Decomposing the Effect of Age on Altruism

A Mediation Analysis

Dominik Andreas Wiegand

(501990)

Erasmus School of Economics

MSc. Behavioural Economics

Supervisor P. van Bruggen (PhD)

Second assessor S.C. van der Zee

20. August 2019

Abstract

The present study aimed at creating a framework in order to decompose the link between age and altruism, as it was identified by past research, into its underlying factors. Five potential factors were suggested, particularly generativity, goal orientation towards growth, future time perspective and future self-continuity (for a temporal distance of 6 months and 10 years). In an online survey, participants of young, medium and older age completed a continuous measure of future self-continuity, a Dictator Game to determine altruism, a short task related to goal orientation and a short questionnaire related to generativity and future time perspective. Furthermore, demographic characteristics of the participants were recorded. The resulting data was tested for significant indirect effects of the proposed variables on the effect of age on altruism in a multiple mediation analysis, using bias-corrected confidence intervals. No significant mediation effects could be identified, however, results are not to be considered concluding, due to several limitations like selection effects, self-reporting bias and a limited incentive structure. Recommendations for future research were given.

Keywords: Altruism and Age, Mediation Analysis

DECOMPOSING THE EFFECT OF AGE ON ALTRUISM

1. INTRODUCTION

Since the beginning of mankind, humans have been in a conflict between helping others and helping themselves. For personal gain, people have been going to war, enslaved whole populations and exploited workers. One of the biggest crises of the modern era, the financial crisis of 2007, has partially been attributed to people acting selfishly (Hansen & Movahedi, 2010). For those situations, the way people behaved can often be explained by the ideas of classical economics. Already Adam Smith, in his groundbreaking work "The Wealth of Nations" (1776), argued that each individual acting in his own interest will eventually prove advantageous to the society as a whole. However, it is clear that people not always act purely out of self-interest, but often in an altruistic manner instead. Such altruistic behaviour is defined as acting in a way that benefits others, without benefitting the actor himself and potentially even carrying negative consequences (Rushton et al., 1986). While altruism is determined by many different factors, it appears that older people often behave less selfishly than younger people (Rushton et al., 1986; Freund & Blanchard-Fields, 2014). Such findings, however, while certainly giving a deeper insight into different age groups, do not find much practical application, because it is impossible to manipulate someone's age. Likewise, it is unlikely that age, which is nothing but time passed since birth, directly causes these effects on altruism. Instead, there must be underlying effects explaining the link between age and altruism. Past research, for example, suggests that concern for future generations, goal orientation towards growth, the perception of remaining lifetime (Freund & Blanchard-Fields, 2014) and similarity to the future self (Ersner-Hershfield et al., 2012) are potentially able to explain that link. In order to find out more about this association, it is the aim of the study at hand to answer the following research question: *To what extent can the effect of age on altruism be explained by differences in each generativity, goal orientation towards growth, future time perspective and future self-continuity?*

To do so, it is tested if these variables have a significant mediation effect on the association, realized by means of an online survey to collect data, which was then further investigated in a mediation analysis. The results of the analysis indicate that there was no mediation effect of any of the suggested factors, however, these results are likely to be biased by selection effects and due to self-reported values and should not be considered as final. Instead, the proposed framework has the potential to act as a guide for interested future researchers and with a few improvements can help to make meaningful findings. The remainder of this paper is organized as follows: The next section reviews past literature on altruism and its importance to research, offers a theoretical background on the suggested mediators and derives the research question. This is followed by a detailed description of the methodology used in order to collect and analyse the information of interest and information about the distribution of the sample, the hypotheses, the derived variables of interest and an illustration of the statistical model. In the last sections of the paper, the results are revealed, followed by an interpretation and discussion of the results in light of the given limitations. Finally, the paper ends with a conclusion.

2. LITERATURE REVIEW

In order to decompose age effects on altruism, theoretical background on altruism, the age effects and further determinants of altruism is needed first. This section presents a review of related past literature. At first, a definition of altruism to be followed throughout the paper is given, followed by a summary of past research about the determinants of altruism, its relationship with age and potential underlying factors and finally a review of methods used to determine altruism and to decompose established effects between a predictor and an outcome. While literature on the link between age and altruism is plentiful, its composition is mostly discussed theoretically and a standardized theoretical framework is required in order to find statistical support and gain a deeper understanding on the effect of age.

2.1 Altruism

Nowadays, research on altruism is a well-established and indispensable field of economic research and research in the Social Sciences, but this has not always been the case. Until the mid-20th century, it was often assumed that economic markets were driven by self-interest, rather than other-regarding preferences like altruism, as already discussed by Adam Smith among his many other notions (1776). In reality although, people often deviate from perfect rationality and selfishness. They often sacrifice something or suffer through negative consequences for the benefit of others, without expecting anything in return. Such behaviour has been described as altruistic (Rushton, 1984), which is the definition to be followed throughout this paper.

Kahneman et al. (1986) were one of the early economists to enter this field of research, proposing to complement standard economic theory with behavioural assumptions such as fairness. Their ideas have later been further developed by Eckel & Grossmann (1996) into the so-called Ultimatum Game and its no-response version the Dictator Game, which became the most established measure of altruism in economic contexts until today. These authors found that proposers were willing to share an initial endowment with others in both games, supporting the idea that economic agents do not always act perfectly rational. Findings giving similar indications were made in the Trust Game (Berg et al., 1995) as well as the Gift-exchange Game (Fehr et al., 1998). Today, it is known that altruism is not necessarily a deviation from rational behaviour, but that many people behave altruistically in a rational way, meaning they have consistent preferences to show such behaviour (Andreoni & Miller, 2002).

People act more or less altruistic and there are many determinants. In early research, it was found that altruism is affected by personal- and social norms so that people behave more generously because they believe it is expected by others (Berkowitz, 1972; Schwartz, 1977). Others who have been interested in the effect of feelings were able to find a strong positive effect of empathy on altruism (Krebs, 1975; Batson et al., 2002). Other substantial factors affecting altruism are of demographic nature. For instance, women were found to act in a more altruistic manner when

associated costs of that behaviour are high, while men act more altruistic when the costs are low (Andreoni & Vesterlund, 2001). Other researchers have found individuals of higher education to be giving more in a Dictator Game, implying a positive effect of education on altruism (Rooney et al. 2005; Havens et al., 2006). Also culture seems to matter, as researchers examined a relationship between nationality and altruism. In particular, the number of people helping strangers was higher for nations with lower economic productivity and vice versa (Levine et al., 2001). Other researchers similarly found wealthier people to care less about the redistribution of finances among the people (Dimick et al., 2014). However, there is no consensus within this field of research, as for example Bekkers (2007) contrarily found individuals with higher income to be giving more to charity. While there is not much research, working status is likely related to income and therefore another variable commonly controlled for. Further demographic factors of importance are political orientation and religious belief, which have both been related to altruism. Left-wing attitudes appeared to be associated with altruism and altruism was found to account for variance in people's political attitude (Zettler & Hilbig, 2010). As to religious belief, religious people were found to self-report higher altruism. Their assessment was furthermore confirmed by closely-related people, reducing the likelihood of the results being biased due to a self-report measure (Saroglou, 2005).

2.2 Altruism & Age

Besides the demographic determinants described, which are most often of time-invariant nature, altruism also appears to change with time, as it was found to be affected by an individual's age (Rushton et al., 1989; Freund & Blanchard-Fields, 2014). This is illustrated in a study from 1989 (Midlarsky & Hannah), in which it was determined that older people donated more, and also more often than younger people. Similar findings were made in more recent research by Freund & Blanchard-Fields (2014), according to which age was positively related to contributing to the public good, as opposed to making personal financial gains. Furthermore, in order to gain a better understanding of underlying factors potentially accounting for age-related changes in altruism, these authors presented a theoretical background. In particular, they hypothesised three channels through which the link between age and altruism potentially can be explained.

The first channel is generativity, which is a concept first introduced by Erik Erikson (1950), who described it as an individual's concern about future generations and their well-being, which relates to the earlier mentioned definition of altruism. Therefore, generativity can be considered to be one dimension of altruism (Freund, Blanchard-Fields, 2014). Furthermore, Erikson (1982) argued generativity to be related to changes in age. To provide empirical support for such claims, researchers have developed a self-report measure of generativity called the Loyola Generativity Scale (LGS; McAdams & De St. Aubin, 1992), consisting of a 20-item questionnaire. On a 4-point scale, participants have to rate how often several statements related to the future applied to themselves, for example: *"I feel as though my contributions will exist after I die."* A year later, the same researchers

could make use of the described measure to find that concern for future generations is higher for middle-aged people than for young people, yet remains stable between middle- and old age (McAdams et al., 1993). Other researchers in the field have criticized some of the LGS items to be focused too much on the individual himself and continuity of his own life, instead of linking to future generations, such as the statement: *"I think that I will be remembered for a long time after I die."* and developed a very similar scale with statements more related to future generations directly. The authors named their expansion the Social Generativity Scale (SGS; Morselli & Passini, 2015).

Another way to look at age-induced changes in altruism is from the perspective of resource availability. It is possible, that younger adults only appear to give less because they need the resources themselves and do not have enough to share. Psychologists have hypothesised that young adults have had a higher need for acquiring and showing off resources than middle-aged or older people because they had less life-time to gather a sufficient amount of resources to guarantee survival and health of themselves and their offspring (Freund & Riediger, 2001). Others have similarly argued resource-accumulation to be especially important for young adults because it increases their attraction to potential resource-rich partners and eventually the chance of reproduction (Buss, 1999). Particularly the wealth of resources relative to others seems to be important (Frederick & Loewenstein, 1999), and because young people had less lifetime to gather such wealth, they should be striving to gain more and more resources (Baltes et al., 1995). This idea finds further support from related research in the field of Goal Theory, which asked participants to state personal goals and then rate them on relatedness to each of the domains resource growth, resource maintenance and loss prevention (Baltes et. al, 2006). The findings indicated that younger people's goals are more oriented towards gaining resources than towards maintaining or preventing to lose resources. Older people, on the other hand, were more likely to already have found a partner and accumulated enough resources or a steady stream of resources to secure the well-being of themselves and their offspring.

Future time perspective (FTP) is the third potential factor, as it was found to be linked with both, age and altruistic behaviour. FTP describes as how limited or unlimited someone perceives their remaining lifetime, as described by Carstensen and Lang (2002). According to these researchers, future time perspective decreases as people grow older. Brandstaedter et al. (2010) argued that as time-perception declines, moral and ethical concerns become more important when making decisions in regard of goals and activities, although in this study the effect on altruism was only examined within a construct and not in isolation of other variables (Brandstaedter et al., 2010).

Self-continuity is yet another concept that has been examined in the context of age, as well as in the context of altruism, that was defined as someone's ability to project his or her current self onto his future- or past self (Chandler, 1994). For instance, past research has given indication for a positive association between self-continuity and altruism. According to one study, a lack of self-continuity with the future self 10 years from the present led individuals to make less ethical decisions and to show more unethical behaviour (Ersner-Hershfield et al., 2012). Recent findings showed that self-

continuity with the future self 6 months from now was significantly associated with a person's age (Rutt & Löckenhoff, 2017). Ersner-Hershfield et al. (2011) described that future self-continuity has three main underlying aspects:

Similarity to the future-self Empathy-related research offered evidence that people are more willing to help others whom they recognize as similar to themselves (Eisenberg & Miller, 1987). In an economic context, participants donated greater amounts when perceiving their counterpart as similar (Galak et al., 2011). Comparably, researchers found evidence supporting similarity of the future-self to have a positive effect on individual saving behaviour (Ersner-Hershfield et al, 2011).

Vividness of the future-self Vividness of the future-self is described as someone's ability to imagine his own future self and has also been found to affect choices with intertemporal consequences (Ersner-Hershfield et al., 2011). By manipulating vividness of the future self by making participants write a letter to themselves, or showing them a digitally created reflection of their own future self, researchers could induce participants to commit less delinquent deeds or cheat less on a following task (Van Gelder et al., 2013). Others additionally argued that people perceive future events which are easier to imagine also as more likely to take place (Kahneman & Tversky, 1973), and that better vividness of a future scenario increases the intensity of related emotions (Loewenstein, 1996). Also, the increasing vividness of the future self was found often to be accompanied by an increase in retirement savings (Ersner-Hershfield et al., 2011).

Positivity of the future self Having a different attitude towards the own future self can affect how we make long-term decisions. Since direct self-report measures are biased, due to healthy individuals generally being more positive towards their future self, researchers often make use of proxies instead. For instance, in one study it was found that a negative attitude towards the elderly decreased future cardiovascular health (Levy et al. 2009). Others could find similar results for this effect in the positive domain (Levy et al., 2002). Findings indicating that we perceive more overlap with others who practice positive emotions (Waugh & Fredrickson, 2006) further implies a possible link between positivity towards the future self and future self-continuity.

As it can be seen from the literature reviewed so far, the effect of age on altruism has many potential underlying factors, raising the question how this effect is composed more specifically and how much weight each underlying factor might carry.

2.3 Measuring & decomposing Altruism

A simple extension of an Ultimatum game from Kahneman et al. (1986) indicated that economic agents often deviate from perfectly selfish behaviour, as the authors observed participants to make choices benefiting others while carrying negative consequences for themselves. Other researchers have adapted and simplified their method into what is known as the Dictator Game (Forsythe et al., 1994; Eckel & Grossmann 1996), which has become the most known and widely-used measure of altruism. According to a meta-study, there are hundreds of contributions related to the Dictator Game

(Engel, 2010). In its essence, the Dictator Game is a game where a player is given a monetary endowment and gets the chance to share an amount with another, anonymous player who did not receive anything (Eckel & Grossmann 1996). Altruism can then be measured based on the amount given.

The present research is mostly interested in the composition of the effect of age on altruism. A common method within Psychology and Social sciences to better understand the relationship between two variables, by examining its underlying factors, is called mediation analysis. A mediator, as defined by Baron & Kenny (1986), is a variable that can partially or fully account for an association between an explanatory and a response variable. The primary objective of such an analysis is to identify how much of the direct link between an independent (*X*) and a dependent variable (*Y*) is mediated by a third variable (*M*). Important measures are the *total effect* which is made up of two parts, with the *direct effect* being the portion of the effect of *X* on *Y* that is not mediated, and the *indirect effect,* being the remaining portion that is mediated (Sobel, 1982). An illustration of the most simple mediation model can be seen in figure 1 below, where the direct effect is represented by *path c'* whereas the indirect effect equals to the sum of *path a*, the association between *X* an *M*, and *path b*, the association between *M* and *Y*. Summing up all paths results in the *total effect c.*

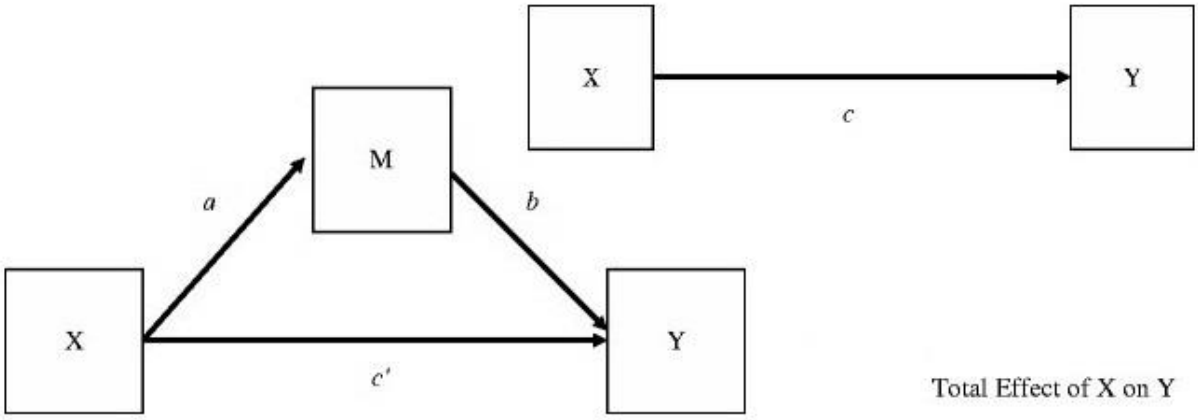

Figure 1: A simple mediation model as introduced by Sobel (1982) and Baron & Kenny (1986). Adapted from: "Two-Condition Within-Participant Statistical Mediation Analysis: A Path-Analytic Framework." by Amanda K. Montoya and Andrew F. Hayes (2017). Copyright 2016 by American Psychological Association.

The traditional mediation analysis as described by Barron and Kenny (1986) follows a logical sequence of three steps:

Firstly, the relationship between *X* and *Y* is tested for significance. Only if there is a significant direct effect (*path c'*) can a portion of the effect be mediated.

Secondly, the relationship between *X* and the mediating variable *M* (*path a*) has to be tested for significance. *M* can only be a mediator if there is a significant relationship with the dependent variable.

Thirdly, it is tested if the relationship between the dependent and independent variable decreases as soon as the mediator variable is added to the regression, which would imply that there is indeed a mediating effect. An effect of *X* on *Y*, controlling for *M*, that is equal to zero, implies that the total effect is fully mediated. According to these authors, all these steps must return significant results for a mediation effect to exist. However, this so-called causal-steps method was often criticized (Hayes et al., 2013) and researchers came up with more modern methods that are able to compute an indirect effect directly, like bootstrapping (MacKinnon, 2006), or the so-called Monte-Carlo Simulation (Preacher & Selig, 2012).

The bootstrapping method takes a sample from an existing dataset and resamples it many times, while changing certain variables. It is a non-parametric method, meaning normality of the sample is not required, making it well-applicable for smaller sample sizes (Fritz & McKinnon, 2007). As bootstrapping results are biased, several methods have been invented to give a more precise estimation, one among them being the bias-corrected confidence interval (Efron & Tibshirani, 1997).

When it is the aim to identify the composition of an effect, one has to examine multiple mediators. A possible approach to do so is to simply examine each mediator separately in a simple mediation model. However, this procedure, also called a single-step mediation analysis, might become problematic when the mediators are related to each other, as in this case each effect would be counted more than once, possibly resulting in a mediated effect of more than 100% (Vanderweele & Vansteelandt, 2014). Vanderweele and Vansteelandt developed a regression-based, as well as a weighting-based statistical approach, able to account for such an issue, although they did not find much realization in statistical software yet.

When examining effects of age, one approach is to create several age categories and compare them to each other, for example, young age compared to old age. For a long time, mediation models were not able to handle mediators with more than two variables (Preacher & Hayes, 2014). It followed that for the sake of simplicity most research on mediation analyses assumed the independent variable to be continuous or binary, and often researchers further aggregated groups or discarded information in order to create a binary variable. This is not the best practice, as the statistical design should evolve from the type of variables specified and not the other way round. Preacher and Hayes (2014) proposed an approach involving dummy coding, where a binary variable is created for each category, except for one reference category. The same approach is implemented in the present study. These binary variables equal 1 if a subject belongs to that category and 0 otherwise. It is important to note that when looking at a multicategorical independent variable, effects of belonging to a certain category are always compared to a base category, therefore there is not just one *total*, *direct* and *indirect effect*, but there are many, one for each category that is compared to the base category. To

make this distinction, the authors coined the terms *relative total*, *relative direct* and *relative indirect effects*.

Reviewing the given literature, specifically findings confirming the link between age and altruism, and the potential underlying factors generativity, goal orientation towards growth, FTP and future self-continuity gave rise to the question, how the total effect between age and altruism is composed and how much weight each potential underlying factor has. This can be expressed more specifically in the following research question:

"To what extent can the effect of age on altruism be explained by differences in each generativity, goal orientation towards growth, future time perspective and future self-continuity?"

3. METHODOLOGY

As described in the earlier section, the main interest of this study is to decompose the effect of age on altruism. In order to collect information on age, altruism and the suggested mediators, 168 participants completed an online survey, essentially consisting of two small tasks, where subjects had to complete a measure for future self-continuity and play a Dictator Game in survey form as well as complete a short questionnaire. To avoid order effects, the order of these three sections was randomized. The survey ended with a few demographic questions that were not obligatory to answer, except for age. In total, 56 young people (under 24 years old), 79 people of medium age (25-34 years old) and 30 people of older age (over 35 years old) took part in the survey. In the following sections, it will be discussed how several hypotheses were derived from the research question, how the sample was collected and which materials were used to determine the variables of interest, followed by a detailed description of the variables and summary of the specified model. Lastly, the section will finish with a precise description of the procedure participants went through, before moving on to the results section.

3.1 Hypotheses

In order to answer the research question, to what extent age differences in altruism can be explained by different mediators, several hypotheses must be derived. To find support for four alternative hypotheses as stated below, mediation analysis will be applied, followed by a bootstrapping approach to to test indirect effects for significance.

***$H_{A.1}$**: "Social generativity significantly mediates the relationship between age and altruism."*
***$H_{A.2}$**: "Goal orientation significantly mediates the relationship between age and altruism."*
***$H_{A.3}$**: "Future time perspective significantly mediates the relationship between age and altruism."*
***$H_{A.4}$**: "Future self-continuity with the future self 6 months from the present significantly mediates the relationship between age and altruism."*

***$H_{A.5}$**: "Future self-continuity with the future self 10 years from the present significantly mediates the relationship between age and altruism."*

3.2 Participants

All participants were recruited online, largely through the social media network Facebook. Apart from the author's personal network, the survey was distributed in as many different facebook groups and other sources, like survey sharing platforms with no personal relation to the author as possible, in order prevent participants being related to the experimenter. The study is single-blind, as even though participants are anonymous to each other, they had the chance to leave an email address to be able to take part in the random lottery and therefore cannot be considered fully anonymous to the researcher. However, for participants who did not enter an email address, the study can be considered double-blind.

While mediation analyses traditionally required very large sample sizes, more modern methods require much less data (Fritz & MacKinnon, 2007). Unfortunately, research indicating appropriate sample sizes or giving instructions on how to determine them for multiple mediator models is scarce (Fritz et al., 2012; MacKinnon et al., 2004). In a meta-study, the authors summarise the most recent and important approaches (Fairchild & McDaniel, 2017). Past studies provide power tables for models with a single mediator (Fritz & McKinnon, 2007) and multiple mediators (Ma & Zeng, 2014), however, not for models with 4 mediators specifically. Zhang (2014) illustrated how to determine the power for more elaborate multiple mediator models, the implementation, however, is complicated and computationally very intensive to this day. Furthermore, all population parameters must be known beforehand, which often results in speculation (Shoemann et al., 2017). The same authors have recently introduced a user-friendly application to calculate power and sample sizes for more than one mediator, but so far only a model with two mediators was implemented. Both studies recommend the Monte-Carlo Power analysis as the most robust with smaller sample sizes, closely followed by the bias-corrected bootstrap. One of their studies had a model design similar to the present study, except it assessed 3 instead of 4 mediators. In this study, high power when identifying the indirect effect could already be achieved with a sample size of n=100, when the effect size was large or medium (Zhang, 2014). Mediation analysis is rare within the field of the present study and no indication of the appropriate sample size can be found. In mediation analyses from unrelated fields of research, examining 4 mediators simultaneously, sample sizes are ranging from 126 to 239 participant (Samaniego & Gonzales, 1999; Mausbach et al., 2011; Napolitano et al., 2008), acting as a rough guideline for the present study.

3.3 Materials

The data required to conduct the analysis as described consists of information about individuals' levels of generativity, goal orientation towards growth, future time perspective and future self-

continuity, about their level of altruism, the dependent variable, as well as their age and other demographics.

Generativity will be measured using a few items from the Social Generativity Scale (SGS, Morselli & Passini, 2015). The SGS is an expansion of the Loyola Generativity Scale (LGS, McAdams & De St. Aubin, 1992). While being very similar, this scale incorporated earlier criticism and focuses more on individuals' attitude towards others and future generations than on their personal life and future (Morselli & Parsini, 2015). Furthermore, both scales showed high internal scale reliability and validity. The original SGS consists of 6 statements, for which subjects rated how much they apply to themselves on a 7-point scale (where 1="Not at all", 7="Completely"). One example of such a statement is: *"I commit myself to do things that will survive even after I die."* Because multiple mediators are examined in the present study, a selection of only 3 of the statements is used which can be found in appendix A.1. Tests of scale reliability can be found in the results section (see 4.1.1). Note that for the remainder of this paper, the terms generativity and social generativity will be used interchangeably.

To examine the role of resources, information on how much importance participants give to the growth of their resources, as opposed to maintaining or preventing a loss of resources. To collect this information, a method from the field of Goal Theory used to measure goal orientation is applied (Ebner et al., 2006). Firstly, subjects are asked to state one of their future goals in the domain of thinking and cognition. Afterwards, they rate the stated goal on the three dimensions growth ("*With this goal, I want to improve something or achieve something new*"), maintenance ("*With this goal, I want to maintain something*") and loss prevention ("*With this goal, I want to prevent a loss*"). This measure was shown to have high internal scale reliability and validity. While in the original study participants rated on an 8-point scale, this research applies a 7-point scale for the sake of standardization and comparability with the other mediators (where 1="Strongly agree", 7="Strongly disagree"). Participants then repeat the same steps for a goal in the domain of physical fitness and activity. Subjects are asked for goals in these particular domains because both, cognitive and physical function have been shown to decrease with rising age (Baltes & Smith, 2003). An illustration can be found in appendix A.2.

The third potential mediator discussed here is future time perspective. A popular measure is the Future Time Perspective Scale, which has shown very high scale reliability (FTP-Scale; Carstensen & Lang, 1996, 2002). FTP is measured on a 7-point Likert scale (where 1="Very untrue" to 7="Very true"). The FTP scale was confirmed to be internally consistent by John and Cate (2007), who could furthermore replicate previous findings. The original scale consists of 10 items out of which 3 selected statements are used within this research. Examples of those statements are: *"Most of my life lies ahead of me."* or *"My future is filled with possibilities."* A test showing reliability of the compilation of statements can be found in the results section (see 4.1.1), whereas an illustration of the final measure can be found in appendix A.3.

To measure future self-continuity, Ersner-Hershfield et al. developed a psychometric measure which has successfully been tested for re-testability and validity (2009). In this measure the participant is presented with 7 Venn diagrams, each overlapping to a different extent, and has to choose one diagram that best describes how similar he perceives his future self. The overlap between the circles can then be used as a measure for self-continuity. A visual illustration of the measure is illustrated in figure 2 below. Compared to a Likert-scale for example, these graphs should help participants to imagine what is a rather abstract scenario.

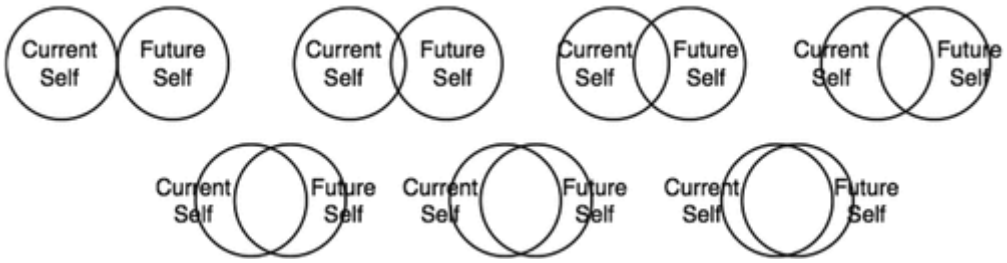

Figure 2. A psychometric measure of future self-continuity, introduced by Ersner-Hershfield et al., (2009). From: "Don't stop thinking about tomorrow: Individual differences in future self-continuity account for saving" by Ersner-Hershfield et al. (2009). Copyright 2009 by Society for Judgement & Decision Making.

In the present study, a slightly adapted version of this scale is implemented, created by Kamphorst et al. (2017). Instead of choosing between 7 circles, which returns discrete results, participants can choose the degree of overlap by drag-and-dropping the circles, resulting in a continuous and therefore more precise measure of future self-continuity. Furthermore, this adapted version is well-applicable to online surveys. Lastly, to be able to compare results with different research, participants will repeat the measure once regarding their future self 6 months from now and once regarding their future self 10 years from now. For an illustration of the final measure, see appendix A.4.

To measure altruism, a modified version of the original Dictator Game is implemented. This modified version is a one-shot hypothetical dictator game, that simplified the original lab experiment into the form of a survey, implemented within the online survey software Qualtrics. A careful design of the survey regarding anonymity and confidentiality is meant to reduce the probability of a social desirability bias. Altruism can be measured on the share of the initial endowment (10€ in the present study) given by the participant to the other player who did not receive any money. The survey form has a few advantages. Particularly, traditional lab experiments are more subject to the experimenter-demand effect, which was found to increase altruistic behaviour in dictator games (Eckel & Grossmann, 1996). Furthermore, the sample of lab experiments often entirely consists of students, which can result in a potential bias, as among other student-specific characteristics, the level of education has been found to positively influence giving (Chin & Steinberg, 2005).

The independent variable age, as well as other demographic characteristics, are collected with a short questionnaire. Participants had to state their age according to age groups, whereas other demographic questions were voluntary, due to the possibility of being perceived as too sensitive. These questions are concerned with the respondent's gender, education, nationality, employment status, income, political orientation and religious belief.

3.4 Measures

Based on the previous section combined with past research, several variables could be identified to be of importance for the analysis, as summarised below. Because the present study consists of several measures, the final survey would be very long. Therefore, the methods to determine generativity, FTP and goal orientation towards growth are implemented in a reduced form, to make the survey more attractive and to avoid participants opting-out. Testing for internal consistency of the reduced measures can be found in section 4.1.1. A more detailed description of the variables, including details on how each variable was obtained, can be found in table 4 in appendix B.

3.4.1 Main Variables

Altruism: This is the dependent variable which will be measured based on the amount that has been given in the dictator game. The measure is continuous, ranging from 0€ to a maximum of 10€.

Generativity: This is one of the mediators of interest measured using the SGS (Morselli & Passini, 2015) as described earlier. Participants have to rate how much they agree with three statements related to future generations, where 1="Strongly agree" and 7="Strongly disagree". The original SGS consists of 6 statements, out of which a selection of 3 is implemented in the present study. Aggregating the mean results for each of the statements results in the final measure.

Growth Orientation: The second mediator of interest, goal orientation towards growth. Participants were asked to state one goal each in two different domains and then rate on a 7-point scale how much they agree with the statement *"With this goal, I want to improve something or achieve something new."*, where 1="Strongly agree" and 7="Strongly disagree". In the original study, participants stated two goals per category and additionally stated goals for any other domain of their choice (Ebner et al., 2006). The final measure is a binary variable, comparing an aggregate of the mean results for the goal ratings in both domains towards growth to both, maintenance and loss prevention (0=goals oriented towards maintenance/loss prevention; 1=goals oriented towards growth).

FTP: Another mediator of interest, future time perspective. It is measured using 3 items from the FTP scale (Carstensen & Lang, 1996), which originally consisted of 10 items. Participants have to rate how true statements are for themselves on a 7-point Likert scale, where 1="Very true" and 7="Very untrue". Aggregating the mean results for each of the statements results in the final measure.

FSC: The last mediator of interest, future self-continuity. FSC is measured using Kamphorst's continuous expansion (2017) of Ersner-Hershfield et al.'s measure (2009). FSC is determined by the

overlap of the circles representing current- and future self and ranges from 0 (no overlap) to 100 (complete overlap). Similar major studies have used a temporal distance of 10 years (see Ersner-Hershfield et al. (2009), yet Rutt and Löckenhoff (2016) were able to show that age was also linked with more self-continuity for smaller distances, even for distances as short as 6 months. For the sake of comparability, the present study assessed both, self-continuity with the future self 6 months, and 10 years from now.

Age: This is the main and only independent variable. Aggregating responses to the age measure, three age categories were created, where young people are defined as people under 24 years old, people of medium age as between 25 and 34 years old and older people as everyone above 35.

3.4.2 Controls

Like age, all control variables were measured through a basic demographic questionnaire at the end of the survey.

Sex: Individual's gender is a categorical variable where 0=male, 1=female and 2=other.

Education: Individual's level of education is measured in 5 ordinal categories, where 1="lower than high school", 2="high school diploma", 3="bachelor's degree", 4="master's degree" and 5="doctorate or higher".

Nationality: Individual's nationality is a categorical variable consisting of 192 categories.

Employment Status: Individual's employment status is measured on a categorical scale consisting of 6 categories where 1= "self-employment", 2="full-time employment", 3="part-time employment", 4="student", 5="unemployed" and 6="retired".

Income: Individual's monthly income is measured on an ordinal scale, where 1="below average", 2="average" and 3="above average".

Political Orientation: Individual's left-right political orientation is measured on a 8-point scale ranging from 0="extremely liberal" to 7="extremely conservative".

Religious Belief: individual's religious belief is measured binary where 0="religious" and 1="not religious".

3.5 Model Specification

As the analysis is meant to assess five mediators, generativity, goal orientation towards growth, future time perspective and future self-continuity (for 6 months and for 10 years), a simple mediation model would be inappropriate. Due to the independent variable age being multicategorical, dummy coding is applied as proposed by Preacher & Hayes (2014) in order to determine the *relative total, indirect* and *direct effects*. An example of such a model can be seen in figure 3 below.

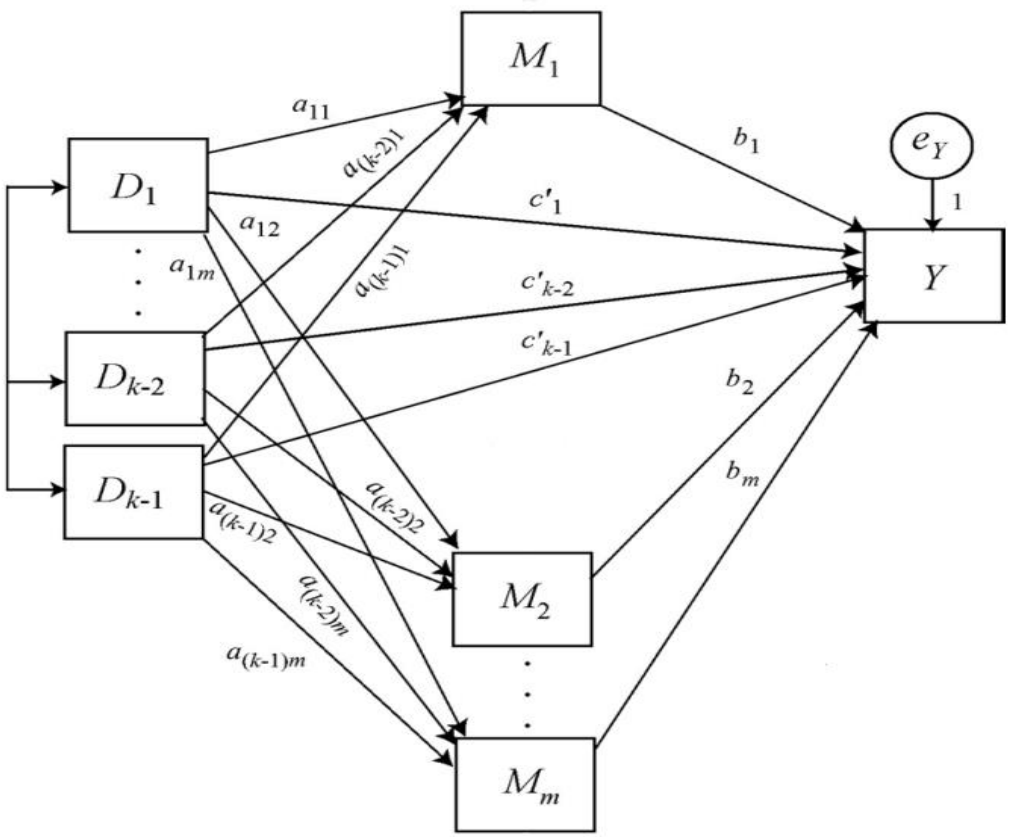

Figure 3: A multiple mediation model with a multicategorical independent variable. From: "Statistical Mediation Analysis with a multicategorical independent variable." by Preacher & Hayes (2014). Copyright 2013 by The British Psychological Society.

In such a model, the dummy coded independent variable, the mediators and the dependent variable are represented by $D_{(k-n)}$, M_m and Y respectively, where k is the number of categories and m is the index of the specific mediator. The slope coefficients are represented by a_{ij}, b_{ij} *and* c_{ij}, corresponding to the paths in the visual model. Note that there are *k-1* categories, as one age category (young age) is not dummy coded in order to act as a reference category.

Applying this to the model of the present study results in two binary variables for age, one comparing the medium age category to people of young age and one comparing people of older age to people of young age. Therefore, for each mediator, there are two *relative indirect effects* and one *relative direct effect*. Estimating these relative effects for the proposed model requires two equations:

$$\boldsymbol{M_j = cons_1 + a_{1j}D_1 + a_{2j}D_2 + \varepsilon_{Mj}} \quad \text{(I)}$$

$$\boldsymbol{Y = cons_2 + c'_1D_1 + c'_2D_2 + b_1M_1 + b_2M_2 + \varepsilon_Y} \quad \text{(II)}$$

In these equations, *Y* refers to the dependent variable, $cons_i$ to the constants, $D_{(k-1)}$ to the dependent binary variable, *M* to the mediator, ε to the error term, whereas a_{ij}, b_j and c'_i refer to the path coefficients. In particular, it is possible to estimate the *relative direct* and *indirect effects*.
The *relative total effect* c_i, on the other hand, can be computed by summing up the associated *relative direct effect* and *relative indirect effects* for each mediator and age category, as it can be expressed in the formula below.

$$\boldsymbol{c_i = c'_i + \sum_{j=1}^{m} a_{ij} b_j}$$

3.6 Procedure

The whole procedure was digital and took place online. Participants were told that a pair of people will be randomly chosen, who have the chance to win a maximum of 10€. This corresponds to a random lottery incentive, which was implemented to reduce selection biases and increase the probability of participants revealing their true preferences. Following an anonymous link to the Qualtrics survey, participants were first met with a welcome message including some general information about the survey and its purpose, where they were informed about anonymity and confidentiality and that they could opt-out of the survey at any time. Afterwards, participants were asked to follow a sequence of 4 small tasks, appearing in random order. There was the measure of future self-continuity, where the participant had to indicate his level of self-continuity by moving the future self circle over the present self circle. This was repeated once concerning the future self 6 months from now and once concerning the future self of 10 years from now.[1] In the next task, the Dictator Game, participants were asked to imagine receiving 10€ and then have the possibility to give a share of their choice to a second player, who was given nothing. Furthermore, both players were completely anonymous to each other.[2] In the third task, participants had to state one goal for each of the domains cognition & thinking and physical activity & fitness and rate their agreement with three related statements on a 7-point scale.[3] In the last task, participants completed a short questionnaire containing 6 questions of random order related to generativity and future time perspective, where again, they rated their agreement on a 7-point scale.[4] At the end of the survey, the participants were asked to state their age and could additionally answer some further demographic questions voluntarily. Before submitting, subjects had the option to leave an email address in order to take part in the random incentive lottery.

[1]For an illustration see appendix A.4
[2]For an illustration see appendix A.5
[3]For an illustration see appendix A.2
[4]For an illustration see appendix A.1 and A.3

4. RESULTS

4.1 Auxiliary Analysis

This section describes the distribution of the sample in addition to some important analytical information about the variables of interest. In particular, the demographics are described in detail, followed by tests for scale reliability, an illustration of the results for altruism, descriptive statistics of each mediator, correlations between them and finally a bivariate analysis of controls and the dependent variable.

4.1.1 Scale Reliability

Before any analysis, Cronbach's Alpha-test of scale reliability was conducted, because the used measures were slightly adapted from the initially proposed scales. In particular, only 3 selected items of each the SGS and the FTP scale were used, and therefore had to be retested for internal consistency. Similarly, participants stated and rated only one goal per category, as opposed to two goals in the original study (Ebner et al, 2006). The results showed, that even though only 3 items were used, Cronbach's Alpha was acceptable for both scale measures of generativity ($\alpha = 0.76$) and FTP ($\alpha = 0.77$). Moreover, the measure of goal orientation had lower, yet acceptable internal consistency ($\alpha = 0.64$).

4.1.2 Demographics

Due to a limited scope of the study at hand, a convenience sample was collected and a total of 168 participants completed the online survey. Among the 168 participants, 2 were under 18 years old, 54 were between 18 and 24, 79 were between 25 and 34, 8 were between 35 and 44, 15 were between 45 and 54, 7 were between 55 and 64 and 3 people were 65 years old or older. They were further aggregated into three age groups of interest, resulting in 56 people considered to be of young age, 79 people considered to be of medium age and 30 people considered to be of older age. Furthermore the sample was more or less evenly divided among males and females (one identified as other), most participants were students (41% of the whole sample), and by far the most participants were German (n = 102), followed by British (n = 10), Dutch (n = 8), Pakistani (n = 4) and Chinese (n = 4). Additionally, 24 other countries were represented by 3 or fewer individuals each, totalling in 40 participants. More detailed descriptive statistics can be found in table 1 below.

Regarding the self-continuity measure, the software recorded an empty response when respondents did not move the circle at all. These empty responses were replaced by the values associated with the default position, namely a value of 0 for overlap of the circles. Apart from the demographics, all other responses, including age, were obligatory to complete the study. Missing values in the demographic variables were excluded from the analysis.

Table 1

Summary of Demographics

Demographic	Category	Responses	Additional info
age	young age	56	
	medium age	79	-
	older age	30	
sex	male	91	
	female	76	even distribution
	other	1	
nationality	German	102	
	United Kingdom	10	Sample is dominated by Germans
	Netherlands	8	
	Pakistan	4	
	China	4	
	Other Countries	40	
education	lower than high school	18	
	High school diploma	42	Most people have higher education
	Bachelor	61	
	Master	41	
	Doctorate or higher	6	
employment status	employment (full-time)	57	
	employment (part-time)	19	Most people are students or full-time workers
	unemployed	4	
	student	69	
	retired	6	
	self-employment	13	
income	below average	51	
	average	80	Most people have an average income
	above average	33	
political orientation	8-point scale	$\mu = 3,71$	The average political orientation is central
religious belief	yes	56	
	no	111	Most people are not religious

4.1.3 Results for Altruism

All participants completed the measure for the dependent variable altruism. In the Dictator Game, 19 people chose to keep all the money, a major share of the sample (99 people) split the endowment in an

egalitarian giving away 5€, while 13 people acted purely altruistic and gave away all of their money. On average, people chose to share 4.58€ of the initial endowment of 10€, which is much higher than the combined average of previous studies of 28.3% (see Engel, 2010), whereas young people gave 3.8€, medium old people 4.8€ and older people 5.2€ on average. As figure 4 below shows, people who did not give 5€ tended to give 0€ or 10€, but not many chose values in between. For that reason, the median might better represent the sample, having a value of 5 for each age group. It can be seen that there was very little variance in altruism among the participants (σ^2 = 5.75), which will complicate the detection of significant effects, as further discussed in the main analysis and limitations section (see section 5). An illustration of these results can be found in figure 4 below.

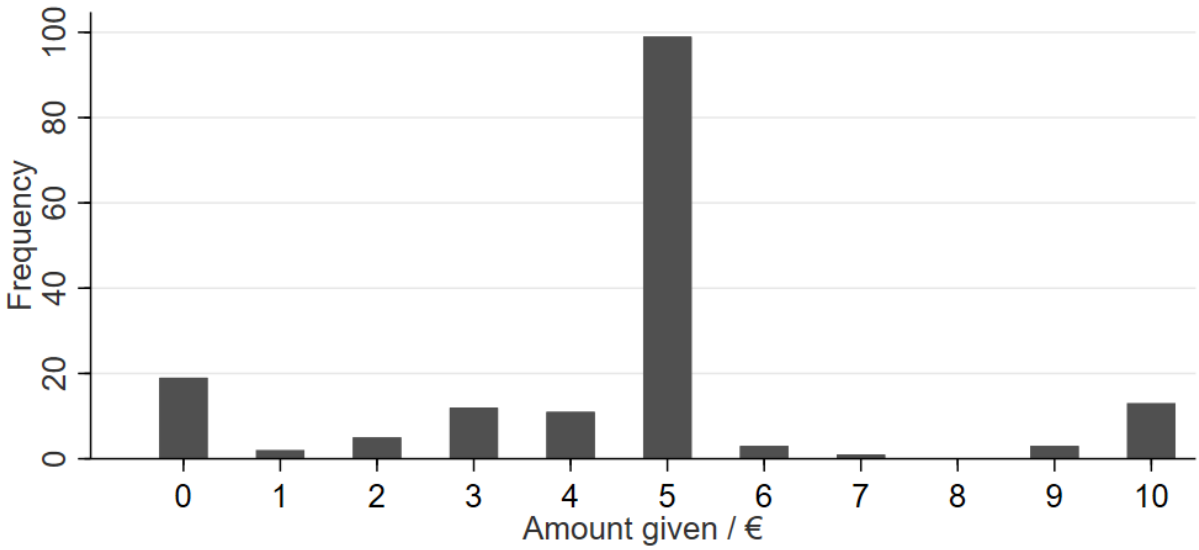

Figure 4: Altruism in the Dictator Game, measured on the amount given in €

A potential explanation for those results is that the rather limited random incentive of only a maximum of 10€ was not strong enough for the participants to reveal their true preferences. A further discussion can be found in section 5.

4.1.4 Descriptive statistics & Correlation between the Mediator Variables

Since the mediators are in the main focus of the present study, it is worth to look at them more closely. In order to do so, descriptive statistics of the responses to the measures of each mediator are presented in table 2, and correlations between the mediators in table 3 below. All of the measures are continuous, with future self-continuity ranging from 0 (no overlap) to 100 (complete overlap) and all other mediators ranging from 0 (Strongly disagree/not true at all) to 7 (Strongly agree/Very true).

Table 2

Descriptive summary of the mediators

Variable	Obs	Mean	Std.Dev.	Min	Max
Generativity	168	2.966	1.291	1	7
Growth Orientation	168	1.881	1.143	1	7
FTP	168	5.258	1.37	1	7
$FSC_{6\ months}$	168	65.161	31.541	0	100
$FSC_{10\ years}$	166	37.964	31.597	0	100

As the table shows, participants on average tended to disagree with statements positively related to generativity ($\mu = 2.97$), while regarding goal orientation, on average most people stated goals they rated to be oriented towards loss prevention ($\mu = 3.62$) followed by goals towards maintenance ($\mu = 2.967$), whereas on average the least number of goals was rated to be oriented towards growth ($\mu = 1.88$). Moreover, participants tended to agree with statements regarding a less limited future time perspective ($\mu = 5.26$). Lastly, participants were on average much more self-continuous with their future self 6 months from the present ($\mu = 65.16$) than they were with their future self 10 years from the present ($\mu = 37.96$). There is a large spread of values around the mean for some of the measures, with a standard deviation of around 31.50 for both self-continuity measures and around 1.37 for the FTP measure, which might be an indication of insufficient sample size (further discussed in the limitations section), while the standard deviation was moderate for the remaining measures.

4.1.5 Bivariate Analysis of the Control Variables and Altruism

Before proceeding with the main analysis, bivariate analysis between the controls and the dependent variable was conducted. In particular, the effect of sex, nationality, education, employment status, income, political orientation and religious belief on altruism has been examined using linear regressions, since altruism is a continuous measure. None of the controls have been found to show a significant effect on the outcome, except political orientation, where people in the second most conservative group appeared to significantly give less in the Dictator Game ($P = 0.016$**)[5], compared to the reference category (extremely liberal). Detailed results of the regressions can be found in appendix C. Potential explanations for the insignificant results can be found in the discussion (section 5).

Lastly, the estimation results of any mediation analysis assessing multiple mediators are distorted, the more the mediators are correlated to each other, as this would mean they affect each other and could result in counting their individual effects on altruism multiple times. An illustration of those correlations can be found in table 3 below.

[5] *$P < 0.10$ **$P < 0.05$ ***$P < 0.01$

Table 3

Matrix of Correlations between Mediators

Variables	(1)	(2)	(3)	(4)	(5)
(1) Generativity	1.000				
(2) Growth Orientation	0.130	1.000			
(3) FTP	-0.450	-0.264	1.000		
(4) $FSC_{6\ months}$	-0.155	0.125	0.066	1.000	
(5) $FSC_{10\ years}$	-0.299	0.036	0.088	0.574	1.000

As the table shows, there certainly is a substantial correlation between the mediators. While most correlations can be considered weak, there is a moderate correlation between generativity and future self-continuity with the future self of 10 years from now (-0.299), between generativity and FTP (-0.450) and between goal orientation towards growth and FTP (-0.264). Furthermore, there was a high correlation between both measures for self-continuity (0.574). Due to these correlations, the results of the main analysis have to be interpreted with caution. Further implications can be found in the discussion (section 5).

4.2 Mediation Analysis

It is the main interest of this study to decompose the effect of age on altruism. To be able to do so, indirect path analysis is conducted to explore potential mediation effects of generativity, goal orientation towards growth, future time preference and future self-continuity (once for 6 months, once for 10 years), controlling for the demographic variables. In general, mediation is likely to be existent, if a significant indirect effect can be found, meaning the association between *X* and *Y* decreases, as soon as *M* is added to the regression. With the bootstrapping approach, it is possible to determine the confidence intervals, from which it can be seen if there is a significant indirect effect. In particular, the indirect effects are different from zero, if the confidence intervals do not contain the value zero. To find support for the alternative hypotheses, namely that the suggested mediators significantly mediate the relationship between age and altruism, the product of coefficients approach is applied to test for mediation, followed by bootstrapping with bias-corrected confidence intervals to test for significance of the mediation. Due to the two dummy-coded independent variables resulting from the 3 age groups of interest, 2 separate mediation analyses are required, one to assess the indirect effects of medium

age relative to the reference group young age and one for the effects of old age relative to the reference group.

For the sake of readability, the earlier suggested model (see section 3.5) is illustrated in a simplified form here. Note that because the model in figure 5 below must be implemented twice, there are multiple coefficients for *paths a*, *b* and *c*. In particular, one each for the effect of medium age compared to young age and for the effect of old age compared to young age.

In the model proposed by the present study, the *relative direct effect* between an independent variable, which are the age categories, and the dependent variable altruism is represented by *path* c'_{k-1}, the coefficient of the link between independent variable and mediator is represented by *path* a_{k-1}, and the coefficient of the link between a mediator and the dependent variable is represented by *path* b_j. The associated p-values can be found in brackets after each coefficient.

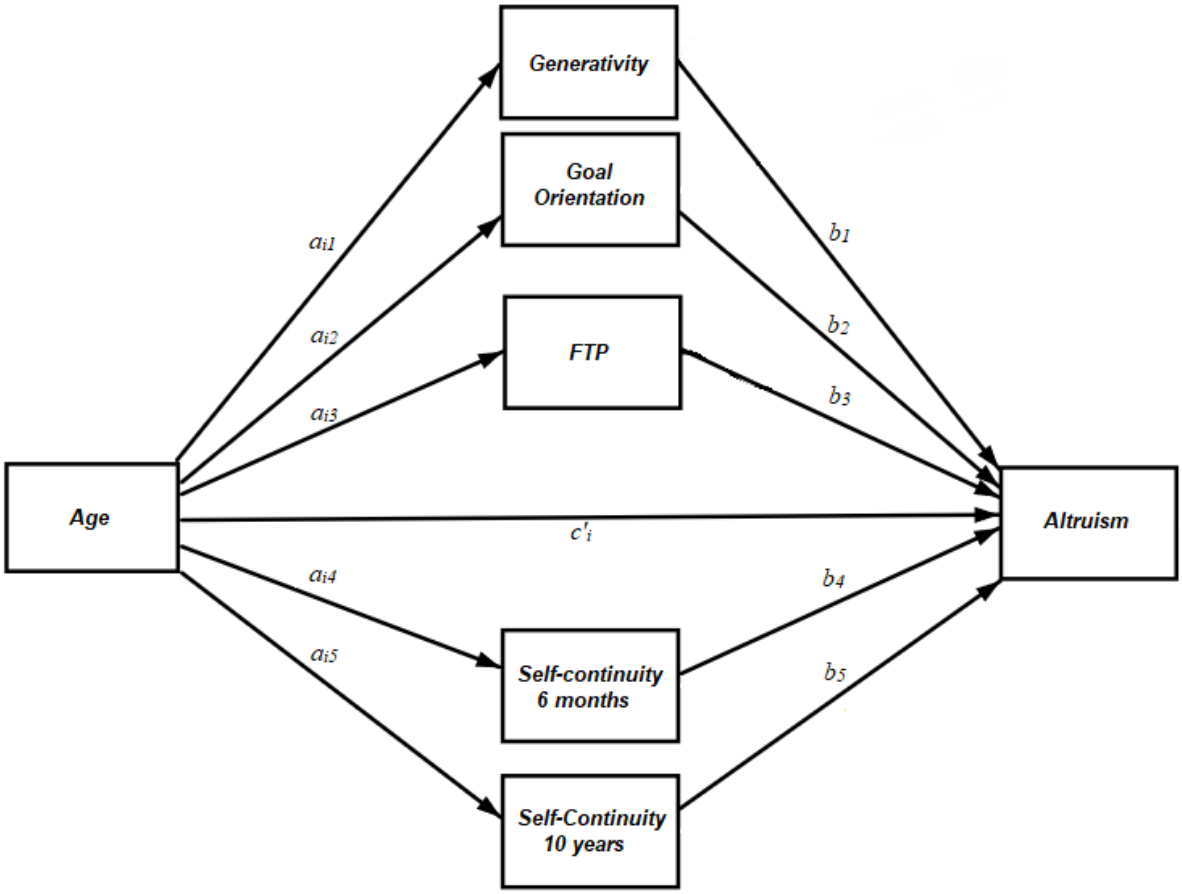

Figure 5: The mediation model; Effects of being of medium/old age relative to being of young age.

To begin with, significance testing for the relative indirect effects of each medium age and older age relative to young age, using bias-corrected confidence intervals, was conducted. For this method, an indirect effect is considered to be statistically significant, if the confidence intervals do not contain zero. As it turned out, none of the mediators examined had a statistically significant indirect

effect on the association between age and altruism, either for medium age or old age, compared to young age.

To gain a deeper understanding of the underlying associations and to explore possible explanations, a mediation analysis, based on a sequence of seemingly unrelated regressions, was conducted (see appendix D.1 & D.2).

At first, the effects of medium age were examined. Analysing *path* a_{1j}, it can be seen from the regression results (see appendix D.1) that being of medium age compared to being of young age does not have a statistically significant effect either on generativity (a_{11} = 0.167 (0.470) CI: -0.286, 0.620) or on goal orientation towards growth (a_{12} = -0.225 (0.211) CI: -0.577, 0.127), while it has a statistically significant negative effect on future time perspective (a_{13} = -0.707 (0.002***) CI: -1.154, -0.260). Regarding self-continuity, being of medium age neither has a statistically significant effect on self-continuity with the self 6 months from now (a_{14} = -0.330 (0.954) CI: -11.473, 10.813) nor with the self 10 years from now (a_{15} = 0.06(0.796) CI: -8.163, 12.720).

Analysing *path* b_j, the links between each mediator and the dependent variable altruism, showed that none of the suggested mediators had a statistically significant effect on altruism, except for generativity which had a negative effect (b_1 = -0.511 (0.019**) CI: -0.938, -0.084).

Analysing *path* c'_1, the relative direct effect of being of medium age compared to being of young age on altruism, showed a statistically significant and positive direct effect (c'_1 = 0.906 (0.055*) CI: 0.0.19, 1.831). The detailed statistical results can be found in appendix D1.1.

The same analysis was then repeated for people of older age, compared to people of young age. The regression results can be found in appendix D.2.

Analysing *path* a_{2j}, it can be seen that being of older age compared to being of young age has no statistically significant negative effect on generativity (a_{21} = -0.326 (0.270) CI: -0.906, 0.253), it has a statistically significant positive effect on goal orientation towards growth (a_{22} = 0.823 (0.019**) CI: 0.133, 1.512) and it has a statistically significant negative effect on future time perspective (a_{23} = -1.770 (0.000***) CI: -2.371, -1.169). Regarding self-continuity, being of older age has a statistically significant effect on both, self-continuity with the self 6 months from now (a_{24} = 18.308 (0.019) CI: 3.040, 33.576) and with the self 10 years from now (a_{25} = 40.498 (0.000) CI: 24.710, 55.286).[6]

Analysing *path* b_j again showed that none of the suggested mediators had a statistically significant effect on altruism.

Analysing *path* c'_2, the relative direct effect of being of old age compared to being of young age on altruism, also showed no statistically significant effects. The detailed statistical results can be found in appendix D2.1.

The results, most importantly non-significance of the indirect effects, show that there is no evidence supporting the alternative hypotheses, implying that no mediation by any of the variables of

[6] *$P < 0.10$ **$P < 0.05$ ***$P < 0.01$

interest was found (see appendix D1.2 and D2.2 for detailed results). However, these results are likely to be biased, which will be elaborated on in the next section.

5. LIMITATIONS & DISCUSSION

In this section the study's results are interpreted further and discussed in light of the limitations, followed by recommendations to future researchers.

First of all, when analysing the links between age and the mediators, some earlier findings could be replicated, while others returned no significant results or even contradicted previous literature. Being of medium age compared to being of young age negatively affected future time perspective, which is in line with past literature (see Carstensen & Lang, 2002), while it had no significant effect on the remaining mediators.

When analysing the effects of older people compared to young people, the results were more clear. On the one hand, older people appeared to state goals that they rated more often to be oriented towards growth, which contradicts previous findings (see Ebner et al., 2006). On the other hand, they perceived future time as more limited, confirming past research (see Carstensen & Lang, 2002). Also in line with past findings, older people were more self-continuous with both their future selves 6 months from now and 10 years from now, confirming each Ersner-Hershfield et al.'s (2012) and Rutt & Löckenhoff's results (2017).

In the main part of the analysis, when testing for a significant indirect effect, it was not possible to detect any mediation as hypothesised earlier or even confirm the associations between the proposed mediators indicated by past research (see Freund & Blanchard Fields, 2014; Löckenhoff & Rutt, 2017).

However, these findings should not be considered as concluding, since this study was subject to several limitations. A potential cause for the unsuccessful detection of significant mediation effects is found quickly. The dependent variable altruism, measured based on the amount given in the Dictator Game, showed very little variance ($\sigma^2 = 5.75$) among the different age groups. In Engel's meta-analysis of 129 Dictator Games (2011), he found all Dictators to give on average 28.3% of the initial endowment. Compared to these findings, respondents gave a much higher average ($\mu = 4.5$) in the present study. An overwhelming amount of 99 people, making up 59% of the sample even acted egalitarian by sharing the 10€ evenly among themselves and the receiver, which is reflected in a median of 5 for all age groups. This small variation in altruism potentially aggravated the detection of any significant direct effects on altruism (*path* c'_i) or interactions between the mediators and altruism (*path* b_j).

As the indirect effect is equal to the product of the coefficients a_{ij} and b_j, a small value for b_j reduces its size, potentially creating a problem of statistical power, because many more participants are required to detect a small effect in mediation than to detect effects of medium or big size (Zhang, 2014).

The small variance in altruism might have arrived due to a combination of different reasons. First of all, there was a rather limited random lottery incentive of a maximum of 10€. Therefore, it is likely that many participants did not participate to earn money, but for other, possibly altruistic reasons. For example, in case participants took part in the survey only to help the researcher, to help science or because it made them feel better about themselves, the results are likely to be biased by selection effects. Another common issue of self-reported measures is likely to have impacted the results for altruism. According to the social desirability bias, people often report their answers in a way they expect to be socially acceptable and therefore might have given amounts above their true preference. While this study attempted minimizing the bias with high levels of anonymity and confidentiality, strict anonymity could not be ensured due to the collection of email addresses. Similarly, some participants' choices might have been affected by relatedness to the experimenter.

More generally, the limitations include the method of sample collection. As mentioned, a substantial share of the responses was collected within the author's personal network and moreover is not evenly divided among the age groups. While people of young and medium age were rather evenly divided among the sample, the older age group was represented by much fewer people, adding to the potential problem of statistical power. Furthermore, the age categories defined in this study are rather unintuitive and can certainly be improved upon, particularly a continuous measure of age would give the most precise results. Lastly, the sample consisted dominantly of students, who are likely to share certain characteristics (Bekkers, 2007) and are not representative of the real world.

Further aspects that should be considered went beyond the scope of this study. For instance, caution will be required when interpreting mediation effects, since correlations between the suggested mediators, especially between the two measures of self-continuity, could be identified. This means the mediators might affect each other and observing the mediators one at a time possibly results in counting the effect of the mediator multiple times. This can lead to a total indirect effect of over 100% when summing up the individual indirect effects (Vanderweele & Vansteelandt, 2014). While more modern methods are able to account for such correlations (see Vanderweele & Vansteelandt, 2014), their implementation in statistical software is still in its early stage and rather complex (Fairchild & McDaniel, 2017). Moreover, to find true age-related differences, longitudinal data assessing within-effects as opposed to cross-sectional data will be required.

Mediation analyses itself, while very popular, is often criticized and is subject to fundamental limitations. Most importantly, such an analysis cannot statistically prove any causality between the examined variables, but only confirm a hypothesized causal pathway based on theoretical logic (Pearl, 2009). In the case of the present study, one can be certain about the direction of the causal pathway between the independent and the mediator variable (*path* a_{ij}), because it is simply not possible for any mediator to affect age. Yet for the link between mediator and dependent variable (*path* b_j), no such claim about a causal direction can be made.

Despite those limitations and a lack of significant findings regarding mediation effects, it is believed that the proposed framework, when improved, has the potential to be a starting point for future researchers interested in the underlying factors of the effect of age on altruism. Such a study can be an addition to research since even though it is evident that altruistic characteristics and behaviours often change as people get older, it is not possible to influence them through someone's age directly. However, altruism can possibly be influenced indirectly by manipulating its underlying factors, as higher future self-continuity, as an example, can be primed with words related to elderly people (Hershfield, 2011). A successful decomposition of age effects on altruism could have implications for any domain where altruism is of importance and help to make policy interventions more efficient because age groups can be targeted more specifically and interventions can be prioritized based on the weight of an underlying factor. Some examples follow. From a political perspective, altruism was found to be associated with political attitude (Zettler & Hilbig, 2010), so findings could help parties to improve their messaging. In the work environment, altruism could make the difference between employees working solely out of self-interest and those working to achieve goals of the organization, no matter the employee's level in the company hierarchy (Simon, 1992). In general, a better understanding of altruism can be helpful wherever it is the goal to promote ethical and environmental-friendly behaviour. Charities, for example, could incorporate findings into their promotion and potentially increase the number of donations. Even the biggest present debates are certainly impacted by altruism, be it the refugee crisis, where promoting altruism might help aid organizations to increase the number and size of donations and voluntary helpers, or climate change, where especially the concern for future generations must be promoted in order to lessen its negative consequences.

Before any such findings can be made, however, some aspects of the proposed model need to be optimized. First of all, a future study should improve the sampling method. In order to increase statistical power, they should collect the sample more systematically to create more evenly sized age groups and they should also increase the sample size in general. Furthermore, the definition of age groups within the present study should be reconsidered, and potentially be dropped completely in favour of a more precise continuous measure, in case sufficient access to participants is given. Moreover, the control variables did not return a significant effect on altruism and should be reinvestigated. A major setback of the present study was a low variance in participants' response to the altruism measure, potentially rendering most effects of interest insignificant. Several recommendations are given. First of all, a more substantial incentive might give subjects the motivation to choose according to their true preference and reduce altruistic selection effects. Furthermore, future research should ensure full anonymity in a double-blind study, to further reduce social desirability. Similarly, relatedness to the researcher should either be ensured or controlled for. Alternatively, other measures of altruism could be considered, preferably based on observed as opposed to self-reported values. Such a model should be able to make more meaningful general

findings in the given field of research. Once a stable framework has been created and successfully used, further considerations will have to be made, because the present study identified correlations between the suggested mediators, which a further improved model has to be able to account for (see for example the approach of Vanderweele & Vansteelandt, 2014). Eventually, to find true age effects, researchers need to conduct longitudinal studies.

6. CONCLUSION

In the present study, it was the aim to investigate the effect of age on altruism and determine its underlying factors. More specifically, generativity, goal orientation towards growth, future time perspective and future self-continuity were suggested to be potential mediators and examined by the means of a survey to collect data, followed by a mediation analysis. In the survey, participants rated a sequence of statements related to generativity and future time perspective, completed a measure for self-continuity and played a Dictator Game to indicate their level of altruism. Overall, 168 participants took part in the survey, who were divided among the three age groups young age, medium age and older age, where effects of medium age and older age were each analysed relative to the effects of young age. While some findings of past research regarding the effect of age on those mediators, namely future time perspective and future self-continuity, could be confirmed, others have been partially contradicted, namely the effect of age on goal orientation towards growth, and require further investigation. The results of the mediation analysis itself did not return any significant results, however, potential reasons have been discussed. Biased results of the measure of altruism due to incentive structure, selection effects and social desirability are likely to be the main cause and therefore the given results cannot be considered concluding. Instead, further investigation is required. Research as proposed in the present study could be worthwhile, as potential findings would have implications in many different domains, be it everyday life, politics, working environment or any other situation, where ethical and moral behaviour is demanded. Altruism and selfishness play a vital role in any interaction between two or more parties, which applies to relations on the smallest and most personal level, as much as it applies to interactions between whole nations. Interested future researchers can use the study at hand as a starting point and with some improvements, discussed in the earlier sections, might be able to find more significant results. In particular, researchers should reconsider the definition of age groups, the measure for altruism, the incentive structure and size and the sampling method. Furthermore, the correlation between mediators has to be accounted for and longitudinal data will be required eventually to identify true age-related changes. Lastly, a mediation analysis comes with limitations and its results should always be interpreted in light of those limitations, however, it has the potential to make general findings in a field that is not explored much yet.

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APPENDIX

Appendix A: Measures

A.1 Social Generativity Scale (Selected Items)

Participants were asked to read a sequence of three selected statements from the Social Generativity Scale, and each time rate how much they agree or disagree. For the complete list of the original items, see Morselli & Parsini (2015).

"I commit myself to do things that will survive even after I die."

"I think that I am responsible for ensuring a state of well-being for future generations."

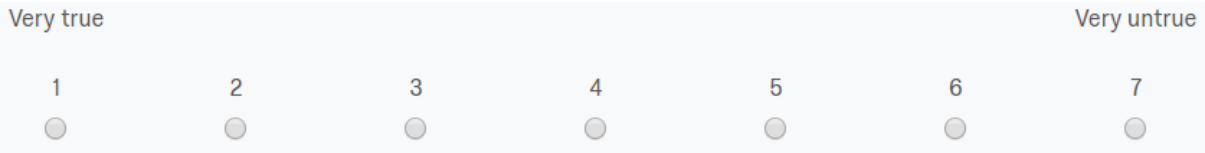
"I have a personal responsibility to improve the area in which I live."

A.2 Goal Orientation Measure

Participants were asked to state a personal goal in the domain of thinking & cognition and in the domain physical activity & fitness. After each goal, they were asked to rate how much they agree with the three following statements:

A.3 Future Time Perspective Scale (Selected Items)

Participants were asked to read a sequence of three selected statements from the Future Time Perspective Scale, and each time rate how much they are true or are not true for them. For the complete list of the original items, see Carstensen & Lang (1996).



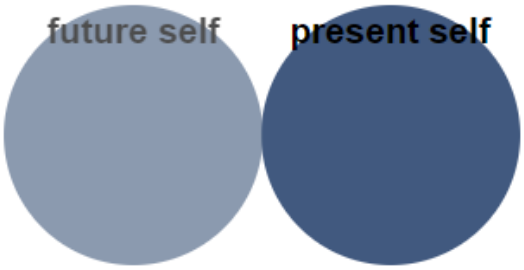
"Most of my life lies ahead of me."

"My future is filled with possibilities."
"There is plenty of time left in my life to make new plans."

A.4 Continuous Future Self-continuity Measure
Participants were given the following instructions:

"In this section, It is the aim to collect information on self-continuity, which is a concept describing the extent to which we perceive our current-self and our future-self to be similar. Imagine that you (your present self) and yourself at some time in the future (your future self) are different people. If you consider your future self to be the exact same person you are now, you are highly self-continuous and the circles would be completely overlapping. The opposite counts, if you see that person as a complete stranger. In that case, the circles should not overlap."

Afterwards, they were asked first to indicate how similar they feel to their future self of 6 months from now by dragging the circles seen below, then repeat the same for their future self 10 years from now.



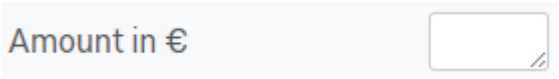
This implementation was introduced by Kamphorst (2017) who adapted his version from the original discrete measure introduced by Ersner-Hershfield et al. (2009)

A.5 Measure of Altruism; The Dictator game
Participants received the following instructions
"In this task you are being paired with another participant, where you are referred to as the giver and the other person as the receiver. You are completely anonymous to each other at any point during and after the task. Moreover, your partner will never get any information on the decision you make.

Imagine you are being given 10€ while your matched partner, the receiver, is given nothing. Afterwards, you are asked to make a simple decision. You have to decide, how much of the 10€ you want to give to the other person and how much you want to keep for yourself. You can give any amount between 0€ and 10€. The other player has no choice but to accept any amount you give and he cannot influence your choice in any way.

After the evaluation of the survey, one matched pair will be randomly chosen and paid out for real according to the decision the giver made.

How much do you want to give to the receiver?"



Appendix B: Detailed Description of important Variables

Table 4

Detailed Summary of important Variables

Variable	Description	Type	Obtainment	In detail
Altruism (dependent)	individual's level of altruism	continuous	Dictator Game	measured on the amount given
Age (independent)	individual's age	continuous/ ordinal	demographic questionnaire	age is measured, then categorised
Circle1Overlap (mediator)	individual's level of future self-continuity (6 months)	continuous	FSC-C Measure	measured on the overlap of the circles
Circle2Overlap (mediator)	individual's level of future self-continuity (10 years)	continuous	FSC-C Measure	measured on the overlap of the circles
FTP (mediator)	individual's level of future time perspective	ordinal, treated as continuous	FTP Scale 3 selected items	participants rate statement-agreement; 7-point Likert scale
Generativity (mediator)	individual's level of (social) generativity	ordinal, treated as continuous	SGS 3 selected items	participants rate statement-agreement; 7-point Likert scale
GoGrowth (mediator)	individual's goal orientation	binary: 0=orientation towards maintenance or loss prevention 1=orientation towards growth	participants state two goals and assess them on orientation towards growth, maintanance and loss prevention	participants rate statement-agreement; 7-point Likert scale
Gender (Control)	individual's sex	categorical; 3 categories	demographic questionnaire	voluntary question
Edu (Control)	individual's education	ordinal; 5 categories	demographic questionnaire	voluntary question
Nation (Control)	individual's nationality	categorical	demographic questionnaire	voluntary question
EmployStat (Control)	individual's employment status	categorical; 6 categories	demographic questionnaire	voluntary question
Inc (Control)	individual's monthly income	ordinal; 6 categories	demographic questionnaire	voluntary question
Polit	individual's left-right political orientation	categorical;; 7 categories	demographic questionnaire	voluntary question
Rel	individual's religious belief	binary	demographic questionnaire	voluntary question

Appendix C: Bivariate Analysis of Controls and Altruism

Below you can find a sequence of simple regressions, summarised in one table.

Table 5

Linear regression

altruism	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
sex							
female	0.490	0.373	1.31	0.190	-0.246	1.227	
other	0.648	2.414	0.27	0.789	-4.117	5.414	
constant	4.352	0.252	17.29	0.000	3.855	4.849	***
nation							
China	-1.750	2.641	-0.66	0.509	-6.975	3.475	
Germany	-0.490	2.374	-0.21	0.837	-5.186	4.206	
Netherlands	-2.000	2.506	-0.80	0.426	-6.956	2.956	
Pakistan	3.500	2.641	1.32	0.187	-1.725	8.725	
UK &Northern Ireland	-.0700	2.47769	-0.28	0.778	-5.601	4.2011	
…							
educ							
high school	-0.563	0.676	-0.83	0.406	-1.899	0.772	
bachelor	-0.931	0.644	-1.45	0.150	-2.202	0.341	
master	-0.257	0.679	-0.38	0.705	-1.598	1.083	
Doctorate or Higher	0.222	1.132	0.20	0.845	-2.013	2.457	
Constant	5.111	0.566	9.03	0.000	3.994	6.229	***
employment status							
part-time	0.298	0.635	0.47	0.639	-0.955	1.552	
unemployed	1.548	1.240	1.25	0.213	-0.900	3.996	
student	-0.542	0.429	-1.26	0.208	-1.389	0.305	
retired	0.465	1.029	0.45	0.652	-1.566	2.496	
self-employed	0.144	0.737	0.20	0.845	-1.310	1.599	
constant	4.702	0.317	14.81	0.000	4.075	5.329	***
inc							
average	0.160	0.426	0.38	0.708	-0.682	1.002	
above average	-0.385	0.532	-0.72	0.470	-1.435	0.665	
constant	4.627	0.333	13.89	0.000	3.970	5.285	***
polit							
2	-0.075	0.992	-0.08	0.940	-2.035	1.885	
3	-0.681	0.899	-0.76	0.450	-2.455	1.094	
4	-0.625	0.919	-0.68	0.497	-2.439	1.189	
5	0.256	0.985	0.26	0.795	-1.691	2.202	
6	-0.696	1.051	-0.66	0.509	-2.773	1.380	
7	-3.125	1.281	-2.44	0.016	-5.655	-0.595	**
8 (extremely conservative)	-0.125	2.516	-0.05	0.960	-5.094	4.844	
constant	5.125	0.839	6.11	0.000	3.469	6.781	***
rel							

not religious	-0.111	0.391	-0.28	0.777	-0.883	0.661	
constant	4.679	0.319	14.67	0.000	4.049	5.308	***
constant	5	2.3623	2.12	0.036	0.0369	9.6730	

*** p<0.01, ** p<0.05, * p<0.1

Appendix D: Mediation Analysis

D.1 Medium Age compared to Young Age

D.1.1 Regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Circle1ove~p	121	8	29.17719	0.0552	7.07	0.5294
Circle2ove~p	121	8	27.3413	0.0924	12.31	0.1378
FTP	121	8	1.171536	0.1067	14.45	0.0708
Generativity	121	8	1.185339	0.0943	12.61	0.1262
GoGrowth	121	8	.9216748	0.0764	10.01	0.2645
altruism	121	13	2.265036	0.1356	18.98	0.1237

	Coef.	Std.Err.	z	P>z	[95% Conf.	Interval]
Circle1overlap						
agemedium1	-0.330	5.685	-0.060	0.954	-11.473	10.813
sex	2.470	5.313	0.460	0.642	-7.942	12.883
nation	0.014	0.023	0.630	0.528	-0.030	0.059
educ	1.296	3.112	0.420	0.677	-4.804	7.396
employStatus	0.596	0.719	0.830	0.407	-0.812	2.004
inc	5.589	4.302	1.300	0.194	-2.844	14.021
polit	1.330	1.944	0.680	0.494	-2.480	5.140
rel	13.746	6.060	2.270	0.023	1.868	25.625
_cons	13.581	21.134	0.640	0.520	-27.841	55.003
Circle2overlap						
agemedium1	2.279	5.328	0.430	0.669	-8.163	12.720
sex	5.602	4.978	1.130	0.260	-4.155	15.360
nation	0.025	0.021	1.170	0.243	-0.017	0.067
educ	4.104	2.916	1.410	0.159	-1.612	9.820
employStatus	-0.475	0.673	-0.700	0.481	-1.794	0.845
inc	5.963	4.032	1.480	0.139	-1.939	13.865
polit	-2.510	1.822	-1.380	0.168	-6.080	1.061
rel	-3.831	5.679	-0.670	0.500	-14.962	7.299
_cons	16.233	19.804	0.820	0.412	-22.582	55.049
FTP						
agemedium1	-0.707	0.228	-3.100	0.002	-1.154	-0.260
sex	0.067	0.213	0.310	0.754	-0.351	0.485
nation	0.001	0.001	0.820	0.415	-0.001	0.003
educ	-0.017	0.125	-0.140	0.892	-0.262	0.228
employStatus	-0.047	0.029	-1.630	0.103	-0.104	0.009
inc	0.220	0.173	1.270	0.203	-0.118	0.559
polit	-0.080	0.078	-1.030	0.302	-0.233	0.072
rel	0.138	0.243	0.570	0.570	-0.339	0.615
_cons	5.791	0.849	6.820	0.000	4.128	7.454
Generativity						
agemedium1	0.167	0.231	0.720	0.470	-0.286	0.620
sex	0.090	0.216	0.420	0.677	-0.333	0.513
nation	0.001	0.001	0.850	0.397	-0.001	0.003
educ	-0.258	0.126	-2.040	0.042	-0.505	-0.010
employStatus	-0.000	0.029	-0.020	0.988	-0.058	0.057
inc	-0.272	0.175	-1.550	0.120	-0.614	0.071
polit	0.109	0.079	1.380	0.166	-0.045	0.264
rel	0.363	0.246	1.470	0.141	-0.120	0.845
_cons	2.945	0.859	3.430	0.001	1.262	4.628
GoGrowth						
agemedium1	-0.225	0.180	-1.250	0.211	-0.577	0.127
sex	-0.252	0.168	-1.500	0.134	-0.581	0.077

nation	-0.000	0.001	-0.020	0.981	-0.001	0.001
educ	0.128	0.098	1.300	0.195	-0.065	0.320
employStatus	-0.012	0.023	-0.520	0.605	-0.056	0.033
inc	-0.139	0.136	-1.030	0.305	-0.406	0.127
polit	0.126	0.061	2.060	0.039	0.006	0.247
rel	-0.178	0.191	-0.930	0.353	-0.553	0.197
_cons	2.074	0.668	3.110	0.002	0.766	3.383
altruism						
Circle1overlap	-0.000	0.009	-0.040	0.967	-0.018	0.017
Circle2overlap	-0.007	0.010	-0.700	0.484	-0.026	0.012
FTP	-0.135	0.227	-0.590	0.552	-0.581	0.310
Generativity	-0.511	0.218	-2.350	0.019	-0.938	-0.084
GoGrowth	-0.130	0.233	-0.560	0.575	-0.586	0.325
agemedium1	0.906	0.472	1.920	0.055	-0.019	1.831
sex	0.273	0.420	0.650	0.516	-0.550	1.095
nation	0.001	0.002	0.700	0.486	-0.002	0.005
educ	-0.197	0.253	-0.780	0.436	-0.692	0.298
employStatus	-0.037	0.058	-0.640	0.521	-0.150	0.076
inc	-0.507	0.341	-1.490	0.137	-1.174	0.161
polit	-0.235	0.156	-1.500	0.133	-0.542	0.071
rel	-0.435	0.506	-0.860	0.389	-1.427	0.556
_cons	9.592	2.481	3.870	0.000	4.731	14.454

D.1.2 Bootstrap results

Number of obs = 134
Replications = 1000

command: bootmm
_bs_1: r(indC2O)
_bs_2: r(indC1O)
_bs_3: r(indFTP)
_bs_4: r(indGen)
_bs_5: r(indGrowth)

Bootstrap

Coef.	Bias	Std.Err.	[95%Conf.	Interval]	
-0.015	0.000	0.078	-0.257	0.086	(BC)
-0.018	0.000	0.065	-0.248	0.061	(BC)
0.009	0.001	0.112	-0.184	0.278	(BC)
0.024	0.014	0.107	-0.134	0.314	(BC)
0.034	-0.011	0.074	-0.071	0.265	(BC)

(BC) bias-corrected confidence interval

D.2 Old Age compared to Young Age

D.2.1 Regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Circle1ove~p	78	8	27.07136	0.1179	10.43	0.2362
Circle2ove~p	78	8	27.9933	0.3552	42.97	0.0000
FTP	78	8	1.065988	0.3428	40.69	0.0000
Generativity	78	8	1.02755	0.1782	16.91	0.0310
GoGrowth	78	8	1.222831	0.1709	16.08	0.0412
altruism	78	13	2.077479	0.2340	23.83	0.0327

	Coef.	Std.Err.	z	P>z	[95%Conf.	Interval]
Circle1overlap						
ageold	18.308	7.790	2.350	0.019	3.040	33.576
sex	-6.507	6.837	-0.950	0.341	-19.907	6.893
nation	0.024	0.022	1.080	0.279	-0.019	0.066
educ	-0.024	3.143	-0.010	0.994	-6.183	6.136
employStatus	1.144	0.905	1.260	0.206	-0.631	2.919
inc	4.626	5.265	0.880	0.380	-5.694	14.945
polit	2.370	2.373	1.000	0.318	-2.282	7.022
rel	0.233	6.635	0.040	0.972	-12.771	13.237
_cons	45.468	24.826	1.830	0.067	-3.190	94.126
Circle2overlap						
ageold	40.498	8.055	5.030	0.000	24.710	56.286
sex	2.362	7.070	0.330	0.738	-11.494	16.218
nation	0.044	0.023	1.980	0.048	0.000	0.089
educ	0.706	3.250	0.220	0.828	-5.663	7.075
employStatus	1.566	0.936	1.670	0.094	-0.269	3.401
inc	10.041	5.445	1.840	0.065	-0.630	20.712
polit	2.170	2.454	0.880	0.377	-2.640	6.981
rel	0.889	6.861	0.130	0.897	-12.558	14.335
_cons	-17.986	25.671	-0.700	0.484	-68.301	32.329
FTP						
ageold	-1.770	0.307	-5.770	0.000	-2.371	-1.169
sex	0.167	0.269	0.620	0.535	-0.361	0.695
nation	0.001	0.001	1.040	0.300	-0.001	0.003
educ	-0.063	0.124	-0.510	0.613	-0.305	0.180
employStatus	-0.022	0.036	-0.620	0.536	-0.092	0.048
inc	0.354	0.207	1.710	0.088	-0.053	0.760
polit	-0.045	0.093	-0.490	0.626	-0.229	0.138
rel	-0.263	0.261	-1.010	0.314	-0.775	0.249
_cons	5.913	0.978	6.050	0.000	3.997	7.829
Generativity						
ageold	-0.326	0.296	-1.100	0.270	-0.906	0.253
sex	-0.128	0.260	-0.490	0.622	-0.637	0.381
nation	0.000	0.001	0.490	0.627	-0.001	0.002
educ	0.048	0.119	0.400	0.689	-0.186	0.281
employStatus	-0.021	0.034	-0.620	0.536	-0.089	0.046
inc	-0.428	0.200	-2.140	0.032	-0.820	-0.037
polit	0.088	0.090	0.970	0.330	-0.089	0.264
rel	0.470	0.252	1.870	0.062	-0.024	0.963
_cons	2.731	0.942	2.900	0.004	0.884	4.578
GoGrowth						
ageold	0.823	0.352	2.340	0.019	0.133	1.512
sex	-0.620	0.309	-2.010	0.045	-1.225	-0.015
nation	0.001	0.001	0.530	0.593	-0.001	0.002
educ	-0.036	0.142	-0.260	0.798	-0.315	0.242
employStatus	0.069	0.041	1.700	0.089	-0.011	0.150
inc	-0.144	0.238	-0.600	0.545	-0.610	0.322
polit	0.301	0.107	2.810	0.005	0.091	0.511
rel	0.231	0.300	0.770	0.440	-0.356	0.819
_cons	1.108	1.121	0.990	0.323	-1.089	3.306
altruism						
Circle1overlap	0.006	0.011	0.590	0.553	-0.014	0.027
Circle2overlap	0.007	0.010	0.730	0.462	-0.012	0.027
FTP	0.072	0.255	0.280	0.779	-0.429	0.572
Generativity	-0.579	0.254	-2.280	0.022	-1.077	-0.082

GoGrowth	0.338	0.206	1.650	0.100	-0.065	0.742
ageold	0.963	0.852	1.130	0.258	-0.707	2.633
sex	0.679	0.544	1.250	0.212	-0.387	1.744
nation	0.001	0.002	0.480	0.634	-0.003	0.004
educ	-0.073	0.242	-0.300	0.763	-0.548	0.402
employStatus	0.035	0.072	0.480	0.634	-0.107	0.177
inc	-0.859	0.423	-2.030	0.042	-1.688	-0.029
polit	-0.038	0.194	-0.200	0.845	-0.417	0.342
rel	0.411	0.522	0.790	0.431	-0.612	1.433
_cons	3.883	2.850	1.360	0.173	-1.702	9.469

D.2.2 Bootstrap results

Number of obs = 88
Replications = 1000

command: bootmm
_bs_1: r(indC2O)
_bs_2: r(indC1O)
_bs_3: r(indFTP)
_bs_4: r(indGen)
_bs_5: r(indGrowth)

Coef.	Bias	Std.Err.	[95%Conf.	Interval]	
0.322	-0.016	0.508	-0.613	1.367	(BC)
0.073	-0.023	0.225	-0.338	0.599	(BC)
-0.093	-0.056	0.372	-0.834	0.711	(BC)
0.257	-0.012	0.226	-0.064	0.851	(BC)
0.058	0.008	0.118	-0.064	0.465	(BC)

(BC) bias-corrected confidence interval