Altruism in Medical and Non-Medical Students

Bachelor Thesis

Abstract

This study examines altruism levels in medical students compared to students of business-related programs. The following research question is posed: To what extent do financial incentives, personal factors such as altruistic values, and behavioral factors such as past altruistic behavior, influence altruistic decision-making of medical students compared to nonmedical students? To answer the research question, we use survey-collected data of 57 medical students and 59 students of business-related programs at a Dutch university. We compare altruism levels as measured by a dictator game – experimental altruism, self-reported frequency of past altruistic acts, and self-reported valuing of altruism in the professional setting. Moreover, we evaluate the self-altruistic measures of altruism with the experimentally obtained measure. Thirdly, we analyze the relation of personal and behavioral factors to experimental altruism. We find that medical students are more altruistic using all three measures of altruism, although the relation between study program and experimental altruism is the weakest out of all three of them. Furthermore, we show that the self-reported measures provide us with some degree of internal validity. Lastly, we evaluate that only some personal characteristics such as gender and some behavioral factors in relation to personal characteristics help explaining experimental altruism levels among students.

Keywords: altruism in healthcare, medical students, dictator game, altruistic decision-making, self-reported altruism

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Introduction

Health-related careers such as nursing and medicine are oftentimes regarded as more altruistic and pro-social than other careers. In fact, altruistic and pro-patient orientation are one of the most important characteristics of a good healthcare professional (Kacker et al., 2021). Some studies suggest that such altruistic attitude can already be found in students of these professions as highly altruistic individuals self-select into more pro-social careers that enable them to practice their values (Besley & Ghatak, 2005; Heyes, 2005). However, classical economic models and reward schemes oftentimes ignore the altruistic aspect of healthcare workers and model their behavior as self-interested, rational decision-makers (Andreoni et al., 2010; Tichem, 2014). This traditional notion has increasingly been questioned by behavioral economists who try to incorporate psychological findings into economic models (Tichem, 2014). They point out that classical economic models oftentimes cease to explain phenomena in which financial incentives aimed at increasing healthcare quality might not work (Heider & Mang, 2020) and can even backfire, i.e. crowding out effects for certain groups of doctors (Galizzi, 2015; Siciliani et al., 2009). One of the most frequently mentioned reasons for such discrepancies is the role of altruism (Galizzi et al., 2015; Siciliani et al., 2009). A commonly used definition of altruism in behavioral economics is the one by the philosopher Thomas Nagel who characterizes it as 'a willingness to act in the consideration of the interests of other persons, without the need of ulterior motives' (Nagel, 1970 as cited in Andreoni et al., 2010).

However, the conceptualization of altruism and its assessments in literature differ (Falk et al., 2016; Galizzi et al., 2015). Many studies rely on self-reported values of healthcare workers or their self-reported behavior in the past (Galizzi et al., 2015). Moreover, there is relatively limited empirical evidence of higher altruism in medical students compared to students of other professions, especially in the context of Western Europe. As a matter of fact, most attention has been given to either working professionals or nursing students (Galizzi et al., 2015). Nevertheless, there is a high chance that altruistic individuals already self-select into pro-social careers including medicine before starting to practice the profession (Heyes, 2005). Therefore, this study aims to contribute to the existing literature by empirically studying altruism levels in medical and nonmedical students in the Dutch context.

We study altruism through its three commonly analyzed dimensions: experimental altruism, self-reported professional altruistic values, and self-reported past altruism (Galizzi et al., 2015). Using methods from behavioral economics, we can assess to what extent an individual is motivated by altruistic incentives in contrast to monetary incentives to assess experimental altruism (Andreoni et al., 2010; Falk et al., 2016). These experimentally-obtained altruism levels can also be viewed as altruistic decision-making and are believed to associate with how the individual might decide in work

scenarios (Galizzi et al., 2015). Moreover, the remaining two dimensions can help us compare the self-assessed altruistic measures of students to the actual altruistic extent of their choices. Therefore, the second contribution of this study is aiming to provide a link and internal validation for the different measures of altruism used in the past in the context of university students (Falk et al., 2016). Thirdly, we study the relation of personal characteristics of students such as their status and identity formation with their altruism levels. Thus, our findings can provide quantitative evidence that might help in shaping better reward and recruitment schemes for attracting pro-social young graduates and professionals (Smith et al., 2013). We pose a research question: To what extent do financial incentives, personal factors such as altruistic values, and behavioral factors such as past altruistic behavior, influence altruistic decision-making of medical students compared to nonmedical students?

In this paper, we first review the existing literature on altruism in health careers compared to other careers. As this study is based on the application of behavioral economics to health and personnel psychology, we focus mainly on these domains. In the methodology section, we provide detailed account of the survey and experimental techniques used in our study. Following methodology, we present the results obtained by using statistical analysis and discuss them in the next section. Lastly, we highlight the most relevant limitations of this study and state the conclusion based on our findings.

Theoretical framework and Literature Review

There is a relatively large body of literature indicating that healthcare professionals and students show high altruism related to their job (Galizzi et al., 2015). Yet, most studies use either qualitative methodology or self-reported surveys and vary in their conceptualization of altruism (Galizzi et al., 2015; Scott & Sivey, 2017). The conceptualizations of altruism range from pro-sociality (Lagarde & Blaauw, 2014), past altruism and altruistic personality (Zulkarnain et al., 2021), altruistic decision-making (Jacobsen et al., 2011; Smith et al., 2013) to altruism as a self-described motivation (Serra et al., 2011; Smith et al., 2013). However, most studies converge in assuming that altruism is an intrinsic value reflected in one's economic preferences (Ashraf et al., 2020; Falk et al., 2016; Galizzi et al., 2015). Therefore, we also conceptualize altruism as a personal value characterized by selfless concern for the welfare of others that can be observed in one's preferences (Bénabou & Tirole, 2006; Jacobsen et al., 2011; Tichem, 2014).

It is assumed that employee's preferences, in which altruism is reflected, shape their economic choices (Bénabou & Tirole, 2006; Tichem, 2014), including career selection (Besley & Ghatak, 2005; Bénabou & Tirole, 2006) and work performance (Tichem, 2014). Traditionally, economic literature has emphasized the role of extrinsic incentives in the workplace, such as monetary rewards (Tichem, 2014). However, studies have also increasingly recognized other motivators, such as the role of intrinsic

motivation (Heider & Mang, 2020; Tichem, 2014). As altruism depicts a personal value that motivates one's choices, it can be seen as a part of intrinsic motivation (Besley & Ghatak, 2005; Jacobsen et al., 2011; Smith et al., 2013). Accordingly, it is theorized that highly altruistic individuals choose pro-social careers such as careers in non-profit or public sector (Besley & Ghatak, 2005; Lagarde & Blaauw, 2014; Serra et al., 2011). Besley and Ghatak (2005) emphasize that individuals have different intrinsic motivators and values based on which they choose their career. This theory was empirically supported by Serra and colleagues (2011) who found that more pro-socially motivated healthcare professionals were more likely to work in the non-profit sector. Similarly, Lagarde and Blaauw (2014) found that more altruistic nurses chose to work in monetarily less attractive rural areas. In fact, matching the personal values and the goals of the organization can help increase efficiency (Besley & Ghatak, 2005; Brosig-Koch et al., 2017; Tichem, 2014). As Kacker and colleagues (2021) found, healthcare providers who preferred higher treatment efficacy over monetary profit also tended to provide better quality care.

One's altruism can be studied in experimental settings, which are assumed to capture the preferences of a person in the most reliable way (Andreoni et al., 2010). Thus, experimentally-obtained measures of altruism, that suffer from less response bias than self-reported measures (Andreoni et al., 2010), seem to be related to altruistic choices in real life, such as job selection (Lagarde & Blaauw, 2014). Generally, the experimental studies have used various approaches to study altruism in decision-making, such as dictator games (DGs) and public goods games (Galizzi et al., 2015). Typically, they compare healthcare professionals with business-related professions that are characterized by higher pay (Galizzi et al., 2015; Jacobsen et al., 2011). One of such studies was performed by Cadsby and colleagues (1998) who conducted threshold public goods game with economics-and-business students and nurses. They found that economics-and-business students were far less cooperative than nurses, leaning towards free-riding equilibrium. Similarly, Hennig-Schmidt and Wiesen (2014) found major differences between medical students and students from other majors in their altruistic motivation towards a patient, with medical students showing greater levels of altruism. Consistently with these findings, Jacobsen and colleagues (2011) conducted a DG comparing nursing students with real-estate broker students, finding that nursing students gave away 75 percent of their endowments, while the latter group donated only 61 percent. A similar study by Smith and colleagues (2013) supports these findings as well. This study also used a DG to test altruism of nursing students across three different countries - Kenya, South Africa, Thailand. The study also included a survey on respondents' personal values to measure altruism as a self-reported value. Smith and colleagues found that nursing students donated cca 30% of their endowments in all three countries; and found high positive association between experimental altruism and survey-reported altruism as a value.

Although previous studies show that healthcare workers might be generally more altruistic than other professionals, evidence suggests great differences in altruism among healthcare workers (Brosig-Koch et al., 2017; Godager & Wiesen, 2013; Scott & Sivey, 2017). In an experiment, Godager and Wiesen (2013) found major differences among physicians' altruistic levels in valuing patient benefits when choosing quantity of medical service provision. Around 26% doctors preferred their own benefit over patient's, around 30% were indifferent, and 44% doctors preferred patient's benefit over their own. Other experimental studies also highlight the heterogeneity of medical population in their levels of altruism (Brosig-Koch et al., 2017; Scott & Sivey, 2017).

Such differences in altruistic levels in healthcare workers were modelled by Siciliani and colleagues (2009), who established a model of the price effect on output in publicly-funded providers in regard to their differing altruism levels. This model would also explain why crowding out effects might occur for some healthcare workers while not in others (Siciliani, 2009). The authors identified three subgroups based on their altruistic levels. While higher payment increases output for high- and low- altruism providers, the output of moderately altruistic providers decreases or stays unchanged. The reason for this is the differing effect of monetary incentives on provider's reputation that is linked to their utility. In turn, provider's utility is determined by financial compensation but also by their reputation among colleagues and patients. Moderately altruistic doctors suffer the most from reduced reputation as gaining more money makes them seem less altruistic and more money-driven, which decreases their utility and performance. This is also in line with the social preference framework and conformist utility maximization developed by Sliwka (2007). Another reason for potential discrepancies in altruism levels among healthcare professionals can be linked to different specialties that are characterized by different personality and value fits, including altruism (Ratanawongsa et al., 2006).

Identity formation and status based on one's reputation seems to be an essential link between altruistic and financial motivation (Olivella & Siciliani, 2017). Studies found changes in performance of doctors based on reactions to reciprocity, reputation and social comparisons (Galizzi et al., 2015; Olivella & Siciliani, 2017). Similarly, Bénabou and Tirole (2006) found that doctors would generally like to appear uninterested in money when they provide care, which can be devalued by financial incentives. Moreover, other identity characteristics such as gender are also associated with altruistic levels, as women in the healthcare field tend to be more altruistic in DGs (Smith et al., 2013).

Even though there is a link between altruism as a self-reported personal value and one's choices, they should be still considered as distinct dimensions of altruism whose relationship needs to be studied further. As Smith and colleagues (2013) indicated, there was a positive association between

the self-reported altruistic values of nursing students and the experimental altruism, which is also supported by the findings of (Lagarde & Blaauw, 2014). However, Serra and colleagues (2011) find only weak correlation between self-reported altruistic values and altruistic choices obtained experimentally. Another commonly acknowledged dimension of altruism is past altruism (Galizzi et al., 2015), which might suffer from more bias than experimental altruism, but less bias than self-reported altruistic values (Galizzi et al., 2015). As the theory of altruistic capital suggests, rather than having fixed altruistic preferences, past altruism is reflected in altruistic capital (Ashraf & Bandiera, 2017). Altruistic capital is accumulated or depleted over time, depending on individual's choices and it can be affected by policy. In other words, the individuals who practice altruism often accumulate their altruistic capital over time.

Methodology

Experimental and Survey Methods

Similarly to the previous studies, we used an established method to experimentally test altruism in individuals – a dictator game (DG). As described by Andreoni and colleagues (2010) and Falk and colleagues (2016), DGs are a common way to study altruism. We might call the altruism levels obtained this way "experimental altruism" as it is estimated using an experimental method, that is supposed to be relatively accurate (Andreoni et al., 2010). In the DG, participants received an endowment of 40 eur and they were asked to distribute the endowment between themselves and a recipient, i.e. they could either keep or donate a portion of it. To assure that participants were truly incentivized to allocate real money, they were able to win a prize in the amount of their endowment that they kept for themselves (a voucher for an online store). We assume that the higher the giving share of the endowment, the more altruistic the individual is (Andreoni et al., 2010; Falk et al., 2016; Smith et al., 2013). Most people share 25% of their endowment on average (Andreoni et al., 2010). Typical DGs tend to be fully anonymous (Andreoni et al., 2010) meaning that the participants cannot choose the recipient of the endowment, yet in our case, this was not fully the case. Although participants were fully anonymous, the recipient could be chosen by them as we aimed to maximize the giving rates by choosing a charity they would prefer to donate to and find the cause worthy.

We also study self-reported professional altruism and self-reported past altruism to achieve greater internal validity, and further examine the relation among the three dimensions of altruism. We measured past altruism by asking subjects to report past altruistic acts on an adopted Altruistic Personality Scale (Rushton et al., 1981), which has been previously used to assess behavioral altruism in healthcare providers (Galizzi et al., 2015; Zulkarnain et al., 2021). The survey originally consists of a scale that measures altruistic tendencies by reporting the frequency of one's engagement in altruistic

acts and it can also be used to measure altruistic personality when used in the original form (Rushton et al., 1981). The subjects reported how often they had engaged in a described altruistic behavior on the scale between 1 (Never) to 5 (Very often).

For the self-reported professional altruism, subjects reported what they consider professional on the Altruistic dimension as adopted from the Penn State College of Medicine Professionalism Questionnaire (Blackall et al., 2007), which was modified to also be applicable to business-related students. This questionnaire has been used to report professional and altruistic values of the subject (Blackall et al., 2007). Respondents indicated how important is the described altruistic behavior for being professional in their field on the scale 1 (Not important at all) to 5 (Most important). Therefore, we can assess how much the respondents value altruism in being professional in general, not just for them personally. To study status-and-identity formation, we used indirect questions related to whether a person associates their identity and reputation with their study program.

Furthermore, we conduct a robustness check for the self-reported measure of past altruism. After respondents answered all the questions regarding their past altruistic behavior, they were asked to assess how altruistic they think they are compared to the average. They could either indicate that they are less altruistic than average, more altruistic than average or averagely altruistic. As this self-assessment took place after the questions in which they had been made to think about different acts of altruism in the past, the subjects were primed to think mainly about their past altruism when estimating their overall altruism.

The outline of the full survey as well as the exact wording of the questions can be found in the Appendix.

Data collection

This study was conducted via an online Qualtrics survey that assessed three dimensions of respondents' altruism: experimental altruism, self-reported past altruism (past altruism), and self-reported professional altruistic values (professional altruism). The participation in the study was fully voluntary and subjects were incentivized to participate in the study by the possibility to win a prize (a voucher for up to 40 eur). The exact sum of the prize was linked to the experiment used in the study. The subjects were briefly informed about the data privacy and anonymous data collection. We did not store any personal information of the participants and the only potential identifiability of the subjects was based on their study cohort. To ensure full anonymity, the subjects received two codes at the beginning and at the end of the survey to claim their prize. One code served as a personal identifier (a student was assigned this identifier randomly without the knowledge of the researcher); the second code served as a prize-claimer, a password for the voucher. These codes were randomly distributed

and paired. In the end, the winning personal identifier codes were posted at the faculty and social media groups, so that subjects could claim their prize.

The survey consisted of two versions – one for each study group. The respective versions of the survey were distributed among medical students and students of business-related subjects (business majors) at the same university in the Netherlands. Medical studies are divided into bachelor and master's degree each lasting three years in the Netherlands (Maastricht University, n.d.). Business-related studies are also divided into a bachelor and a master's degree, although master's degrees typically last 1-2 years. Moreover, it is worth noting that the university has a fairly international character, thus the sample of students was also international. The sampling method was limited to convenience sampling and snowball method since taking part in a survey was fully voluntary. The study received an Ethical Approval from the UCM Ethics Committee, which can be found in Appendix 3. The data collection took place in May, 2021.

Analysis

The data are further statistically analyzed using R programming language. A descriptive analysis of the data is conducted first, followed by inferential statistical analysis to answer the research questions. Before using statistical tests, certain data is manipulated: Past altruism is scored using overall sums from this category of questions; Professional altruism (reported on a Likert scale) is scored using mean scores of the answers; and status-and-identity formation is scored using mean scores of the answers (also reported on a Likert scale).

Using regression analysis, namely multiple linear regression, we model altruistic decision-making in dictator games (Experimental altruism) based on the student personal and behavioral characteristics: gender, study year, specialization, self-reported past altruistic behavior, professional altruism, salary expectation and status formation.

We aim to answer the following sub-research questions:

1. How do medical students differ from business students on the three dimensions of altruism?

      i.   Experimental altruism

      ii.   Self-reported Past altruistic behavior

      iii.   Self-reported Professional altruism (value-based)

2. Are the self-reported measures of altruism predictive of experimental altruism for different study areas?

3. Are personal (including self-reported professional altruism, gender, year of study, status/identity formation, intended specialization, salary expectation) and behavioral factors (including the self-reported past altruism) associated with experimental altruism?

Hypotheses
1. We hypothesize that medical students will show higher levels of altruism on all three measures.
2. We hypothesize that both self-reported measures of altruism will be strongly related to the experimental measure.
3. We hypothesize that the personal characteristics and behavioral factors of students will be strongly associated with experimental altruism.

Results

Descriptive Results

We obtained 131 answers to our survey: 66 for medical students and 65 for business-related students. Out of these, we only use the complete answers: 57 for medical students and 59 for business-related students. Specifically, the sample comprises of 48 medical bachelor students and the same amount of business-major bachelor students. There are 9 medical master students and 11 business-major master students, forming a relatively balanced representative sample since bachelor programs are longer than master programs. Students from different years are almost equally represented in each group, however there are very few fourth year students as this is not a standard (3 medical students and 1 business-major). There are only 8 men (14%, n=57) among the medical respondents and 49 women (86%, n=57), while the number of male business majors almost matches the number of female (30 men, 29 women, corresponding to 50.8% and 49.2%, n=59). For detailed information on data description see Appendix 1.1.

When comparing means of the three altruism measures, medical students show higher scores on all three dimensions of altruism (Figure 1). For Experimental altruism, medical students allocated to charity 22.98 eur out of 40 on average, corresponding to 57.45%, while business major students allocated only 18.76 eur on average, corresponding to 46.9%. The distribution of Experimental Altruism scores for the two student groups shows that the allocations varied more for the business majors with more business-related students choosing not to allocate anything to the charity (Figure 2). See the Appendix 1.2 for the score distributions of Past altruism and Professional Altruism.

We conduct independent sample t-tests for each dimension of altruism to see if differences in the student groups seem significant. For Experimental altruism, the differences in the mean allocations between medical and business-related students are significant only under the significance level 0.1

(n=116, p<0.1). However, for both Past altruism and Professional altruism, the differences do seem highly significant (n=116, p<0.01).

	Mean		Median		SD	
	medical students	business majors	medical students	business majors	medical students	business majors
Experimental altruism	22.98	18.76	20	20	11.45	14.11
Past altruism	49.29825	43.25424	50	43	7.91	7.44
Professional Altruism	3.778363	3.348023	3.83	3.33	0.56	0.38

Figure 1: Altruism Scores
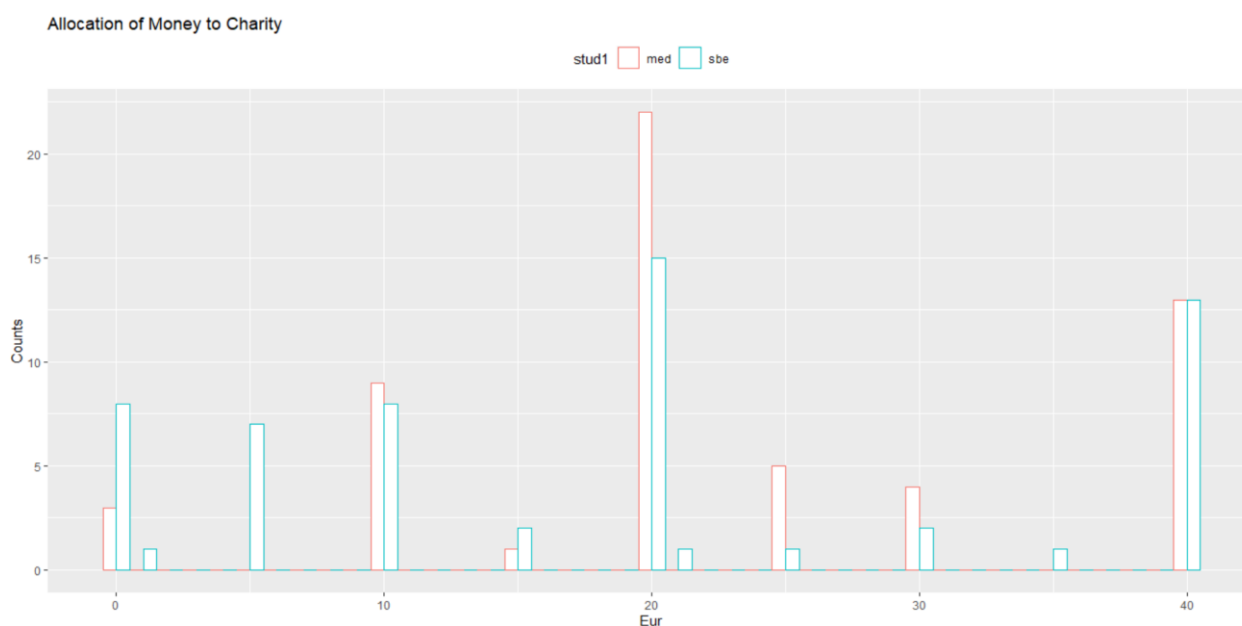
Figure 2: Distribution of Results Experimental Altruism – Donations to charity (medical students - med, business-related students – sbe)

For the independent variables, it is worthy to point out status-and-identity formation as well as reported salary. Medical students score lower on average than business majors on status-and-identity formation questions (Figure 3). Medical students score 2.55 points on average (n=57, SD = 0.52), while business majors score 2.76 on average (n=59, SD = 0.61). Moreover, interestingly, students did not respond similarly to the question about their expected professional salary. Only 24.5% of medical students (n=57) reported their expected salary, while 50.8% (n=59) of business majors

reported their expected salary (Figure 4). It is not possible to draw meaningful inferences from such few answers from medical students. Therefore, we continue the analysis with the variable salary depicting whether students reported their expected salary or not as a dummy variable.
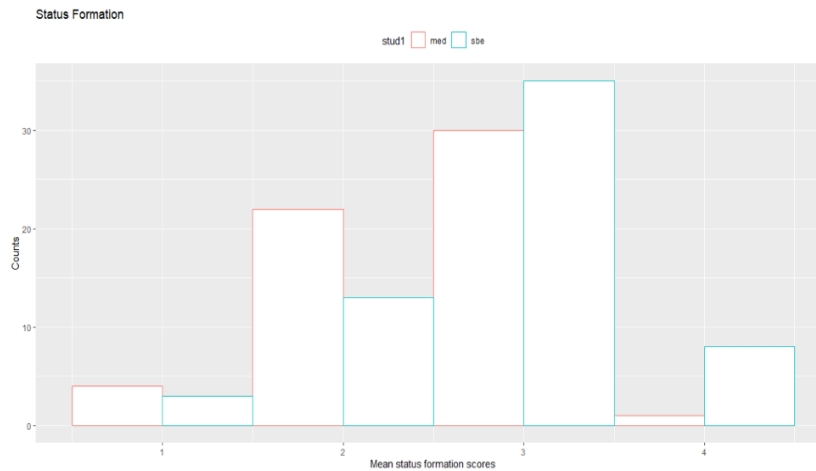
Figure 3: Status Formation for Medical and Business-related students
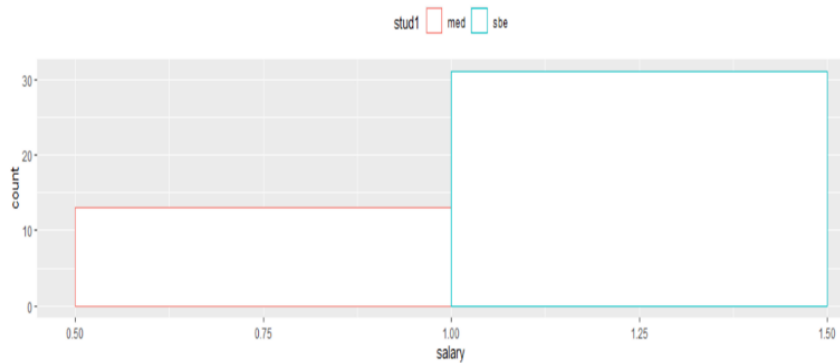
Figure 4: Salary indication for Medical and Business-related students

Inferential Analysis

All of the models used constitute a variation of the ordinary least squares (OLS) regression equation for a quantitative outcome variable (see the equation below). The empirical approach can be summarized as follows:

$$Y_i = \alpha_i + \beta_i * \text{predictor variable}_i + \varepsilon$$

Y_i depicts outcome variable, a measure of altruism. α is the constant of the regression, which is the Y_i-intercept of the regression model. β_i represents the coefficient of the predictor variable i. ε represents the residual error term, i.e. the unmeasured variables. In cases of all regression models that follow, we check the conditions for linear regression. Coefficients are reported with their level of significance.

1. Comparison of Medical and Business-related Students on their Levels of Altruism

Firstly, we test whether Experimental altruism, Past altruism and Professional altruism as outcome variables were associated with study program in three separate linear regressions (Figure 5). The study group dummy uses medical students as a reference group (medical students coded as 0, business majors coded as 1). Our findings are consistent with those obtained in our descriptive analysis that suggested the observed patterns. As seen in the model for Experimental altruism (Figure 5, Column 1), business-major students allocate 4.22 eur less to charity than medical students on average (n = 116, $p<0.1$, CI = [-8.905,0.466]). Similarly, for Past altruism (Figure 5, Column 2), business-major students score less than medical students by 6.044 points on average, corresponding to lower number of past altruistic acts (n = 116, $p<0.01$, CI = [-8.838, -3.250]). Furthermore, business-major students also show lower mean Professional altruism than medical students by 0.43 points on average (n = 116, $p<0.01$, CI = [-0.603, -0.257]) (Figure 5, Column 3), meaning that they value Professional altruism less than medical students.

Three dimensions of Altruism based on Study Program

	Dependent variable:		
	Experimental Altruism	Past Altruism	Professional Altruism
	(1)	(2)	(3)
Study Group	-4.220[*]	-6.044[***]	-0.430[***]
	(-8.905, 0.466)	(-8.838, -3.250)	(-0.603, -0.257)
Constant	22.982[***]	49.298[***]	3.778[***]
	(19.641, 26.324)	(47.306, 51.291)	(3.655, 3.902)
Observations	116	116	116
R^2	0.027	0.136	0.173
Adjusted R^2	0.018	0.129	0.165
Residual Std. Error (df = 114)	12.872	7.675	0.475
F Statistic (df = 1; 114)	3.115[*]	17.979[***]	23.785[***]
Note:			[*]$p<0.1$; [**]$p<0.05$; [***]$p<0.01$

Figure 5: Three dimensions of Altruism based on Study Program

2. Relation of Self-reported measures of Altruism with Experimental Altruism

Secondly, we study the association of Experimental altruism with the self-reported measures of altruism, namely Past altruism and Professional altruism for different student groups. Study group can be considered collinear with Past altruism and Professional altruism as observed in the regression in

the previous section (Figure 5, Columns 2 and 3), thus we report only the relation between Experimental altruism with Past and Professional altruism (see Appendix 1.3.1 for further explanation and reporting with study group). Using the stepwise method, we employ a linear regression model with Experimental altruism as an outcome variable and Past altruism (Figure 6, Column 1), then we continue adding the predictor variable Professional altruism (Figure 6, Column 2). On average, an increase of one point in the Past altruism score is associated with 0.295 eur greater allocations to charity (n = 116, p<0.05, CI = [0.01,0.58]), meaning that Past altruism is positively associated with Experimental altruism – those students who showed more altruism in the past tend to be more altruistic also in experimental setting (Figure 6, Column 1). Past altruism seems to be collinear with Professional altruism, as its statistical significance decreases majorly when used jointly with Professional altruism as predictors (Figure 6, Column 2). To further understand their relation and check if they are really collinear, we use Past altruism as outcome variable and Professional Altruism as a predictor variable (Figure 6, Column 3). Indeed, we observe a statistically significant positive association between the two, confirming their collinearity. On average, an increase in mean Professional altruism by one point is associated with an increase in Past altruism by 4.72 points (n = 116, p<0.01, CI = [1.95,7.489]).

The Connection of Experimental Altruism to Past Altruism and Professional Altruism

	Dependent variable:		
	Experimental Altruism		Past Altruism
	(1)	(2)	(3)
Past Altruism	0.295**	0.280*	
	(0.010, 0.580)	(-0.019, 0.580)	
Professional Altruism		0.758	4.720***
		(-3.981, 5.497)	(1.950, 7.489)
Constant	7.213	5.177	29.425***
	(-6.163, 20.588)	(-13.328, 23.682)	(19.462, 39.388)
Observations	116	116	116
R^2	0.035	0.036	0.089
Adjusted R^2	0.026	0.019	0.081
Residual Std. Error	12.818 (df = 114)	12.869 (df = 113)	7.881 (df = 114)
F Statistic	4.110** (df = 1; 114)	2.088 (df = 2; 113)	11.153*** (df = 1; 114)
Note:			*p<0.1; **p<0.05; ***p<0.01

Figure 6: The Connection of Experimental Altruism to Past Altruism and Professional Altruism

3. Relation of Personal and Behavioral Factors with Experimental Altruism

In the third part of our analysis, we aimed to study the relation of Experimental altruism as an outcome variable with predictor variables Past altruism, Professional altruism, study group and the personal characteristics of the students: gender, year of study, status-and-identity formation, and salary expectation using the step-wise approach. However, from the previous regressions, we observe that both Past and Professional altruism are strongly associated with study group (Figure 5, Columns 2 and 3). Moreover, Past altruism is strongly associated with Professional altruism (Figure 6, Column 3). Thus, we do not include study group and Professional altruism further in the regression analysis (see Appendix 1.3.2 for inclusion of Professional altruism and study group).

The first regression model indicates that both Past altruism and status-and-identity formation are significantly related to Experimental altruism (Figure 7, Column 1). Yet, when gender variable is added in the next model (Figure 7, Column 2), the significance of both Past altruism and status-and-identity formation drops. Moreover, the coefficients also change greatly, especially the one for status-and-identity formation (Figure 7, Column 2). Therefore, we suspect that there might be a relation between Past altruism and status-and-identity formation, which we incorporate in our next model.

We observe that the third regression model (Figure 7, Column 3) explains Experimental altruism the best out of all models as the predictor variables added further do not contribute to explanatory power of the model (Figure 7, Columns 4 and 5). The third model shows that gender is related to experimental altruism – women donate more to charity than men by 5.149 eur on average (men acting as our reference group, coded as 0, women as 1), holding all else equal (n = 116, p<0.05, CI = [0.146,10.152]) (Figure 7, Column 3). From this regression model (Figure 7, Column 3), we also observe that Past altruism and status-and-identity formation interact with each other. The interaction variable of Past altruism and status-and-identity formation increases donations to charity. Thus, the effect of Past altruism on Experimental altruism depends on status-and-identity formation and vice versa. To gain a better understanding of the interaction, we plot the interaction effects (Figure 8). For those who had higher levels of status-and-identity formation than average (+1SD from average), Past altruism is positively associated with Experimental altruism (Figure 8). Yet, for those who had lower levels of status-and-identity formation (-1SD), the association of Past altruism with Experimental altruism is slightly negative, indicating lower donations to charity for those who were more altruistic in the past (Figure 8).

The fourth model (Figure 7, Column 4) and fifth model (Figure 7, Column 5) show that the fact whether a student indicated an expected salary does not influence Experimental altruism of the student (Figure 7, Column 4), neither does year of study of the student (Figure 7, Column 5) as each of

these two variables was nonsignificant in the respective regression model. For further refinement of the analysis that includes testing the relation of preferred specializations with Experimental altruism, see Appendix 1.5.

	Experimental Altruism				
	Dependent variable:				
	Experimental Altruism				
	(1)	(2)	(3)	(4)	(5)
Past Altruism	0.297**	0.205	-1.148*	-1.120*	-1.143*
	(0.016, 0.577)	(-0.083, 0.493)	(-2.413, 0.117)	(-2.397, 0.157)	(-2.414, 0.129)
Status formation	-4.337**	-3.757*	-27.194**	-26.538**	-27.161**
	(-8.339, -0.336)	(-7.739, 0.224)	(-48.900, -5.487)	(-48.550, -4.527)	(-48.961, -5.361)
Gender		5.833**	5.149**	5.117**	5.038*
		(0.788, 10.877)	(0.146, 10.152)	(0.092, 10.141)	(-0.048, 10.125)
Salary Indication				-0.996	
				(-5.739, 3.747)	
year of study					-0.391
					(-3.194, 2.413)
Interaction variable: Status formation and Past Altruism			0.513**	0.502**	0.513**
			(0.046, 0.980)	(0.030, 0.973)	(0.044, 0.982)
Constant	18.659**	17.472**	79.802***	78.475**	80.301***
	(1.774, 35.544)	(0.525, 34.419)	(20.622, 138.982)	(18.734, 138.215)	(20.762, 139.839)
Observations	116	115	115	115	115
R^2	0.072	0.111	0.146	0.148	0.147
Adjusted R^2	0.055	0.086	0.115	0.109	0.108
Residual Std. Error	12.625 (df = 113)	12.432 (df = 111)	12.234 (df = 110)	12.280 (df = 109)	12.285 (df = 109)
F Statistic	4.375** (df = 2; 113)	4.598*** (df = 3; 111)	4.718*** (df = 4; 110)	3.780*** (df = 5; 109)	3.758*** (df = 5; 109)

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Figure 7: The Connection of Predictors to Experimental Altruism

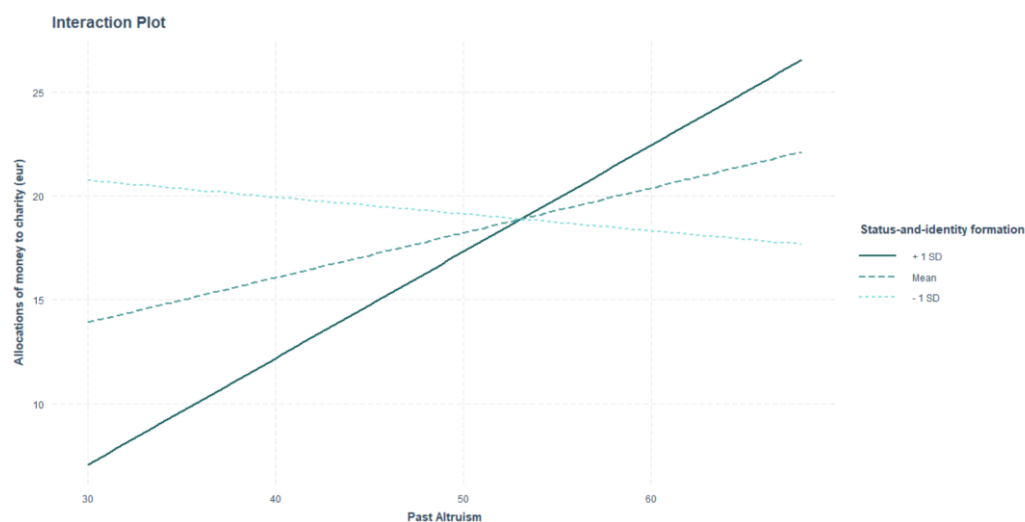*Figure 8: Interaction Plot (Status-and-identity formation with Past Altruism)*

Robustness Assessment of Past Altruism

We check the robustness of the measure of Past altruism. After answering questions concerning Past altruism, in which students reported frequency of past altruistic acts, students reported how altruistic they think they are compared to other students having three options: average, or below, or more than

average. We use these self-assessments as dummy variables with average as a reference group. For distributions of answers among student groups see Appendix 1.4. We test the relation of self-assessed altruism levels with Past altruism with a regression (Figure 9). The below average dummy and the constant are significant, while the above average dummy is not. Our results indicate that those students who view themselves as averagely altruistic scored 46.024 points on Past altruism on average (n = 116, p<0.01, CI = [44.32, 47.728]) (Figure 9). Moreover, the students who viewed themselves as altruistic below average have lower scores for Past altruism by 8.19 on average than those who view themselves as averagely altruistic (n = 116, p<0.05, CI = [-14.79, -1.591]) (Figure 9). However, the dummy representing the students who viewed themselves as more altruistic than average is not significant.

Past Altruism

	Dependent variable:
	Past Altruism
below average dummy	-8.190**
	(-14.790, -1.591)
above average dummy	2.784
	(-0.721, 6.289)
Constant	46.024***
	(44.320, 47.728)
Observations	116
R^2	0.077
Adjusted R^2	0.061
Residual Std. Error	7.968 (df = 113)
F Statistic	4.720** (df = 2; 113)
Note:	*p<0.1; **p<0.05; ***p<0.01

Figure 9: Robustness Check of Past Altruism and Self-assessed Altruism Levels

Discussion

1. How do medical students differ from business students on the three dimensions of altruism?

We find that medical students show higher levels of altruism on all three dimensions of altruism and thus our first hypothesis is confirmed. Not only do medical students donate slightly more money to a charitable organization than students of business majors, they also appear to be more altruistic in the past and value altruistic values in professional setting more. This is in line with what previous literature suggests (Galizzi et al., 2015; Jacobsen et al., 2011; Smith et al., 2013). Similarly to the study by

Jacobsen and colleagues (2011), we find that more business-related students did not allocate anything to charity compared to healthcare students, clearly suggesting that medical students are more altruistic. Moreover, in line with Jacobsen et al. (2011), healthcare students allocated more money in general, although in their study, nursing students allocated a very large part of their endowment: 75%, and broker students also allocated more: 61%. In our case, the allocations average at 57.45% for medical students and 46.9% for business majors. Yet, both of these proportions are higher than those found by Smith and colleagues (2013), who found that nursing students allocated more than 30% of their endowment on average. However, considering that the association of experimental altruism with student group is the weakest out of all the altruism measures studied, more evidence is needed to establish a clearer relation between a study program and experimental altruism. Our results also suggest that medical students might have overvalued their professional and past altruism compared to experimental altruism more than business-related students.

Comparing self-reported professional altruism values and self-reported past altruism in student population is quite novel (Galizzi et al., 2015). Our findings contrast those by Coulter and colleagues (2007), who found no difference in altruistic attitudes between medical students and business students. Yet, as several existing studies do indicate that healthcare students and professionals value altruism highly (Serra et al., 2011; Smith et al., 2013) and have a high altruistic personality (Zulkarnain et al., 2021), our findings that medical students tend to value altruism in practicing their profession also very highly, more so than business majors, are not surprising. A reason for this might be that altruism can be seen as an important part of professionalism in medicine (Kacker et al., 2021), while its role in business is not as well-pronounced (Jacobsen et al., 2011). In fact, the strong role of altruism in the profession might be the reason why many medical students choose the study program in the first place because it matches their values (Besley & Ghatak, 2005; Galizzi et al., 2015; Serra et al., 2011).

Especially, when observing that medical students were also more altruistic in the past than business-related students, it is quite likely that being altruistic is not only important to them as a theoretical value, but practicing altruism frequently is also important. Accordingly, Zulkarnain and colleagues (2021) also find that medical students engaged in altruistic acts very often, making their personality very altruistic. Thus, the finding that medical students both value professional altruism highly and engaged in past altruistic acts more than business-related students, seems to relate to the fact that medical career enables highly altruistic individuals to engage in altruism often; and that altruism seems to be valued the medical field.

2. Are the self-reported measures of altruism predictive of experimental altruism for different study areas?

When analyzing internal validity and the relation of the altruistic measures, we find that they are interlinked, although experimental and past altruism capture altruism from different angles. Our results show that higher altruism in the past is associated with allocating more money to charity – higher experimental altruism, which confirms our hypothesis. This would support the theory of altruistic capital according to which more altruistic behavior in the past leads to accumulation of altruistic capital and more altruistic behavior further (Ashraf & Bandiera, 2017). Furthermore, it provides some degree of internal validity for the two assessment measure types as the self-reported measure of how altruistic a person was in the past is indeed related to experimentally-tested altruism. However, the relationship between self-reported past altruistic behavior and experimental altruism is not well-established in the literature yet. To illustrate, McAuliffe and colleagues (2019) observe only moderate association between self-reported altruism measured by the frequency of past altruistic acts and dictator and trust game decisions in the first round of their study.

Although professional altruistic values are not significantly associated with experimental altruism, they are related to how altruistic an individual was in the past. In fact, the collinearity of self-reported professional altruism with self-reported past altruistic acts shows a great overlap of these two. Students who value professional altruism were also more altruistic in the past, which would support the assumption that values are indeed reflected in preferences and behavioral choices as suggested by the findings of Lagarde and Blaauw (2014) and Smith and colleagues (2013). Considering that these two measures of altruism are interrelated, it is not surprising that medical students both value professional altruism highly and engaged in past altruistic acts frequently. This further suggests that students who value altruism highly professionally, as also reflected in high frequency of past altruistic acts, would prefer careers that enable them practicing altruistic values further, such as medicine.

However, both past altruism and professional altruism were self-reported, which makes them susceptible to response bias as people want to maintain a positive self-image (Johansson-Stenman & Martinsson, 2006; Serra et al., 2011). Thus, another potential explanation for such a high association of self-reported past altruistic acts and self-reported professional altruistic values is simply that those individuals who scored high on both criteria were more aware of their altruism or wanted to be seen this way, while those who scored lower were not. Past studies that used some form of self-reported altruistic values report a similar problem (Serra et al., 2011; Smith et al., 2013).

The potential bias in self-reported assessments is also suggested in our robustness check of past altruism. When asked to assess their own altruism, answers reporting to be more altruistic than average were not significantly associated with past altruism. This might suggest that some students over-estimated their own altruism compared to how altruistic they were compared to their peers in terms of past altruism. Such over-estimation of one's own skill or character compared to others in the absence of knowledge of the real distribution, is characterized as overconfidence bias (Proeger & Meub, 2014). Overconfidence bias points onto an important issue of biases in self-reported measures. It is possible that the less precise measure of valuing altruism in the professional setting might be more biased than self-indicating how often a person engaged in an altruistic act. Accordingly, past altruism is also more significant and explains more of experimental altruism than how much one values professional altruism. Moreover, both of the self-reported measures are more biased than experimental altruism, which supports our suggestion that medical students might have overestimated their altruism on both self-reported measures as compared to experimental altruism. The reason for this might be simply that they are more aware of their own altruistic motivation and values.

3. Are personal and behavioral factors associated with experimental altruism?

In the third part of our analysis, we examine which personal characteristics and behavioral factors associate with being altruistic in a dictator game – experimental altruism. One of the personal characteristics that seems to be strongly associated with experimental altruism is an individual's gender. Similarly to other experimental studies concerned with healthcare students and professionals (Jacobsen et al., 2011; Smith et al., 2013), we find that women tend to be more altruistic than men. However, we should be careful with generalizing the results as women seem to be more sensitive to the context of the dictator game (Croson & Gneezy, 2009). Moreover, our sample of medical students consisted of mostly women (86%). However, this reflects the real gender imbalance that is present in healthcare professions (Zurn et al., 2004).

Our results show that past altruistic behavior and status-and-identity formation should be viewed together when analyzing experimental altruism. Those students who do not associate their identity with reputation and status of what they study as much as their peers and were more altruistic in the past tend to donate less money to charity. In contrast, those who associate themselves with reputation and status of their study program more than their peers and were more altruistic in the past tend to donate more money to charity. Thus, the level to which one associates their identity with their study program is greatly related to their past altruistic behavior when explaining experimental altruism. This suggests that status-and-identity formation is indeed an important moderator of how altruistic employees might be as suggested by Olivella and Siciliani (2017) and Besley and Ghatak (2005).

Moreover, it shows the personal identity is inextricably linked to altruism since an altruistic personal identity precedes acting altruistically, while this altruistic identity is maintained only by acting altruistically (Andreoni et al., 2010). Accordingly, students who might not care about their identity and status based in their study program as much as others do not need to maintain high altruistic levels consistently (Olivella & Siciliani, 2017). On the other hand, those who care about their identity and status based in their study program maintain more consistent altruistic levels. This suggests that altruism can play a strong role in choices of highly altruistic students who associate their identity and status with a highly altruistic career such as medicine. Career and study program selection could be considered such a choice that on the one hand helps them strengthen an altruistic identity as much as the altruistic identity motivates practicing altruism often in their career and outside of it.

Out of the personal characteristics tested, the fact whether a student indicated an expected salary or not is not significantly associated with experimental altruism. However, it is striking that very few medical students were able and willing to answer how much they think they will earn in the future compared to business-majors. This might suggest that business-related students are more aware of the extrinsic motivator in the workplace than medical students. Accordingly, Bénabou and Tirole (2006) argued that highly altruistic individuals derive their motivation from pro-social acts and are indeed less sensitive to extrinsic rewards. As our results show, medical students are indeed more altruistic on all three levels of altruism. Therefore, our findings would support this theory since medical students seem to be less focused on the monetary reward for their work in the future and thus cannot or do not want to indicate their salary expectation. Yet, further research is needed to confirm this.

Similarly, the year of study of a student is not related to experimental altruism, which suggests that university education might not play a major role in shaping one's altruism. This finding contrasts Zulkarnain and colleagues (2021) who found significant differences in altruism levels among study years, however they did not use experimental methods and relied on self-report. Considering the strong relation of past altruism with status-and-identity formation, it seems plausible that one's intrinsic altruistic identity determines experimental altruism better than the impact of the university. Moreover, it also implies that altruistic individuals already self-select into pro-social study programs and education has limited impact in increasing altruistic decision-making further. Overall, our hypothesis is confirmed only partially.

Limitations and Future Research

Despite employing both experimental measures and self-reported measures, it is problematic to generalize the findings to actual altruistic behavior at work as the evidence on external validity of these altruism measures for work environment is limited (Galizzi et al., 2015). More studies are needed to

establish clearer external validity of experimental and self-reported measures of altruism with altruism in real life, especially healthcare. To our knowledge, there are only two studies providing a link between real-life altruism of healthcare workers and experimental methods (Lagarde & Blaauw, 2014; Serra et al., 2011). Another potential problem in our method is a potential uncertainty effect that could have affected the measure of experimental altruism. The endowment available for allocation to oneself or charity was tied to a winning sum in a lottery. Therefore, as it was not certain whether the participant would truly win, they could have not taken the allocation of money seriously enough. Similarly, the self-reported measures were highly susceptible to a response bias and thus might not reflect real levels of altruism (Falk et al., 2016).

Importantly, the participation in the study was fully voluntary with a possibility to win a financial reward. Therefore, it is likely that the subjects were more altruistic than normal student population since they all agreed to participate in the study with an uncertain reward. Moreover, our results apply only to students as our sample was purely student-based and generalizability to actual healthcare and business professionals is limited. It is also important to keep in mind that the students, although all of them based in the Netherlands, were international. There could be potential variations in levels of altruism and other answers based on their origin. Also, the sample itself was relatively small due to time-constraints and it was obtained using a snowball method, although random sample would have been preferred. Moreover, the small size of the sample posed the biggest problems for our analysis. As there were relatively few participants, it was not possible to conduct a subgroup analysis to determine the relation between preferred medical and business specialties and altruism levels. As a matter of fact, the average number of students per specialty was too low to draw meaningful comparisons. Therefore, future studies with large number of participants are needed to examine this relationship.

Conclusion

Altruism is oftentimes neglected in shaping policies and reward schemes in healthcare although medicine and other healthcare career have gained a reputation of attracting highly altruistic people. However, there is only limited evidence that medical students are indeed more altruistic than other students. We contribute to the existing literature by confirming that medical students tend to be more altruistic than students of business-related programs on all three altruistic measures studied, with experimental altruism having the weakest association among the three. Moreover, we provide a validation of different measures of altruism. We establish internal validity between the measures of experimental altruism and the self-reported measure of how altruistic a person was in the past. Additionally, we provide a link between valuing professional altruism highly and acting altruistically in

the past when reported by self-report. In addition, this study contributes to understanding personal and behavioral characteristics linked to experimental altruism. We highlight the link between altruism and forming an identity and status based on one's study. Only those students who were highly altruistic in the past and care about their identity and status being associated with their study program are consistent in being more altruistic experimentally. As previous studies have suggested, altruism appears to be a personal value and part of one's identity formation, which can be taught at a university only to a limited degree. Our study suggests that altruism might shape which study programs and careers highly altruistic individuals choose. With medical students being indeed highly altruistic, more attention could be paid to their intrinsic motivation rather than purely monetary incentives.

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Appendix

1. Analysis

1.1 Data manipulation

We obtained 131 answers to our survey: 66 for medical students and 65 for business-related students. Out of these, 58 medical ones and 59 business-related ones were complete, while we discarded the incomplete answers. One student reported to study both business and medicine, thus, we discarded this answer as well, resulting in 57 medical students and 59 business-related students. From the students of business-related programs, majority studied international business (50 students), 5 studied economics and business economics, 2 studied business engineering, 1 studied finance and 1 studied accounting and business information technology.

The respondents indicated their preferred specialties for medical students and program concentrations for business-major students. There were 21 distinct specialties indicated by medical students, 13 by business majors. The answers that had more specialties indicated were coded as undecided, alongside those that indicated that they did not know. As the average number of students belonging into a specialty was very low (2.71 medical students per specialty, 4.54 business majors per specialty), we decided to group certain specialties together.

We grouped medical students into 6 groups: surgery, diagnostics, public health, psychiatry, anesthesiology and emergency medicine, and internal medicine based on Milić et al. (2020). This grouping and list of specialties is comparable to EU standards (Milić et al., 2020) (see Figure A1). However, the average number of medical students per specialty was still very low. Therefore, we used grouping of medical students into only 4 groups: undecided, surgical specialties, nonsurgical specialties and supportive specialties based on (Molleman et al., 2009) (see Figure A2). This grouping resulted in the following numbers of students in preferred specialties: 29 nonsurgical, 9 surgical, 8 supporting specialties, 11 undecided. The average number of medical students in a preferred specialty is 14.25, however the median 10 is still quite low. We coded the groups into dummy variables (with undecided as our reference group) to be suitable for regression analysis since specialty is a categorical variable.

SURGERY	Surgery	PUBLIC HEALTH	Public Health Medicine	
	Thoracic Surgery		Occupational Medicine	
	Cardiothoracic Surgery			
	Vascular Surgery	PSYCHIATRY	Psychiatry	
	Plastic, Reconstructive and Aesthetic Surgery		Child and Adolescent Psychiatry and Psychotherapy	
	Neurosurgery	ANAESTHESIOLOGY AND EMERGENCY MEDICINE	Anesthesiology	
	Oro-Maxillo-Facial Surgery		Emergency Medicine	
	Pediatric Surgery			
	Orthopedics	INTERNAL MEDICINE	Internal Medicine	
	Gynecology and Obstetrics		Gastroenterology	
	Urology		Cardiology	
	Ophthalmology		Endocrinology	
	Otorhinolaryngology		Nephrology	
			Pneumology	
DIAGNOSTICS	Pathology		Rheumatology	
	Laboratory Medicine / Medical Biopathology		Allergology	
	Medical Microbiology		Geriatrics	
	Radiology		Infectious Diseases	
	Nuclear Medicine		Pediatrics	
	Clinical Neurophysiology		Clinical Genetics	
			Physical Medicine and Rehabilitation	
			Radiotherapy	
			Dermatology and Venereology	
			Neurology	

Figure A1: Medical Specialties based on (Milić et al., 2020)

Surgical Specialties	n	Nonsurgical Specialties	n	Supporting Specialties	n
General surgery	203	Internal medicine	199	Pathology	46
Cardiothoracic surgery	11	Cardiology	74	Laboratory medicine	3
		Gastroenterology	36		
Orthopedics	71	Respiratory system	43	Medical microbiology	18
Plastic surgery	26	Rheumatology	28		
Urology	48	Clinical geriatrics	24	Nuclear medicine	21
Gynecology and obstetrics	144	Neurology	77	Clinical genetics	14
		Dermatology	52	Radiology	80
Neurosurgery	14	Pediatrics	183	Anesthesiology	170
Otorhinolaryngology	62	Rehabilitation	59		
Oral and maxillofacial surgery	24	Radiotherapy	29		
Ophthalmology	68				

Figure A2: Medical Specialties based on (Molleman et al., 2009)

Business-major students indicated only 13 distinct specializations in their studies. We merged students into groups based on relatedness of different indicated specializations and number of respondents in each group. We merged the students concentrated on controlling and strategy and supply chain management, and students concentrating on emerging markets with those concentrating on sustainable finance and with those focusing on entrepreneurship. We also merged the students focusing on information management with those focusing on marketing and HR. This left us with 7 groups: controlling+, economics, emerging markets+, finance, international business, marketing+ and undecided. This means that there were 8.33 students per group on average. However, 13 students indicated that they both study and specialize in international business. It is likely that they either

misunderstood the question or have not chosen their study concentration yet. In fact, majority of these students were in their first year.

Moreover, we combined the level of study program – bachelor/master with study year into one variable by adding three years to the number of study years indicated by master students (this was done since the typical length of a bachelor program is 3 years). We also coded study program, gender, study year as dummy variables as well as self-assessed altruism level: whether the respondent views themselves as more or less altruistic than the average.
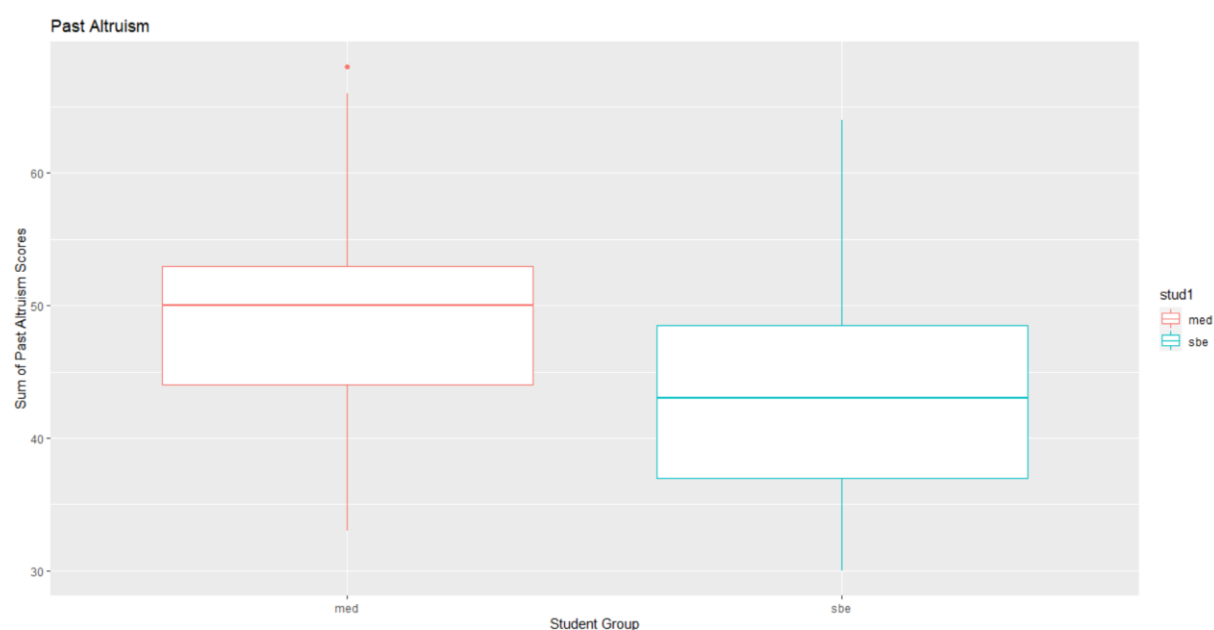
1.2 Descriptive statistics

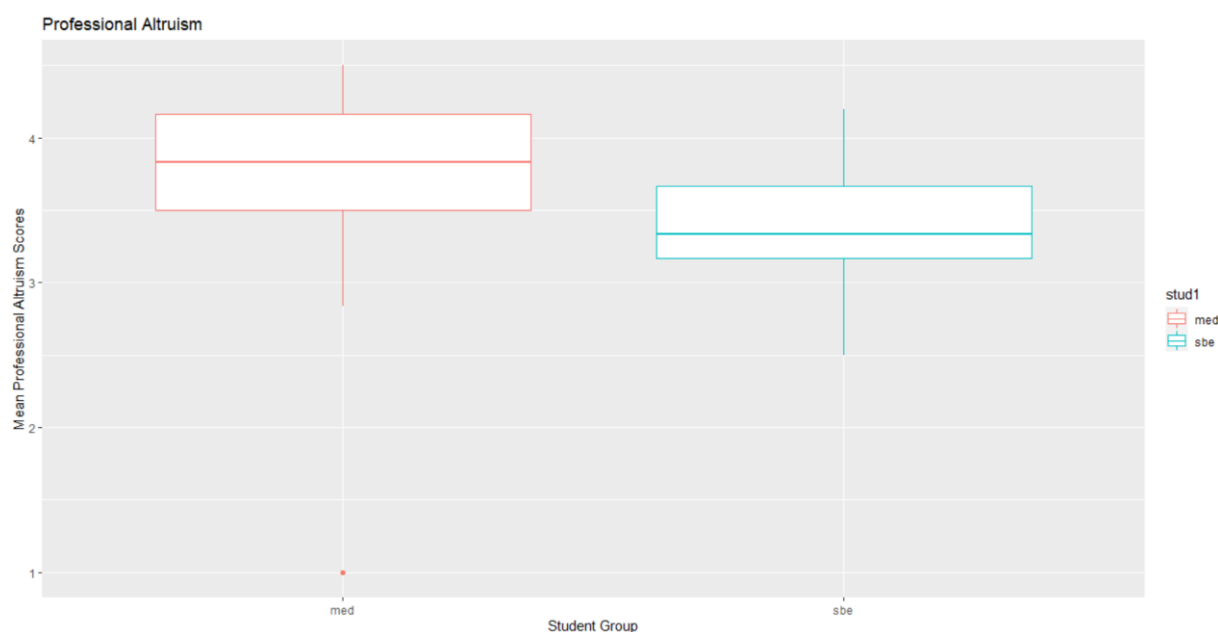*Figure A3: Distribution of Past Altruism Scores*

Figure A4: Distribution of Professional Altruism Scores

1.3 Inferential Analysis

1.3.1 RQ2 The Connection of Experimental Altruism to Past Altruism and Professional Altruism Including Student Group

The Connection of Experimental Altruism to Past Altruism and Professional Altruism

	Dependent variable:			
	Experimental Altruism			Past Altruism
	(1)	(2)	(3)	(4)
Past Altruism	0.295**	0.280*	0.233	
	(0.010, 0.580)	(-0.019, 0.580)	(-0.079, 0.545)	
Professional Altruism		0.758	-0.177	4.720***
		(-3.981, 5.497)	(-5.221, 4.868)	(1.950, 7.489)
Study Group			-2.888	
			(-8.253, 2.478)	
Constant	7.213	5.177	12.165	29.425***
	(-6.163, 20.588)	(-13.328, 23.682)	(-10.434, 34.763)	(19.462, 39.388)
Observations	116	116	116	116
R^2	0.035	0.036	0.045	0.089
Adjusted R^2	0.026	0.019	0.020	0.081
Residual Std. Error	12.818 (df = 114)	12.869 (df = 113)	12.863 (df = 112)	7.881 (df = 114)
F Statistic	4.110** (df = 1; 114)	2.088 (df = 2; 113)	1.764 (df = 3; 112)	11.153*** (df = 1; 114)

Note: *p<0.1; **p<0.05; ***p<0.01

Figure A5: The Connection of Experimental Altruism to Past Altruism and Professional Altruism Including Student Group

We observe that study group is indeed not significant when used in the model with Past and Professional Altruism. Moreover, both Past altruism loses its significance, suggesting that study group and Past altruism are collinear (Figure A5, Column 3). The reason for this was suggested by results in Figure 5, where we saw that study group is significantly associated with both Professional and Past altruism. After seeing that student group on its own is not a significant predictor (Figure A5, Column 3), we examine the possible interaction of study group with past altruism and professional altruism.

In Figure A6, we show how the model changes when student group is used as an interaction variable with professional altruism (Figure A6, Column 3) and then past altruism (Figure A6, Column 4). However, student group does not seem to interact with professional nor past altruism significantly when modelling experimental altruism. The reason for this might be that student group appears to be collinear with past altruism and professional altruism and thus it does not contribute

anything to models, where past altruism and professional altruism are already included. Similarly, student group interacting with professional altruism is not significant either when predicting past altruism (Figure A6, Column 6). The same reasoning applies in this case.

The Connection of Experimental Altruism to Past Altruism and Professional Altruism

	Dependent variable:					
	Experimental Altruism				Past Altruism	
	(1)	(2)	(3)	(4)	(5)	(6)
Past Altruism	0.295**	0.280*	0.219	0.369*		
	(0.010, 0.580)	(-0.019, 0.580)	(-0.096, 0.535)	(-0.055, 0.794)		
Professional Altruism		0.758	-1.340		4.720***	1.399
		(-3.981, 5.497)	(-7.412, 4.732)		(1.950, 7.489)	(-2.155, 4.954)
Student Group			-15.910	10.521		-19.679*
			(-53.920, 22.099)	(-18.233, 39.275)		(-41.690, 2.332)
Interaction var: student group and professional altruism			3.715			4.252
			(-7.020, 14.451)			(-2.000, 10.504)
Interaction var: student group and past altruism				-0.289		
				(-0.903, 0.324)		
Constant	7.213	5.177	17.232	4.772	29.425***	44.011***
	(-6.163, 20.588)	(-13.328, 23.682)	(-9.741, 44.206)	(-16.407, 25.952)	(19.462, 39.388)	(30.438, 57.585)
Observations	116	116	116	116	116	116
R^2	0.035	0.036	0.049	0.052	0.089	0.175
Adjusted R^2	0.026	0.019	0.015	0.027	0.081	0.153
Residual Std. Error	12.818 (df = 114)	12.869 (df = 113)	12.894 (df = 111)	12.814 (df = 112)	7.881 (df = 114)	7.568 (df = 112)
F Statistic	4.110** (df = 1; 114)	2.088 (df = 2; 113)	1.432 (df = 4; 111)	2.060 (df = 3; 112)	11.153*** (df = 1; 114)	7.908*** (df = 3; 112)

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Figure A6: The Connection of Experimental Altruism to Past Altruism and Professional Altruism Including Student Group and its Interactions

1.3.2 RQ3 The Connection of Predictors to Experimental Altruism Including Interactions

We include the study group and professional altruism to the models used in the third part of our inferential analysis. In the first model (Figure A7, Column 1), we include study group and professional altruism alone, while in the model 6 (Figure A7, Column 6) we include study group interacting with professional altruism. In model 7 (Figure A7, Column 7), we include study group interacting with past altruism. We observe that study group alone is never significant in any of the models (Figure A7, Cols 1-7). It is also not significant when used in the two interaction variables (Figure A7, Cols 6 and 7). This confirms that student group is most likely expressed through different variables, mostly past altruism in particular. Similarly, Professional altruism is not significant when included alone (Figure

A7, Column 1), nor when it is included as interacting with student group (Figure A7, Column 6).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Experimental Altruism			
Past Altruism	0.251	0.205	-1.148*	-1.120*	-1.143*	-1.158*	-1.061
	(-0.058, 0.560)	(-0.083, 0.493)	(-2.413, 0.117)	(-2.397, 0.157)	(-2.414, 0.129)	(-2.446, 0.129)	(-2.328, 0.206)
Status formation	-4.086*	-3.757*	-27.194**	-26.538**	-27.161**	-27.540**	-30.069***
	(-8.229, 0.058)	(-7.739, 0.224)	(-48.900, -5.487)	(-48.550, -4.527)	(-48.961, -5.361)	(-49.650, -5.431)	(-52.018, -8.120)
Professional Altruism	0.436					-2.182	
	(-4.587, 5.458)					(-8.048, 3.684)	
Study group	-1.649					-9.384	23.176
	(-7.098, 3.799)					(-47.300, 28.531)	(-5.105, 51.457)
Gender		5.833**	5.149**	5.117**	5.038*	5.342*	5.276*
		(0.788, 10.877)	(0.146, 10.152)	(0.092, 10.141)	(-0.048, 10.125)	(-0.103, 10.788)	(0.029, 10.523)
Salary Indication				-0.996			
				(-5.739, 3.747)			
year of study					-0.391		
					(-3.194, 2.413)		
Interaction var: professional altruism and study group						2.609	
						(-8.104, 13.322)	
Interaction var: past altruism and study group							-0.494
							(-1.093, 0.104)
Interaction var: past altruism and status formation			0.513**	0.502**	0.513**	0.520**	0.569**
			(0.046, 0.980)	(0.030, 0.973)	(0.044, 0.982)	(0.042, 0.997)	(0.098, 1.040)
Constant	19.383	17.472**	79.802***	78.475**	80.301***	88.279***	75.506**
	(-4.114, 42.880)	(0.525, 34.419)	(20.622, 138.982)	(18.734, 138.215)	(20.762, 139.839)	(23.687, 152.872)	(16.101, 134.912)
Observations	116	115	115	115	115	115	115
R^2	0.076	0.111	0.146	0.148	0.147	0.151	0.167
Adjusted R^2	0.043	0.086	0.115	0.109	0.108	0.095	0.120
Residual Std. Error	12.708 (df = 111)	12.432 (df = 111)	12.234 (df = 110)	12.280 (df = 109)	12.285 (df = 109)	12.372 (df = 107)	12.199 (df = 108)
F Statistic	2.289* (df = 4; 111)	4.598*** (df = 3; 111)	4.718*** (df = 4; 110)	3.780*** (df = 5; 109)	3.758*** (df = 5; 109)	2.715** (df = 7; 107)	3.601*** (df = 6; 108)

Note: *p<0.1; **p<0.05; ***p<0.01

Figure A7: The Connection of Predictors to Experimental Altruism Including Interactions

1.4 Robustness Analysis of Past Altruism Measure

We provide a visualization of the distribution of self-assessments of altruism for the two student groups. We see that the same number of students each group reported that they are averagely altruistic, whereas more business majors believed that they are less altruistic than average. Slightly more medical students thought that they are more altruistic than average (Figure A8).
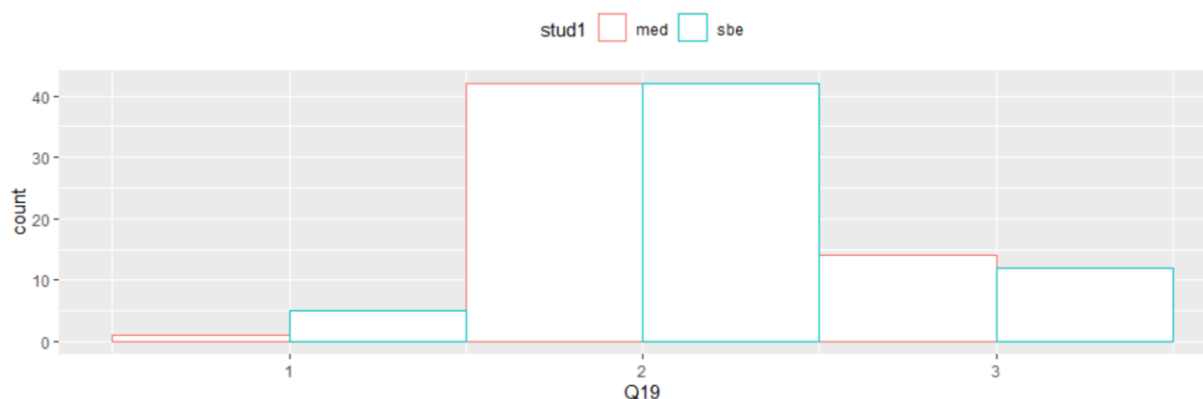

Figure A8: Distribution of Self-reported altruism assessments of students (1-below average, 2-average, 3-above average)

1.5 Refining the Analysis – Experimental Altruism based on Specialties

After conducting our main analysis, we perform an analysis for different medical specialties and business concentrations preferred by medical and business students and their levels of experimental altruism. The undecided group was used as a reference level in both cases (see Figure A9 for medical students, Figure A10 for business-related students). In both cases, the reference group was

significant for predicting experimental altruism levels. This indicates that being undecided is associated with 21.92 eur mean allocation for medical students (n = 57, p<0.01, CI = [16.16, 27.66]) (Figure 9) (Figure A9) and 23.33 eur mean allocation for business-related students (n = 59, p<0.01, CI = [12.59, 34.07]) (Figure A10). However neither the preferred medical specialty nor the preferred business study concentration seems to be significantly associated with levels of experimental altruism of medical students (Figure A9) and business-relate students respectively (Figure A10).[1]

It seems that specialization is not associated with experimental altruism. However, it is important to state that the sample sizes for medical students and for business students were relatively small. Thus the potentially low association with altruism might be due to small number of students in each specialty group.

Experimental Altruism based on Preferred Medical Specialties

	Dependent variable:
	Experimental Altruism
Surgical Specialties	3.644
	(-5.888, 13.175)
Non-surgical Specialties	-0.057
	(-6.942, 6.828)
Supportive Specialties	3.734
	(-5.301, 12.769)
Constant	21.912***
	(16.164, 27.660)
Observations	57
R^2	0.022
Adjusted R^2	-0.033
Residual Std. Error	11.638 (df = 53)
F Statistic	0.405 (df = 3; 53)
Note:	*p<0.1; **p<0.05; ***p<0.01

Figure A9: Experimental Altruism based on preferred medical specialty of medical students

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[1] A complete subgroup analysis based on specialties would be more informative. However, due to a low number of medical participants (n=57) and business participant (n=59), we cannot further divide the student groups into specialty-subgroups while keeping a reasonable sample size in each.

Experimental Altruism based on Business-related Specialties

	Dependent variable:
	Experimental Altruism
Controlling+	10.000
	(-5.188, 25.188)
Economics	-4.000
	(-19.188, 11.188)
Emerging+	-1.667
	(-15.531, 12.198)
Finance	-10.061
	(-23.411, 3.290)
International Business	-7.564
	(-20.547, 5.419)
Marketing+	-10.208
	(-24.415, 3.999)
Constant	23.333***
	(12.594, 34.073)
Observations	59
R^2	0.189
Adjusted R^2	0.095
Residual Std. Error	13.422 (df = 52)
F Statistic	2.016* (df = 6; 52)
Note:	*p<0.1; **p<0.05; ***p<0.01

Figure A10: Experimental Altruism based on preferred study concentration of business-related students

2. Survey

2.1 Survey Outline based on Themes:

1. Consent form

2. Dictator Game

3. Self-reported Past altruistic Behavior

    a. Scored based on instructions of the questionnaire (sums)

4. Professional Altruism

    a. Scored based on instructions – Likert scale (mean score)

5. Expected starting salary question

6. Bachelor/master question

7. Year

8. Study area

9. Concentration/ intended specialization for medical students (subgroups)

    a. Potential subgroup analysis

10. Gender

11. Identity/ status formation question

    a. Likert scale for each

    b. Mean score taken

2.2 Survey Questions and Instructions

1. Consent form + Information about filling out the whole survey to be eligible for getting the voucher:

    a. We are interested in understanding the decision-making of business and medical students. By participating in the study, you will be able to win up to 40 eur in the form of an Amazon voucher depending on your answers.

    To assure that your responses will be kept completely confidential, you will receive a personal identifier (a randomly generated code to mask your identity) and a random password tied with your identifier. Please store both of these carefully, in case you win the voucher, you will be able to redeem it using these two codes. The wining identifiers will be announced by a poster at the entrance of your faculty in May/beginning of June. The whole study is completely anonymous.

    The study involves participating in an online survey and should take you around 5-7 minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. However, only fully completed answers will be considered for winning the prize of an Amazon voucher.

    If you would like to contact the researcher in the study to discuss this research, please e-mail ___@student.maastrichtuniversity.nl.

    After the study is completed, the outcome of this research will be used in written report for a bachelor thesis. All provided information will be treated confidentially

2. Random code (from Qualtrics)

    a. These are your random code and anonymous identifier so that you can anonymously obtain your price in case you win.

3. Dictator Game

    a. INSTRUCTIONS: You will now face three decision tasks, in which you have to choose what you would do with 40 eur in each. In the end of this study, three students will be randomly selected and they will receive an Amazon voucher with worth depending on their choices and the rest of the money will be donated to the charities of their choice.

As you will participate in three rounds of decision tasks, only one of them will be randomly chosen.

b. INSTRUCTIONS: You have 40 eur at your disposal. You can keep some portion of the money depending on your choice. The rest of the money goes to charity. You can keep all the money, but you can also donate all of it to charity, or choose any other allocation of money.

c. First, select the charity to which you would like to donate:

     i. Charity 1: Against Malaria Foundation

     ii. Charity 2: Refugee Project Maastricht

     iii. Charity 3: UM First Generation Students (FGS) Scholarship

     iv. Charity 4: Climate Change Fund

     v. Charity 5: Amnesty International (Maastricht)

d. Now, select the allocation of 40 eur.

e. OPTIONS: (0-40 self selected)

4. Past altruistic Behavior (adapted Altruistic Personality Scale to measure past altruistic acts)

     i. INSTRUCTIONS: Using the following scale, please select the category that conforms to the frequency with which you have carried out the following acts.
1: Never 2: Once 3: More than Once 4: Often 5: Very often

     ii. 1.) I have given directions to a stranger OR I have offered to help a handicapped or elderly stranger across a street.

     iii. 2.) I have given money to a stranger who needed it (or asked me for it).

     iv. 3.) I have donated goods, money or clothes to a charity or a clothes swap.

     v. 4.) I have done volunteer work for a charity or done community-work.

     vi. 5.) I have donated blood.

     vii. 6.) I have helped carry a stranger's or a friend's belongings (books, parcels, etc).

     viii. 7.) I have delayed an elevator and held the door open for a stranger.

     ix. 8.) I have allowed someone to go ahead of me in a lineup (in the supermarket, at a copy machine, at a fast-food restaurant).

     x. 9.) I have lent a friend/acquaintance my bike

     xi. 10.) I have pointed out a clerk's error (in a bank, at the supermarket) in undercharging me for an item. OR I have paid the asked price without complaining when I was overcharged by mistake.

     xii. 11.) I have let a neighbor/a housemate/ a friend or acquaintance borrow an item that I value (eg, a dish, tools, etc).

      xiii.   12.) I have helped a classmate who I did not know that well with an assignment when my knowledge was greater than his or hers.

      xiv.   13.) I have looked after a neighbor's pets or children without being paid for it.

      xv.   14.) I have offered my seat on a bus or train to a stranger who was standing.

      xvi.   15.) I have helped an acquaintance or a friend to move households.

      xvii.   I consider myself a_____ (fill in: below average/averagely/ above average) altruistic person.

5. Professional Altruism (adapted Penn State College of Medicine Professionalism Questionnaire)
   a. INSTRUCTIONS: We are now interested in your opinion as a future medical/business professional. Below you will find a number of statements on behaviors that a professional in the medical/business field could exhibit. Please tell us how YOU see each of these behaviors. Is it important to YOUR definition of professionalism that a medical/business professional exhibits the respective behavior?"
   b. Use the scale: 1-Not important at all – 5-most important
   c. *two versions: Medical students/ Business students

   d. Maintains relationships with patients/clients and colleagues that do not exploit personal financial gain, privacy, or sexual advantage
   e. Shows a willingness to initiate and offer assistance toward a colleague's professional and personal development
   f. Does not seek to advance one's career at the expense of another's career
   g. Shows compassion
   h. Demonstrates empathy
   i. Advocates the patient's or research subject's/ client's interest over one's own interest
6. Expected starting salary question
   a. What salary do you expect to earn in your first professional paid job monthly? (not internship)
   b. OPEN QUESTION: WRITE DOWN ANSWER
7. Bachelor/master info:
   a. Do you study at a bachelor or master program?
   b. OPTIONS: bachelor/master
8. Year
   a. Which year of study are you currently in?
   b. OPTIONS: 1,2,3,4+

9. Study area

    a. What do you study (the name of your study program)?

    b. OPTIONS: Medicine, International Business, Other (Fill in)

10. Concentration/ intended specialization for medical students (subgroups)

    a. What is your concentration/specialization? (In case of medical students) What is your intended specialization?

    b. OPEN QUESTION: WRITE DOWN ANSWER

11. Gender

    a. How do you identify yourself?

    b. OPTIONS: man, woman, other, don't want to say

12. Status formation question

    a. INSTRUCTIONS: Indicate how well the following statements describe you (1 not at all- 5 very much so):

        i. My study area fits me well

        ii. My study area forms a significant part of who I am as a person

        iii. It is important to me that I study this program

        iv. It is important to me that other people associate me with what I study

        v. I study my study program because I want to be perceived as a good person

13. Thank you message and code repetition

    a. Thank you for participating in this study and helping us understand altruistic decision-making of different professions better!

    Here is your code and anonymized personal identifier that you can use to get your price in case you win. The results will be posted at the entrance of your faculty at the end of May or beginning of July – we will only post the personal identifier. Please store both the identifier and the code well. The code will be used when obtaining the Amazon voucher in case you win.

3. Ethical Approval

3.1 Request with detailed information – Application Form for the UCM Ethical Advisory Committee

**Please complete the form below
and submit to the UCM Ethical Advisory Committee**

General Information

Description of the Study

- Title of your study Altruistic Decision-Making in Medical and Non-Medical Students

- Is the study part of a larger, already ongoing study at UM? If yes, which study led by whom? No.
- At which organisation, if applicable, will the study be carried out? SBE, FHML students are subject to the study
- In which country (countries) will the study be carried out? The Netherlands
  - Please note that different countries have different ethics requirements for research studies. You may hence be held to stricter requirements than prevail in The Netherlands. Make sure to verify those requirements.
- Briefly describe the study. Include very concise information on the background, research questions/aims, research design and methods. Also please explain why this study should take place (in layman's terms) (max 250 words).

Health-related careers such as nursing and medicine are oftentimes regarded as highly altruistic careers that attract individuals with higher pro-social incentives than other careers (previous research has specifically focused on finance/business-workers). Moreover, it was found that high financial reward can worsen the job performance of doctors with higher altruistic levels (Siciliani, 2009). In this study, I aim to test whether medical students have indeed higher altruistic levels than business students. This is important in determining the most suitable reward for health and business-workers respectively, very relevant for employers and policy-makers trying to design reward schemes in healthcare. My research question is: To what extent do financial incentives, personal characteristics and behavioral factors such as past altruistic behavior influence altruistic decision making of medical students compared to nonmedical students?

I intend to answer the research question by using survey data in which participants will first complete a dictator game to measure their altruistic decision making levels and then I will include several questions regarding their past altruistic behavior, professional altruistic behavior and their financial/intrinsic motivation. Dictator game is a common way to measure altruism in behavioral economics. Each participant will have the chance to win up to 40 eur in the form of an Amazon voucher (paid from researcher´s and advisor´s private budget), the exact sum depends on how much of the 40 eur the participant chooses to keep or respectively allocate to charity. In the end, 3 participants will be randomly chosen based on their personal identifiers (random code generated for each participant to ensure anonymity + password to redeem the voucher). The participants will be informed who won the vouchers by a poster indicating the 3 winning identifiers.

*you can find the whole survey including the dictator game in the appendix

Siciliani, L. (2009). Paying for performance and motivation crowding out. Economics Letters. https://doi.org/10.1016/j.econlet.2009.01.022

Ethical Aspects of the Study

The importance of the study

- What justifies in your view using human research subjects in your study? Human subjects are absolutely integral to study their motivation in behavioral economic research.
- Could comparable research results be attained without using human research subjects? No, humans and their decision-making is the subject of interest in this study.

Possible benefits for the research subjects

- Do the research subjects themselves have any direct benefits from the research results? Yes, 3 of the subjects can win up to 40 eur in form of an Amazon voucher. These subjects will be chosen randomly. Moreover, they will be able to reflect on their altruistic tendencies and study program choice.
- Do you expect that in the future, people like these research subjects will benefit from the research results? Yes, in the future, better payment schemes taking into account altruistic preferences of business and healthcare workers can be designed.

Possible harm to the research subjects

- Do you expect that the research subjects may suffer any discomfort or harm from participating in the research (other than time lost on participating in it)? No.

Respecting the autonomy of the research subjects

- What are you doing to make sure that the research subjects are adequately informed about the nature of your research project? Informed consent at the beginning of the survey
- Is there any reason to believe that (some) of your research subjects may not be fully free in their decision to participate in your study?   No.
- Does your study require any type of deception of research subjects about the true nature of the project? If yes, justify why this is absolutely necessary and whether/when you will reveal to participants the truth about the project. : Subjects will be informed that the study is about decision-making, not specifying that it is focused on altruistic decision making, as we do not want to prime subjects to change their answers accordingly. Moreover, since half of the participants wilbe business students, there is a high chance that they encountered similar studies in a behavioral economics course, which might bias their answers. Yet, subjects can quit the questionnaire at any time, although then they cannot win the voucher anymore. In the end, there will be a statement and a thank you note informing them that they participated in a study on *altruistic* decision making.
- How are you securing consent of your participants?
  - If you are going to use a consent paragraph (e.g., at the start of the survey) or a separate consent form (e.g., in preparation of an interview), please attach it. Make sure to use simple language understandable for somebody with a basic high school education.

Consent Paragraph:
We are interested in understanding the decision-making of business and medical students. By participating in the study, you will be able to win up to 40 eur in the form of an Amazon voucher. To assure that your responses will be kept completely confidential, you will receive a personal identifier (a random code to mask your identity generated automatically) and a random password tied with your identifier. Please store both of these carefully, in case you win the voucher, you will be able to redeem it using the password only. The wining identifiers will be announced by a poster at the entrance of your faculty in May. The data are not stored under your name.
The study involves participating in an online survey and should take you around 5-7 minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. However, only fully completed answers are entering the lottery to win the vouchers.
If you would like to contact the researcher in the study to discuss this research, please e-mail ___

There are no reasonable foreseeable risks of participating in the study. Your participation will help to better understand the differences in business and medical students decision making related to their profession. After the study is completed, the outcome of this research will be used in written report for a bachelor thesis.

Please indicate your (dis)agreement:
- I have been informed of the study.
- I have read the written information.
- I have had the opportunity to ask questions about the study.
- I have been able to think about my participation in the study that is completely voluntary.
- I have the right to withdraw my consent and quit from the study at any time without needing to give a reason.
- I have agreed to participate in the study.
- I am 18+ years old.

End message/Debriefing:

Thank you for participating in this study and helping us understand altruistic decision-making of different professions better!

Respecting the privacy of the subjects

- Are the research subjects remaining completely anonymous?
    - If yes, how are you assuring complete anonymity?
        - Each research participant will obtain a unique random code as a personal identifier for the purpose of being able to get their reward at the end of the study. Who received which random code is unknown to the researcher ensuring complete anonymity. No other personal data such as emails/student IDs/IP addresses are collected.
    - If no, why is it necessary to collect identifiable data?
    - If no, what are you doing to assure that no third persons can gain access to the identifiable data or otherwise learn about the identity of the research subjects?
    - If no, when will you destroy the original, identifiable data?

3.2 Approval Letter

Maastricht University

University College Maastricht

From: Ethics Advisory Committee
          University College Maastricht
          Faculty of Science and Engineering

Cc:

Subject: Capstone research project, Spring 2022

Date: 29 March 2022

Dear Student,

Thank you, first of all, for the diligence with which you have reflected on the ethical aspects of your Capstone research project. Secondly, we appreciate the effort you have made to provide detailed information about your project, answering all questions in the form in a clear manner.

The Committee concludes that your study neither involves a particularly vulnerable group of research subjects, nor presents any salient risks for the participants. The consent process you have used appears adequate.

We do have two specific recommendations: Firstly, in your consent paragraphs, you mention three different – overlapping but still different – descriptions of what your research is about. This could be confusing for research subjects. Consider rewriting the consent paragraphs to provide a single, succinct, and easy to understand description of the purpose of your study.

Second, please pay specific attention to the data storage guidelines, which will be posted shortly on the Canvas site.

We trust you will make the necessary adjustments in your protocol and hereby inform you that you can proceed with this study without submitting it for full ethics approval to one of UM's ethical review committees.

We have sent a copy of this letter to your Advisor, because according to UM's policy, it is the supervising academic who is formally responsible for the ethical quality of research projects undertaken by their advisees.

We recommend that you attach the materials you submitted to us as well as this approval letter as an Appendix to your Capstone final report.

Wishing you all the best with your Capstone project,
On behalf of the committee members,

Jos VM Welie, MA, MMedS, JB, PhD, FACD