.04	-.03
9. I felt I was a priority to them.	-.13	-.04	-.02	**.76**	.03	.02	-.01	.01	.03	.03	.00	-.06	-.06	-.13
10. I felt loved by them.	-.06	.04	.03	**.76**	-.03	-.02	-.06	-.03	-.06	.12	.00	-.04	.03	-.11
11. I felt listened to.	-.07	.00	-.02	**.73**	-.04	-.03	-.03	-.03	.01	-.06	.21	-.02	.06	-.03
12. I could contact them whenever I needed to.	.06	-.05	-.03	**.54**	.11	.03	-.07	-.01	.04	.28	.20	-.02	-.03	-.03
13. My home was safe and secure.	.03	-.06	.00	.36	-.04	.10	-.01	-.15	.04	.29	.21	.05	-.01	-.32
14. My opinions were valued.	-.09	-.02	.08	**.68**	.02	.04	-.03	-.04	.02	.00	.35	-.01	.02	-.02

15. We talked about things I considered important.	-.07	-.04	.04	**.58**	.04	-.04	-.02	.03	.07	.10	.32	-.01	.07	.03
16. My privacy was respected.	-.06	.03	-.09	.18	-.10	-.08	.01	-.03	-.04	.27	.49	-.03	.04	.00
17. My friends were welcomed in our home.	.01	-.04	.01	.02	-.01	-.22	-.04	-.02	.00	**.53**	.26	-.11	-.04	-.03
18. I was provided with clothes, toys, and other equipment I needed.	-.01	-.02	.00	.06	-.05	-.04	-.06	.00	.04	**.79**	.03	.12	-.01	.04
19. I was given pocket money.	-.13	.12	-.04	-.04	.01	.01	.03	-.02	.02	**.60**	-.08	-.04	.21	-.03
2. I could ask for things without difficulty.	-.06	.07	-.02	.09	.00	.02	.02	-.02	.06	**.64**	.04	-.08	.20	.00
21. I was encouraged to achieve.	-.18	.02	.03	.03	-.03	-.01	.02	-.03	**.72**	.02	-.02	-.04	.02	-.21
22. I was cared for when physically unwell.	.05	-.14	.02	.28	-.04	.02	-.05	-.11	.37	.20	-.09	.05	.09	.01
23. I learned skills from them.	.01	-.05	.02	.15	-.04	-.02	-.07	.00	**.54**	.04	.01	.00	.44	.05
24. I received helpful advice to problems or questions I had.	.04	-.01	-.01	.33	-.09	-.05	.01	-.02	**.50**	.00	.10	-.01	.32	.06

25. I was encouraged to learn at school.	-.05	.08	-.10	.00	.06	.03	.02	-.11	**.86**	.02	.05	.04	-.02	-.16
26. An interest was taken in my educational progress.	-.15	-.02	-.03	.22	-.01	-.01	-.18	.10	**.60**	.03	-.05	.04	-.03	-.04

Appendix II

This appendix includes the Socio-demographic Questionnaire, the Socio-demographic Questionnaire for the parent/guardian and the full pack of Questionnaires that were sent at the homes of the participants or that were administered in In-Unit-Assessments.

NSPN
NeuroScience in Psychiatry Network

Sociodemographic Questionnaire

(Participant)

Study ID: _____

Date: __ / __ / ____

Please try to complete all the questions in this booklet. Remember that all your answers are confidential.

If you need any help completing this questionnaire, please contact us:

London Team: info.ucl@nspn.org.uk or 020 7443 2214

Cambridge Team: info.cam@nspn.org.uk or 01223 746075

U-Change | Cambridgeshire and Peterborough NHS | wellcome trust Strategic Award | UCL | UNIVERSITY OF CAMBRIDGE | NHS National Institute for Health Research

A) Information about you

A1. Are you a twin?

☐ Yes ☐ No

A2. Are you adopted or fostered?

☐ Yes **If yes**, at what age? ____

☐ No **If no**, how many weeks was the pregnancy? ____ ☐ Don't know

A3. To your knowledge, were there any complications with the pregnancy, labour and/or delivery of you?

☐ Yes **If yes**, please describe: _____

☐ No

☐ Don't know

A4. How would you describe your ethnic origin?

White:

☐ English/Welsh/Scottish/Northern Irish/British ☐ Irish ☐ Gypsy or Irish Traveller

☐ Any other White background – please specify: _____

Mixed/multiple ethnic groups:

☐ White and Black Caribbean ☐ White and Black African ☐ White and Asian

☐ Any other Mixed/multiple ethnic background – please specify: _____

Asian/Asian British:

☐ Indian ☐ Pakistani ☐ Bangladeshi ☐ Chinese

☐ Any other Asian background – please specify: _____

Black/African/Caribbean/Black British:

☐ African ☐ Caribbean

☐ Any other Black/African/Caribbean background – please specify: _____

Other ethnic group:

☐ Arab ☐ Any other ethnic group – please specify: _____

☐ **Decline to state**

A5. Where were you born?

Country_____Town/Village_____Postcode (if known)_____

If born outside the UK, how old were you when you first moved here? _____ years old

A6. Where did you mainly live until the age of 11 years old?

Country_____Town/Village_____Postcode (if known)_____

A7. Where did you mainly live between the age 12 and leaving school, or from 12 until now if you are still at school?

Country_____Town/Village_____Postcode (if known)_____ ____

B) Education

B1. At what age did your parents leave secondary school?

Mother: _____ ☐ Don't know **Father:** _____ ☐ Don't know

B2. Have your parents completed any more years of full-time education?

Mother: ☐ Yes **If yes**, how many years? _____ ☐ No ☐ Don't know

Father: ☐ Yes **If yes**, how many years? _____ ☐ No ☐ Don't know

B3. Please tick any qualifications you or your family have.

	You	Mother	Father	Mother's partner (if applicable)	Father's partner (if applicable)
GCSEs / O levels or equivalent					
A levels or equivalent					
First degree (e.g. BSc)					
Higher degree (e.g. MSc, PhD)					
Professional qualifications (e.g. teaching, nursing, accountancy)					
Other vocational / work-related qualifications					
No qualifications					
Don't know					
Decline to state					
Not applicable					

C) Family current employment

C1. Please tick your family's employment status.

	You	Mother	Father	Mother's partner (if applicable)	Father's partner (if applicable)
Full-time education					
Full-time work					
Part-time work					
Full-time in the home					
Unemployed / looking for work					
Unemployed for medical reasons					
Other (please describe, e.g. retired)					
Decline to state					
Don't know					
Not applicable					

C2. If you or your family members are in paid work, please state their current occupation:

You:_____
☐ Decline to state ☐ Don't know ☐ Not applicable

Mother: _____
☐ Decline to state ☐ Don't know ☐ Not applicable

Father: _____
☐ Decline to state ☐ Don't know ☐ Not applicable

Mother's partner (if applicable): _____
☐ Decline to state ☐ Don't know ☐ Not applicable

Father's partner (if applicable): _____
☐ Decline to state ☐ Don't know ☐ Not applicable

D) Your health

D1. Are you **currently** being treated for any emotional, behavioural or mental health problem?
☐ Yes ☐ No
If yes, please specify diagnosis, age at diagnosis and treatment: _____

_____

D2. Have you had any similar or related problems in the **past**?
☐ Yes ☐ No
If yes, please specify diagnosis, age at diagnosis and treatment: _____

_____

D3. Are you **currently** being treated for drug or alcohol dependency?
☐ Yes ☐ No
If yes, please specify diagnosis, age at diagnosis and treatment: _____

_____

D4. Have you had or been treated for drug or alcohol dependency in the **past**?
☐ Yes ☐ No
If yes, please specify diagnosis, age at diagnosis and treatment: _____

_____

D5. Are you currently participating in a clinical trial of a medicine, or have you participated in one in the last 12 months?
☐ Yes ☐ No
If yes, please specify: _____

_____

D6. Do you have a current or past history of neurological disorders or trauma including epilepsy, or head injury causing loss of consciousness?

☐ Yes ☐ No

If yes, please specify diagnosis, age at diagnosis and treatment: _____

_____

D7. Do you have any **current or past** medical problems which require/d treatment and affect/ed your daily life?

☐ Yes ☐ No

If yes, please specify diagnosis, age at diagnosis and treatment: _____

_____

D8. Do you have a learning disability which requires or required specialist educational support and/or medical treatment?

☐ Yes ☐ No

If yes, please specify diagnosis, age at diagnosis and treatment: _____

_____

E) Your family's health

E1. Does any other family member **currently** suffer from any medical, emotional, behavioural or mental health problems which require treatment or affect his/her daily life?

☐ Yes ☐ No

If yes, please specify the family member, diagnosis, year of diagnosis and treatment:

_____

_____

E2. Has any other family member had any medical, emotional, behavioural or mental health problems in the **past**?

☐ Yes ☐ No

If yes, please specify the family member, diagnosis, year of diagnosis and treatment:

_____

_____

Thank you for completing this questionnaire.

NSPN
NeuroScience in Psychiatry Network

Questionnaire Pack

Study ID: _____

Date: __ / __ / ____

Please try to complete all the questionnaires in this booklet. Remember that all your answers are confidential and will be stored anonymously.

If you need any help completing the questionnaires, please contact us:

Cambridge: info.cam@nspn.org.uk or 01223 746075

London: info.ucl@nspn.org.uk or 0207 443 2214

Thank you for your help!

U-Change | Cambridgeshire and Peterborough NHS | wellcome trust Strategic Award | UCL | UNIVERSITY OF CAMBRIDGE | NHS National Institute for Health Research

This form is about how you might have been feeling or acting recently. For each item please tick how often you have *felt or acted* in this way over the past two weeks.

- **If a sentence was true about you *all the time* over the past two weeks, tick Always.**
- **If it was true *most of the time*, tick Mostly.**
- **If it was true *only sometimes*, tick Sometimes.**
- **If you *never* felt like that over the past two weeks, tick Never.**

	Always	Mostly	Sometimes	Never
1. I felt miserable or unhappy.				
2. I didn't enjoy anything.				
3. I was less hungry than usual.				
4. I ate more than usual.				
5. I felt so tired I just sat around and did nothing.				
6. I was moving and walking more slowly than usual.				
7. I was very restless.				
8. I felt I was no good any more.				
9. I sometimes blamed myself for things that weren't my fault.				
10. It was hard for me to make up my mind.				
11. I got grumpy and cross easily.				
12. I felt like talking a lot less than usual.				
13. I was talking more slowly than usual.				
14. I cried a lot.				
15. I thought there was nothing good for me in the future.				
16. I thought that life was not worth living.				
17. I thought about dying.				
18. I thought my family would be better off without me.				
19. I thought about killing myself.				
20. I didn't want to see my friends.				
21. I found it hard to think properly or concentrate.				

	Always	Mostly	Sometimes	Never
22. I thought bad things would happen to me.				
23. I hated myself.				
24. I was a bad person.				
25. I thought I looked ugly.				
26. I worried about aches and pains.				
27. I felt lonely.				
28. I thought nobody really loved me.				
29. I didn't have any fun at school / college / work.				
30. I thought I could never be as good as other people my age.				
31. I did everything wrong.				
32. I didn't sleep as well as usual.				
33. I slept more than usual.				
34. I had trouble making up my mind.				
35. I worried when things did not go the right way for me.				
36. Others seemed to do things more easily than I could.				
37. Often I had trouble getting breath.				
38. I worried a lot of the time.				
39. I was afraid of a lot of things.				
40. I got angry easily.				
41. I worried about what my parents would say to me.				
42. I felt that others did not like the way I did things.				
43. It was hard for me to get to sleep at night.				
44. I worried about what other people thought about me.				
45. I felt alone even when there were people with me.				
46. Often I felt sick to my stomach.				

	Always	Mostly	Sometimes	Never
47. My feelings got hurt easily.				
48. My hands felt sweaty.				
49. I was tired a lot.				
50. I worried about what was going to happen.				
51. Other people my age were happier than me.				
52. I had bad dreams.				
53. My feelings got hurt easily when I was fussed at.				
54. I felt someone would tell me I did things the wrong way.				
55. I wake up scared some of the time.				
56. I worried when I went to bed at night.				
57. It was hard for me to keep my mind on my work.				
58. I wiggled in my seat a lot.				
59. I worried.				
60. A lot of people were against me.				
61. I often worried about something bad happening to me.				
62. I felt I had to do things in a certain way, like counting or saying special words, to stop something bad from happening.				
63. I had trouble finishing my homework or other jobs because I had to do things over and over again.				
64. I hated dirt and dirty things.				
65. I had a special number that I counted up to, or I felt I had to do things just that number of times.				
66. I often felt guilty or bad about things I had done even though no one else thought I had done anything wrong.				
67. I worried about being clean enough.				
68. I moved or talked in a special way to avoid bad luck.				
69. I worried a lot if I did something not exactly the way I liked.				
70. I was fussy about keeping my hands clean.				
71. I had special numbers or words that I said because I hoped they kept bad luck or bad things away.				

	Always	Mostly	Sometimes	Never
72. I kept thinking about things that I had done because I wasn't sure that they were the right things to do.				
73. I deliberately broke the rules or disobeyed people (e.g. parents, teachers or supervisors).				
74. I stole things (e.g. from home or a shop or school).				
75. I deliberately damaged property (e.g. broke windows or chairs or wrote graffiti or started fires).				
76. I deliberately hurt or threatened someone (e.g. bullying or fighting).				
77. I skipped lessons/work, skived, or played truant from school / college / work.				
78. I deliberately lied or cheated to get what I wanted.				
79. I ran away from home (e.g. for half a day or overnight).				
80. I threatened or forced someone to give their money or other belongings to me.				
81. I broke into someone else's property (e.g. into a house or a car).				
82. I have carried or used a weapon in a fight (e.g. a knife or a stick).				
83. I have deliberately hurt or been cruel to an animal (e.g. a pet).				
84. At times, I thought I was no good at all.				
85. I was satisfied with myself.				
86. I felt I had a number of good qualities.				
87. I was able to do things as well as most people.				
88. I felt I did not have much to be proud of.				
89. I certainly felt useless at times.				
90. I felt that I was as good as anyone else.				
91. I wished I could have more respect for myself.				
92. I felt that I was a failure.				
93. I took a positive attitude towards myself.				

These questions all refer to the **past year and a half**. We would like to know about experiences that have happened to you, your family and closest friends over the past 18 months. Please give **dates** for all experiences in **month and year** format if at all possible.

We would also like you to **rate** how **you felt** at the time of **each experience** on a scale of 1 to 5, as follows:

1 = very pleasant/happy
2 = quite pleasant/happy
3 = neither pleasant nor unpleasant
4 = quite unpleasant/sad/painful
5 = very unpleasant/sad/painful

1. Have you changed school/college/job in the past 18 months? **YES** **NO** **(Please circle)**

   If YES, how many times has this happened in the past 18 months? _____

   Please describe the event. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful: **Date(s)** **Rate (circle)**

   _____ ___/___ **1 2 3 4 5**

   _____ ___/___

   ⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

2. Have there been any changes in the number of people in your household in the past 18 months? Has anyone left or joined your family? **YES** **NO** **(Please circle)**

   If YES, how many times has this happened in the past 18 months? _____

   Please describe the change(s). **If more than one change**, please select the *one* that you found to be the most unpleasant/sad/painful: **Date(s)** **Rate (circle)**

   _____ ___/___ **1 2 3 4 5**

   _____ ___/___

   ⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

3. Have you moved house in the last 18 months? **YES** **NO** **(Please circle)**

   If YES, how many times has this happened in the past 18 months? _____

   Please describe the move. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful: **Date(s)** **Rate (circle)**

   _____ ___/___ **1 2 3 4 5**

   _____ ___/___

   ⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

1 = very pleasant/happy 2 = quite pleasant/happy 3 = neither pleasant nor unpleasant 4 = quite unpleasant/sad/painful 5 = very unpleasant/sad/painful

4. Have there been any disasters at home over the past 18 months - like a fire, a flood or a burglary? **YES** **NO** **(Please circle)**

If YES, how many times has this happened in the past 18 months? _____

Please describe the event. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful: **Date(s)** **Rate (circle)**

_____ ___/___ **1 2 3 4 5**

_____ ___/___

⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

5. Over the past 18 months have you taken part in anything particularly **enjoyable** outside of school/college/work? **YES** **NO** **(Please circle)**

If YES, how many times has this happened in the past 18 months? **0 1 2 3 4 or more times (Please circle)**

Please describe the event. **If more than one**, please select the *one* that you found to be the most pleasant/happy: **Date(s)** **Rate (circle)**

_____ ___/___ **1 2 3 4 5**

_____ ___/___

6. Over the last 18 months, have you or any of your family or close friends had a serious illness or accident? **YES** **NO** **(Please circle)**

If YES, how many times has this happened in the past 18 months? _____

Please describe the event. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful: **Date(s)** **Rate (circle)**

_____ ___/___ **1 2 3 4 5**

_____ ___/___

⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

1 = very pleasant/happy 2 = quite pleasant/happy 3 = neither pleasant nor unpleasant 4 = quite unpleasant/sad/painful 5 = very unpleasant/sad/painful

7. Over the last 18 months, have you or any of your family or close friends spent time in the hospital? **YES** **NO** **(Please circle)**

If YES, how many times has this happened in the past 18 months? _____

Please describe the event. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful:

	Date(s)	**Rate (circle)**
_____	___/___	**1 2 3 4 5**
_____	___/___	

⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

8. In the last 18 months, have any of your family or close friends died? **YES** **NO** **(Please circle)**

If YES, how many times has this happened in the past 18 months? _____

Please describe the event. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful:

	Date(s)	**Rate (circle)**
_____	___/___	**1 2 3 4 5**
_____	___/___	

⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

9. Have you lost a family pet in the last 18 months? **YES** **NO** **(Please circle)**

If YES, how many times has this happened in the past 18 months? _____

Please describe the event. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful:

	Date(s)	**Rate (circle)**
_____	___/___	**1 2 3 4 5**
_____	___/___	

⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

1 = very pleasant/happy 2 = quite pleasant/happy 3 = neither pleasant nor unpleasant 4 = quite unpleasant/sad/painful 5 = very unpleasant/sad/painful

10. Over the last 18 months, have you lost touch with any good friends (e.g., moved away, changed schools, etc.)? **YES** **NO** **(Please circle)**

    If YES, how many times has this happened in the past 18 months? _____

    Please describe the event. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful: **Date(s)** **Rate (circle)**

    _____ ___/___ **1 2 3 4 5**

    _____ ___/___

⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

11. Over the last 18 months, have you had any particular problems or difficulties with your friendships? **YES** **NO** **(Please circle)**

    If YES, how many times has this happened in the past 18 months? _____

    Please describe the event. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful: **Date(s)** **Rate (circle)**

    _____ ___/___ **1 2 3 4 5**

    _____ ___/___

⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

12. Is there any event that occurred over the past 18 months involving you, your family or close friends that should be mentioned? **YES** **NO** **(Please circle)**

    If YES, how many times has this happened in the past 18 months? _____

    Please describe the event. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful: **Date(s)** **Rate (circle)**

    _____ ___/___ **1 2 3 4 5**

    _____ ___/___

⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

13. Thinking about things that upset you a lot, are there any other really important things that have happened to you before the last 18 months? **YES** **NO** **(Please circle)**

    If YES, how many times has this happened in your lifetime (excluding the 18 months)? _____

    Please describe the event. **If more than one**, please select the *one* that you found to be the most unpleasant/sad/painful: **Date(s)** **Rate (circle)**

    _____ ___/___ **1 2 3 4 5**

    _____ ___/___

⇨ If you circled 4 or 5, were you upset about this for *more than* 2 weeks? **YES** **NO** **(Please circle)**

1 = very pleasant/happy 2 = quite pleasant/happy 3 = neither pleasant nor unpleasant 4 = quite unpleasant/sad/painful 5 = very unpleasant/sad/painful

These questions concern how you have been feeling over the past 30 days.

Tick a box by each question that best represents how you have been.

	None of the time	A little of the time	Some of the time	Most of the time	All of the time
1. During the last 30 days, about how often did you feel tired out for no good reason?					
2. During the last 30 days, about how often did you feel nervous?					
3. During the last 30 days, about how often did you feel so nervous that nothing could calm you down?					
4. During the last 30 days, about how often did you feel hopeless?					
5. During the last 30 days, about how often did you feel restless or fidgety?					
6. During the last 30 days, about how often did you feel so restless you could not sit still?					
7. During the last 30 days, about how often did you feel depressed?					
8. During the last 30 days, about how often did you feel that everything was an effort?					
9. During the last 30 days, about how often did you feel so sad that nothing could cheer you up?					
10. During the last 30 days, about how often did you feel worthless?					

Please read each statement and decide how well it describes you. Mark your answer by ticking in the appropriate column for each statement. Please do not leave any statement unticked.

	0 Not at all true	1 Sometimes true	2 Definitely true
1. You blame others for your mistakes.			
2. You engage in illegal activities.			
3. You care about how well you do at school / work.			
4. You act without thinking of the consequences.			
5. Your emotions are shallow and fake.			
6. You lie easily and skillfully.			
7. You are good at keeping promises.			
8. You brag a lot about your abilities, accomplishments, or possessions.			
9. You get bored easily.			
10. You use or 'con' other people to get what you want.			
11. You tease or make fun of other people.			
12. You feel bad or guilty when you do something wrong.			
13. You do risky or dangerous things.			
14. You act charming and nice to get things you want.			
15. You get angry when corrected or punished.			
16. You think you are better or more important than other people.			
17. You do not plan ahead or you leave things until the last minute.			
18. You are concerned about the feelings of others.			
19. You hide your feelings or emotions from others.			
20. You keep the same friends.			

These questions are of your personality. When you answer these questions, please think about the last 12 months and tick the box that you feel best describes you.

	Not at all	Just a little	Pretty much / pretty often	Very much / very often
1. Are you curious?				
2. Are you friendly?				
3. Are you daring and adventurous?				
4. Do you do things to help other people your age without being asked?				
5. Do you try to do excellent work in school or at work?				
6. Do you like rough games and sports?				
7. Would you feel guilty if you did something that broke the law?				
8. Are you smooth and charming when you are trying to get your way?				
9. Do you enjoy doing things that are risky or dangerous?				
10. Do you react with little or no emotion to both positive and negative things?				
11. Do you like things that are exciting and loud?				
12. Do you keep your true feelings to yourself?				
13. Are you good at telling lies that other people believe?				
14. Would it bother you if you didn't have a close friend?				
15. Do you like things to stay the same and not change?				
16. Do you avoid situations where you might get hurt?				
17. Do you share your things with other people without being asked?				
18. Are you shy with other people your age?				
19. Do you feel bad for other people when they get hurt?				
20. Are you emotional?				
21. Would you get upset if you saw an animal being hurt?				

	Not at all	Just a little	Pretty much / pretty often	Very much / very often
22. Do you enjoy bothering or hurting other people your age?				
23. Are you easily embarrassed?				
24. Do you like TV, movies, comics, or electronic games with a lot of violence in them?				
25. Are you afraid of people your age who like to fight?				
26. Do you think it's funny when other people your age are upset?				
27. Are you more interested in sex than other people your age?				
28. Do you get upset easily?				
29. Do you enjoy doing what you are told not to do?				
30. Do you get bored easily?				
31. Are you carefree?				
32. Do you like meeting new people your age?				
33. Do you enjoy it when other people say you did a good job?				
34. Do you try to cheer up other people your age who are sad or upset?				
35. Do you like to scare other people your age?				
36. Do you react intensely when you get upset?				
37. Do you feel sorry for kids who get picked on?				
38. Are you cautious?				
39. Would you think it would be fun to watch two dogs fight?				
40. Are you selfish?				
41. Do you want everyone to follow the rules, including yourself?				
42. Do you care about other people's feelings?				
43. Do you enjoy learning about new and interesting things?				
44. Are you calm and easy-going?				

	Not at all	Just a little	Pretty much / pretty often	Very much / very often
45. Do you enjoy being with other people your age?				
46. Do you exaggerate things and blow them out of proportion?				
47. Are you jealous of what other people have?				
48. Are you concerned about what is right and wrong?				
49. Do your moods change unpredictably?				
50. Are you brave?				
51. Are you energetic when you have a job to do?				
52. Are you enthusiastic about life?				
53. When you have something to do, are you determined to get it done?				
54. Do you feel confident that you can handle life's challenges?				
55. Are you a self-starter, who does things you need to do without being told?				
56. Are you proud of yourself?				
57. Are you cheerful?				

Please answer each question honestly. Remember that all your answers are confidential. Please answer by ticking the box next to the answer that best describes what you do.

1. During the last month, how often did you smoke a cigarette/s?		**0** – never **1** – occasionally (say up to 2 days a week) **2** – often (say 3-5 days a week) **3** – every day or nearly every day
2. During the last month, on the days you smoked, **on average** how many cigarettes did you smoke per day?		**0** – I didn't smoke **1** – 1-10 cigarettes a day **2** – 11-20 cigarettes a day **3** – more than 20 cigarettes a day
3. During the last month, how often did you drink beer or cider?		**0** – never **1** – occasionally (say up to 2 days a week) **2** – often (say 3-5 days a week) **3** – every day or nearly every day
4. During the last month, how often did you drink wine?		**0** – never **1** – occasionally (say up to 2 days a week) **2** – often (say 3-5 days a week) **3** – every day or nearly every day
5. During the last month, how often did you drink spirits? *(e.g. gin, vodka, whisky)*		**0** – never **1** – occasionally (say up to 2 days a week) **2** – often (say 3-5 days a week) **3** – every day or nearly every day
6. During the last month, how often did you drink alcopops? *(e.g. Bacardi Breezer, WKD, Smirnoff)*		**0** – never **1** – occasionally (say up to 2 days a week) **2** – often (say 3-5 days a week) **3** – every day or nearly every day
7. Have you **ever** been drunk? *(e.g. were sick, fell over, forgot what you had been doing, were hungover, couldn't carry on the next day)*		**0** – no **1** – yes
8. In the last 6 months, how often have you been drunk in the way described in question 7?		**0** – never **1** – less than once a month **2** – one to three times a month **3** – once a week or more
9. During the last month, how often did you take / use cannabis?		**0** – never **1** – occasionally (say up to 2 days a week) **2** – often (say 3-5 days a week) **3** – every day or nearly every day
10. During the last month, how often did you take / use other drugs? What did you take? _____		**0** – never **1** – occasionally (say up to 2 days a week) **2** – often (say 3-5 days a week) **3** – every day or nearly every day
11. In the last month, have you tried to hurt yourself on purpose without trying to kill yourself? If no, go to 14		0 – No 1 – Yes On how many days? _____

12. What do you do? (tick the answers that apply to you)		1 – scratch skin
		2 – cut or carve skin
		3 – burn skin
		4 – bang, hit or punch parts of your body
		5 – ingest substances
		6 – Other please specify_____
13. What best describes your reason for hurting yourself? (tick the answers that apply to you)		1 – I felt very unhappy or depressed
		2 – I wanted to distract myself from my problems
		3 – I wanted to get back at someone
		4 – I wanted to punish myself
		5 – I wanted to know how it would feel
		6 – I was bored
		7 – I was high or drunk
		8 – It made me feel like I was in control
		9 – I wanted to be noticed
		10 – I wanted to feel something
14. Excluding the last month, have you tried to hurt yourself on purpose without trying to kill yourself in the last 12 months?		0 – No
		1 – Yes On how many days? _____
15. What did you do? (tick the answers that apply to you)		1 – scratched skin
		2 – cut or carved skin
		3 – burnt skin
		4 – banged, hit or punched parts of your body
		5 - ingested substances
		6 - other please specify_____
16. What best describes your reason for hurting yourself? (tick the answers that apply to you)		1 – I felt very unhappy or depressed
		2 – I wanted to distract myself from my problems
		3 – I wanted to get back at someone
		4 – I wanted to punish myself
		5 – I wanted to know how it would feel
		6 – I was bored
		7 – I was high or drunk
		8 – It made me feel like I was in control
		9 – I wanted to be noticed
		10 – I wanted to feel something

Please read each statement below and tick whether or not you feel it applies to you.

	YES	NO
1. Do you sometimes feel that things you see on the TV or read in the newspaper have a special meaning for you?		
2. I sometimes avoid going to places where there will be many people because I will get anxious.		
3. Have you had experiences with the supernatural?		
4. Have you often mistaken objects or shadows for people, or noises for voices?		
5. Other people see me as slightly eccentric (odd).		
6. I have little interest in getting to know other people.		
7. People sometimes find it hard to understand what I am saying.		
8. People sometimes find me aloof and distant.		
9. I am sure I am being talked about behind my back.		
10. I am aware that people notice me when I go out for a meal or to see a film.		
11. I get very nervous when I have to make polite conversation.		
12. Do you believe in telepathy (mind-reading)?		
13. Have you ever had the sense that some person or force is around you, even though you cannot see anyone?		
14. People sometimes comment on my unusual mannerisms and habits.		
15. I prefer to keep myself to myself.		
16. I sometimes jump quickly from one topic to another when speaking.		
17. I am not good at expressing my true feelings by the way I talk and look.		
18. Do you often feel that other people have it in for you?		
19. Do some people drop hints about you or say things with a double meaning?		
20. Do you ever get nervous when someone is walking behind you?		
21. Are you sometimes sure that other people can tell what you are thinking?		
22. When you look at a person, or yourself in a mirror, have you ever seen the face change right before your eyes?		
23. Sometimes other people think that I am a little strange.		
24. I am mostly quiet when with other people.		
25. I sometimes forget what I am trying to say.		
26. I rarely laugh and smile.		

	YES	NO
27. Do you sometimes get concerned that friends or co-workers are not really loyal or trustworthy?		
28. Have you ever noticed a common event or object that seemed to be a special sign for you?		
29. I get anxious when meeting people for the first time.		
30. Do you believe in clairvoyancy (psychic forces, fortune telling)?		
31. I often hear a voice speaking my thoughts aloud.		
32. Some people think that I am a very bizarre person.		
33. I find it hard to be emotionally close to other people.		
34. I often ramble on too much when speaking.		
35. My "nonverbal" communication (smiling and nodding during a conversation) is not very good.		
36. I feel I have to be on my guard even with friends.		
37. Do you sometimes see special meanings in advertisements, shop windows, or in the way things are arranged around you?		
38. Do you often feel nervous when you are in a group of unfamiliar people?		
39. Can other people feel your feelings when they are not there?		
40. Have you ever seen things invisible to other people?		
41. Do you feel that there is no one you are really close to outside of your immediate family, or people you can confide in or talk to about personal problems?		
42. Some people find me a bit vague and elusive during a conversation.		
43. I am poor at returning social courtesies and gestures.		
44. Do you often pick up hidden threats or put-downs from what people say or do?		
45. When shopping do you get the feeling that other people are taking notice of you?		
46. I feel very uncomfortable in social situations involving unfamiliar people.		
47. Have you had experiences with astrology, seeing the future, UFOs, ESP, or a sixth sense?		
48. Do everyday things seem unusually large or small?		
49. Writing letters to friends is more trouble than it is worth.		
50. I sometimes use words in unusual ways.		
51. I tend to avoid eye contact when conversing with others.		
52. Have you found that it is best not to let other people know too much about you?		
53. When you see other people talking to each other, do you often wonder if they are talking about you?		

	YES	NO
54. I would feel very anxious if I had to give a speech in front of a large group of people.		
55. Have you ever felt that you are communicating with another person telepathically (by mind-reading)?		
56. Does your sense of smell sometimes become unusually strong?		
57. I tend to keep in the background on social occasions.		
58. Do you tend to wander off the topic when having a conversation?		
59. I often feel that others have it in for me.		
60. Do you sometimes feel that other people are watching you?		
61. Do you ever suddenly feel distracted by distant sounds that you are not normally aware of?		
62. I attach little importance to having close friends.		
63. Do you sometimes feel that people are talking about you?		
64. Are your thoughts sometimes so strong that you can almost hear them?		
65. Do you often have to keep an eye out to stop people from taking advantage of you?		
66. Do you feel that you cannot get “close” to people?		
67. I am an odd, unusual person.		
68. I do not have an expressive and lively way of speaking.		
69. I find it hard to communicate clearly what I want to say to people.		
70. I have some eccentric (odd) habits.		
71. I feel very uneasy talking to people I do not know well.		
72. People occasionally comment that my conversation is confusing.		
73. I tend to keep my feelings to myself.		
74. People sometimes stare at me because of my odd appearance.		

Below are some statements about feelings and thoughts.

Please tick the box that best describes your experience of each over the last two weeks.

	None of the time	Rarely	Some of the time	Often	All of the time
1. I've been feeling optimistic about the future.	1	2	3	4	5
2. I've been feeling useful.	1	2	3	4	5
3. I've been feeling relaxed.	1	2	3	4	5
4. I've been feeling interested in other people.	1	2	3	4	5
5. I've had energy to spare.	1	2	3	4	5
6. I've been dealing with problems well.	1	2	3	4	5
7. I've been thinking clearly.	1	2	3	4	5
8. I've been feeling good about myself.	1	2	3	4	5
9. I've been feeling close to other people.	1	2	3	4	5
10. I've been feeling confident.	1	2	3	4	5
11. I've been able to make up my own mind about things.	1	2	3	4	5
12. I've been feeling loved.	1	2	3	4	5
13. I've been interested in new things.	1	2	3	4	5
14. I've been feeling cheerful.	1	2	3	4	5

Please read each statement and decide how well it describes you. Mark your answer by ticking the appropriate box for each statement. Do not leave any statement unrated.

	Not at all true	Somewhat true	Very true	Definitely true
1. I express my feelings openly.				
2. What I think is "right" and "wrong" is different from what other people think.				
3. I care about how well I do at school or work.				
4. I do not care who I hurt to get what I want.				
5. I feel bad or guilty when I do something wrong.				
6. I do not show my emotions to others.				
7. I do not care about being on time.				
8. I am concerned about the feelings of others.				
9. I do not care if I get into trouble.				
10. I do not let my feelings control me.				
11. I do not care about doing things well.				
12. I seem very cold and uncaring to others.				
13. I easily admit to being wrong.				
14. It is easy for others to tell how I am feeling.				
15. I always try my best.				
16. I apologise (say I am sorry) to persons I hurt.				
17. I try not to hurt others' feelings.				
18. I do not feel remorseful when I do something wrong.				
19. I am very expressive and emotional.				
20. I do not like to put the time into doing things well.				
21. The feelings of others are unimportant to me.				
22. I hide my feelings from others.				
23. I work hard on everything I do.				
24. I do things to make others feel good.				

People differ in the ways they act and think in different situations. This is a test to measure some of the ways in which you act and think. Read each statement and put a tick in the appropriate box. Do not spend too much time on any statement. Answer quickly and honestly.

	Rarely	Occasionally	Often	Always
1. I plan tasks carefully.				
2. I do things without thinking.				
3. I make-up my mind quickly.				
4. I am happy go lucky.				
5. I don't "pay attention."				
6. I have "racing thoughts."				
7. I plan trips well ahead of time.				
8. I am self-controlled.				
9. I concentrate easily.				
10. I save regularly.				
11. I "squirm" at plays and lectures.				
12. I am a careful thinker.				
13. I plan for job security.				
14. I say things without thinking.				
15. I like to think about complex problems.				
16. I change jobs.				
17. I act "on impulse".				
18. I get easily bored when solving thought problems.				
19. I act on the spur of the moment.				
20. I am a steady thinker.				
21. I change residences.				
22. I buy things on impulse.				
23. I can only think about one thing at a time.				
24. I change hobbies.				
25. I spend or charge more than I earn.				
26. I often have extraneous thoughts when thinking.				
27. I am more interested in the present than the future.				
28. I am restless at the theatre or lecture.				
29. I like puzzles.				
30. I am future orientated.				

Below are some statements about families. Please read each statement carefully, and decide how well it describes your own family. If you feel a statement is true for some family members and false for others, answer according to your best *overall* impression.

Try not to spend too much time thinking about each statement, but respond as quickly and as honestly as you can by **ticking a box**. If you have trouble with one, answer with your first reaction. Remember, do not try to figure out how other members see your family; we would like to know what your family **seems like to you**.

	Strongly agree	Agree	Disagree	Strongly disagree
1. Planning family activities is difficult because we misunderstand each other.				
2. We cannot talk to each other about the sadness we feel.				
3. We feel accepted for what we are.				
4. We don't get along well together.				
5. We can express feelings to each other.				
6. In times of crisis we can turn to each other for support.				
7. We avoid discussing our fears and concerns.				
8. We are able to make decisions about how to solve problems.				
9. We confide in each other.				
10. There are lots of bad feelings in the family.				
11. Individuals are accepted for what they are.				
12. Making decisions is a problem for our family.				

The following questions are about your friendships.
Please **circle** the answer that **best describes** how you feel about your friendships.

1. Are you happy with the **number** of friends you've got at the moment?			
Very happy	**Quite happy**	**Not very happy**	**Unhappy**

2. How often do you arrange to see friends **other than at school, college or work**?					
Almost every day	**More than once a week**	**Once a week**	**Less than once a week**	**Hardly ever**	**Never**

3. Do you feel that your friends understand you?			
Most of the time	**Sometimes**	**Not often**	**Not at all**

4. Can you confide in your friends?			
Most of the time	**Sometimes**	**Not often**	**Not at all**

5. Do your friends ever laugh at you or tease you in a hurtful way?					
Almost every day	**More than once a week**	**Once a week**	**Less than once a week**	**Hardly ever**	**Never**

6. Do people **who aren't your friends** laugh at you or tease you in a hurtful way?					
Almost every day	**More than once a week**	**Once a week**	**Less than once a week**	**Hardly ever**	**Never**

7. Do you have arguments with your friends that upset you?					
Almost every day	**More than once a week**	**Once a week**	**Less than once a week**	**Hardly ever**	**Never**

8. Overall, how happy are you with your friendships?			
Very happy	**Quite happy**	**Not very happy**	**Unhappy**

9. If you are on Facebook, how many friends do you have on there?	
_____ friends	**I'm not on Facebook** ☐

The following are a number of statements about your family. Please rate each item as to how often it typically occurs in your home or used to occur, if you no longer live there. Please answer all items.

	Never	Almost Never	Sometimes	Often	Always
1. Your parents tell you that you are doing a good job.					
2. Your parents threaten to punish you and then do not do it.					
3. You go out without leaving a note or letting your parents know where you are going.					
4. You play games or do other fun things with your parents.					
5. You talk your parents out of punishing you after you have done something wrong.					
6. Your parents ask you about your day in school.					
7. You stay out in the evening past the time you are supposed to be home.					
8. Your parents help you with your homework.					
9. Your parents compliment you when you have done something well.					
10. Your parents praise you for behaving well.					
11. Your parents do not know the friends you are with.					
12. Your parents let you out of a punishment early (like lift restrictions earlier than they originally said).					
13. Your parents spank you with their hand when you have done something wrong.					
14. Your parents slap you when you have done something wrong.					
15. Your parents hit you with a belt or other object when you have done something wrong.					

During your first 16 years, how true are the following statements about your mother's behaviour towards you?

My mother…	Not true at all	Slightly true	Moderately true	Extremely true
1. was overprotective of me				
2. was verbally abusive of me				
3. was over-controlling of me				
4. sought to make me feel guilty				
5. ignored me				
6. was critical of me				
7. was unpredictable towards me				
8. was uncaring of me				
9. was physically violent or abusive to me				
10. was rejecting of me				
11. left me on my own a lot				
12. would forget about me				
13. was uninterested in me				
14. made me feel in danger				
15. made me feel unsafe				

During your first 16 years, how true are the following statements about your father's behaviour towards you?

My father…	Not true at all	Slightly true	Moderately true	Extremely true
1. was overprotective of me				
2. was verbally abusive of me				
3. was over-controlling of me				
4. sought to make me feel guilty				
5. ignored me				
6. was critical of me				
7. was unpredictable towards me				
8. was uncaring of me				
9. was physically violent or abusive to me				
10. was rejecting of me				
11. left me on my own a lot				
12. would forget about me				
13. was uninterested in me				
14. made me feel in danger				
15. made me feel unsafe				

The following are a number of statements about your family. Please rate each item as to how often it usually happens or used to happen when you lived at home. Please answer all items.

	Always	Mostly	Sometimes	Rarely
1. We spent quality time together.				
2. They attended school and social events which were important to me.				
3. I received physical affection (lots of hugs etc.).				
4. I knew they would come and get me from places if needed.				
5. They comforted me when I felt sad.				
6. If I was angry I was still listened to.				
7. They praised me when I did well.				
8. My ideas and interests were encouraged and supported.				
9. I felt I was a priority to them.				
10. I felt loved by them.				
11. I felt listened to.				
12. I could contact them whenever I needed to.				
13. My home was safe and secure.				
14. My opinions were valued.				
15. We talked about things I considered important.				
16. My privacy was respected.				
17. My friends were welcomed in our home.				
18. I was provided with clothes, toys, and other equipment I needed.				
19. I was given pocket money.				
20. I could ask for things without difficulty.				

	Always	Mostly	Sometimes	Rarely
21. I was encouraged to achieve.				
22. I was cared for when physically unwell.				
23. I learned skills from them.				
24. I received helpful advice to problems or questions I had.				
25. I was encouraged to learn at school.				
26. An interest was taken in my educational progress.				