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Trust behavior and being trusted are influenced by a multitude of individual and situational factors. Loneliness is a factor that has recently been hypothesized to be related to trust. Societies and governments are increasingly concerned with the rise of loneliness, and a negative impact on trust might add an additional social cost of loneliness. To evaluate the economic risk of loneliness, we present results from a large, incentivized trust experiment conducted with more than 27000 respondents. Our study allows us to investigate (i) the relationship between self-reported loneliness and behavior in an incentivized trust situation and (ii) the impact of knowing about the loneliness status of others on behavior.

Contrary to what the literature hypothesized, we observe no negative correlation between self-reported loneliness and trust in the trust game: lonely individuals are more trusting than individuals who are not lonely. Higher trust by lonely individuals cannot be attributed to more optimistic beliefs of returns but seems to reflect a larger willingness of the lonely to take the social risk associated with trusting in the trust game.

We further observe that being informed that an interaction partner is lonely leads to a beneficial treatment of the lonely. Individuals known to be lonely are significantly more likely to be trusted, and they benefit from their partners acting more trustworthy. Behavior that cannot be attributed to strategic concerns.

We conclude that loneliness should not be considered as a deteriorator of social capital but as an emotional state that organizations should acknowledge to enable individuals to reconnect to others.

Keywords:

loneliness, trust, experiment, trust game

JEL codes:

C90, D91, N34

LONELINESS AND TRUST: EVIDENCE FROM A LARGE-SCALE TRUST GAME EXPERIMENT

November 2024

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Abstract

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1. Introduction

Trust is one of the key drivers of social and economic progress. Trust is essential for successful economic exchange (Arrow, 1972) and business interactions (Kondo et al., 2021), and high levels of trust have been linked to higher economic growth, democratic governance, government regulations, and community well-being (Knack and Keefer, 1997; Putnam, 2000; Aghion et al., 2010).

Given the consensus on the economic importance of trust, much effort has been directed toward understanding the drivers of trust. Trust can be influenced through multiple channels, notably through an individual's characteristics (e.g., preferences, expectations, socio-economic background), the institutional environment (e.g., a functioning legal system, independent supervisory boards), and characteristics of the society (e.g., cultural norms and values). Over recent years, a novel variable combining individual characteristics and societal aspects has been getting into the focus of researchers from psychology, sociology, political science, and management: loneliness.

Since Putnam's (2000) documentation of the gradual decrease in face-to-face interactions in the United States, societies have been experiencing drastic changes regarding interpersonal interactions. Loneliness prevalence has been increasing over time (Buecker et al., 2021), and the topic of loneliness is receiving increased media attention¹. Some have been going as far as considering the existence of a *loneliness epidemic*.² Japan and the United Kingdom appointed Ministers of Loneliness to tackle the problem (Pimlott, 2018), and campaigns to reduce loneliness have been launched in several affluent nations.³

Loneliness is a subjective state and should not be confused with social isolation. It stems from a perceived lack of social connections relative to a desired level of connectedness and is linked to a need 'to belong' (Maslow, 1943). The consequences of loneliness are wide-ranging and go as far as leading to specific physiological symptoms, including heightened plasma and cortisol levels (Vitale and Smith, 2022). On a behavioral level, loneliness has been suggested to have a negative relationship with trust (Rotenberg, 1994; Rotenberg et al., 2010; Bellucci, 2020; Langenkamp, 2023). The relationship might be bidirectional: lonely individuals are less willing to trust others, and conversely, those who trust less become lonelier. The first relationship is especially interesting because it implies that organizations

¹ E.g. www.economist.com/international/2018/09/01/loneliness-is-a-serious-public-health-problem

² E.g. hbr.org/2017/09/work-and-the-loneliness-epidemic

³ E.g. www.who.int/initiatives/decade-of-healthy-ageing/evidence-gap-map/sil-in-person and joint-research-centre.ec.europa.eu/loneliness/mapping-loneliness-interventions_en

and societies experiencing higher levels of loneliness would also have to deal with the negative consequences caused by overall low trust.

However, much of the previous work has been focused on self-reported trust measures and could thus not evaluate the behavioral implications concerning trust. In this paper, we present evidence from a large experiment run with more than 27000 respondents across 27 European countries to investigate the link between loneliness and trust in an incentivized trust game.

In addition to the direct effects of loneliness on behavior, how lonely individuals are treated is also important to understand. Fear of further social exclusion might inhibit lonely individuals from revealing their loneliness and speaking about it. Meanwhile, it is known that awareness and acceptance are essential to overcome its problems (Rokach and Brock, 1998; Lindsay et al., 2019).

Our paper has, therefore, two objectives. First, we investigate to which degree self-reported loneliness is linked to trust and trustworthiness in an incentivized trust game. Previous evidence regarding the relationship between loneliness and trust relies on self-reported trust measures.

In a second step, we investigate the consequences of being known to be lonely on potential returns in a trust setting. Studying this question outside of a laboratory setting is difficult, as the loneliness status of interaction partners is usually unknown. In a separate information treatment, we thus inform participants about the fact that their interaction partner previously reported feeling lonely.

Our study relies on an experimental setting, employing an incentivized trust game to infer trust and trustworthiness (Berg et al., 1995). We combine this with incentivized beliefs by participants about their counterpart's behavior in the game, as well as a survey regarding loneliness status, socio-demographic characteristics, and socio-economic preferences (Falk et al., 2018).

The experiment was conducted with over 27.000 participants from the 27 member states of the European Union. A representative sample of approximately 1,000 adults was recruited in each country. Contrary to the previous literature, we find reassuringly positive results regarding actual trust behavior by lonely individuals. Though lonely individuals report significantly lower trust in the self-reported trust measure, confirming previous findings, they do not exhibit less trust in the trust game. Contrary to expectations, the correlation with trust in the trust game is even significantly positive. The higher trust behavior by the lonely cannot be attributed to more optimistic beliefs about returns from others. It thus confirms that the lonely are willing to incur social risk to interact with others. The lonely are also not significantly different from the non-lonely concerning their trustworthiness. This is reassuring news because it implies that loneliness is not a problem as such

regarding economic interactions but should be rather seen as the affective response that motivates individuals to incur higher costs and risks to re-equilibrate their social connectedness.

The lonely are thus trusting and trustworthy: but how do people react when they know their interaction partner is lonely? Through the results from our information treatments, we find that lonely individuals can expect to be treated kindly. Being informed that an interaction partner is lonely leads to higher transfers in the trust game and higher returns compared to the baseline treatment. From beliefs, we learn that lonely individuals are not expected to behave differently in terms of trustworthiness but nevertheless benefit from higher transfers.

The rest of the paper is structured as follows. In the next section, we will give an overview of the literature on loneliness. We will discuss the empirical evidence regarding the relation between loneliness and trust, and we will discuss evidence regarding social exclusion and discrimination of lonely individuals. In the third section, we will present the game setting, our measures of loneliness, and our hypotheses. Section four will present results regarding behavior by lonely individuals and behavior towards lonely individuals, and section five will conclude.

2. Loneliness

Loneliness is an emotional and subjective state arising from a perceived lack of social relationships (Peplau and Perlman, 1982; Hawkley and Cacioppo, 2010). Biologically, loneliness might have evolved as an emotional warning signal to re-affiliate with others to maintain a protective social network (Cacioppo and Cacioppo, 2018). However, due to its subjectivity, loneliness needs to be differentiated from being alone or being socially isolated. Neurobiological research indicates associations between loneliness and alterations in the structure and function of specific brain regions and networks (Eisenberger, 2012; Lam et al., 2021). These neural changes are accompanied by physiological symptoms, including heightened plasma and cortisol levels (Vitale and Smith, 2022).

Prolonged loneliness is costly at the individual level, as there is strong evidence of a heightened risk of depression and suicide among lonely individuals (Stravynski and Boyer, 2001). The policy interest in loneliness is partially due to its importance for public health issues (Steptoe et al., 2013; Holt-Lunstad et al., 2015; Stickley and Koyanagi, 2016).⁴ However, loneliness might also affect other issues of societal interest, most notably trust.

⁴ Political psychologists have also suggested an association between loneliness and political preferences (e.g. Langenkamp, 2021; Langenkamp and Bienstman, 2022; Langenkamp and Stepanova, 2024; Cuccu and Stepanova, 2021).

Several studies have found that self-reported interpersonal trust beliefs are negatively associated with loneliness (e.g., Jones et al., 1982; Rotenberg, 1994; DiTommaso et al., 2004). Most of the reported evidence has been cross-sectional, and only two studies (to the best of our knowledge) try to pin down the underlying mechanisms of potential causal relationships between loneliness and trust using longitudinal data (Rotenberg et al., 2010; Langenkamp, 2023).

Rotenberg et al. (2010) examine the relationship between self-reported trust and loneliness by following longitudinally 278 UK-based pupils (5 to 21 years old). The results indicate that higher trust is associated with lower levels of loneliness, and more socially integrated children trust their peers more. Over time, trust beliefs at time 1 are negatively correlated with loneliness at time 2. These changes are partially mediated by social integration. This finding suggests that individuals with low trust beliefs integrate less socially, which contributes to their increased loneliness over time.

An inverse causation is the focus of the study by Langenkamp (2023). It uses 12 waves of longitudinal, representative panel data (2008 to 2020) from the Netherlands to confirm that within-person variations in loneliness are related to variations in trust beliefs. The results show that rising loneliness on an individual level causes a reduction in social trust. One potential pathway causing this might be the feelings associated with loneliness. Loneliness, as a very subjective and emotional state, is known to cause negative feelings and emotions, which might affect behaviors (Jones et al., 1982; Rotenberg, 1994; Lucas et al., 2010).

Only few papers have tried linking loneliness to behavior in a controlled experimental setting. Rotenberg et al. (2004) studied loneliness in association with behavior in a modified prisoner dilemma game for 63 primary school children (i.e., 10 years old). The game asked children which action they would choose if they knew that their partner had already chosen the cooperative action. Behavior is thus comparable to trustworthiness (or reciprocity) in a trust game. The game was played concerning several specific other classmates, and thus, behavior is likely to reflect actual relationships with these people. The findings suggest a negative association between trustworthiness in this game and loneliness. However, since the interaction partners were known in this setting, the behavior is likely to reflect past and ongoing interaction levels with specific individuals and might thus not be informative regarding behavior concerning novel and unknown interaction partners. The closest to our paper is a study by Bellucci and Park (2024), which links self-reported loneliness to trust behavior in an investment game and self-reported trustworthiness ratings. The results indicate higher trust of lonely individuals while holding lower trustworthiness expectations. The game was incentivized; however, players were not actually matched with a real interaction partner, and all participants were

assigned the role of first movers in the Investment game - thus not allowing them to study trustworthiness behavior.

We will add to this literature by studying the relationship between loneliness and trust and trustworthiness behavior in an incentivized trust game for a large representative participant pool from Europe. In addition to behavior in the trust game, our study measures incentivized beliefs about the interaction partner and can thus add to our understanding of the underlying mechanisms.

We additionally investigate behavior in an incentivized trust game when it is made explicit that the interaction partner is lonely. Incentivized trust and reciprocity concerning the lonely have not yet been studied; however, previous studies have investigated the general perception of the lonely. People described as lonely are, in general, negatively evaluated and avoided by others (Borys and Perlman, 1985). Lau and Kong (1999) observe that individuals described as lonely are rated by their peers as less adjusted, less competent, and less likable. Similar conclusions were derived by Lodder et al. (2016) and Tsai and Reis (2009), who found that loneliness is related to lower peer ratings regarding social skillfulness and positive personality characteristics. The extent of negative attitudes toward the lonely varies across demographic and cultural dimensions (Kerr and Stanley, 2021; Barreto et al., 2022). The negative stigma surrounding loneliness is especially strong among men, the young, and those living in collectivist cultures.

There is some evidence that individuals with preferences for solitude are more likely to be ostracised (Ren et al. 2020), and lonely individuals might unconsciously send signals that induce ostracism from others (Williams, 2007). Though there is no direct evidence of social ostracism of the lonely, they often perceive themselves to be socially excluded. Lonely individuals expect that others are out to hurt them and exclude them (Cacioppo and Hawkey, 2009) and are more likely to expect rejection (Qualter et al., 2013).

We contribute to this literature by providing insights into how verified knowledge about the loneliness status of another person influences behavior in an incentivized trust setting. The experimental environment allows us to provide such information, which is hard to obtain neutrally outside the laboratory. Our results will inform the literature on the likely behavioral consequences of knowing about the loneliness of the other in a trust game setting. We opt for an imposed revelation of the loneliness of the interaction partner because we are interested in detecting the potential discriminative behavior of lonely individuals. This has to be distinguished from reactions to individuals who explicitly claim to be lonely because others may or may not trust such statements to be true. Our results thus do not focus on recommendations on whether loneliness should be explicitly made public but rather on whether it is reasonable for lonely individuals to put effort into hiding their loneliness

from others. For this reason, we will also focus on a comparison between reactions to an interaction partner who is explicitly known to be lonely and an interaction partner about whom no information is available. We believe this comparison to be more informative than a comparison between reactions to individuals explicitly known to be lonely or not lonely.

3. Methodology

We developed a trust game experiment to observe trust and trustworthiness behavior by lonely and non-lonely individuals. The trust-game experiment was included in a survey on loneliness inquiring participants from the 27 member states of the European Union, with approximately 1,000 respondents per country (for details, see Appendix A). The survey and embedded experiment were conducted online between November and December 2022 by a consortium of research and survey companies.⁵ The programming of the survey was carried out by the consortium in close collaboration with the authors based on a detailed script provided by the authors (for details, see <https://osf.io/5bvtx>). Country-level quotas on age, gender, place of residence, and income were applied for participant recruitment (see Appendix A.4), which allowed us to obtain representative samples of adults aged 16+ for all 27 EU Member States.

In the following, we will first describe the game and the different information treatments. We will then describe our measures of loneliness and other survey items. The order of the individual items within the survey is presented in Figure 1.

We will conclude this section by presenting our pre-registered hypotheses.

⁵ The consortium consisted of LE Europe, Ipsos and VVA Market Research and was responsible for questionnaire optimization, scripting and translations. The consortium further took care of participant recruitment from the online panels of CINT, data collection, data processing, and data delivery. Using CINT as a single panel provider ensured that all country panels were compliant with industry standards including ESOMAR (European Society for Opinion and Marketing Research) and the Insights Association and that the fieldwork implementation was consistent across all countries.

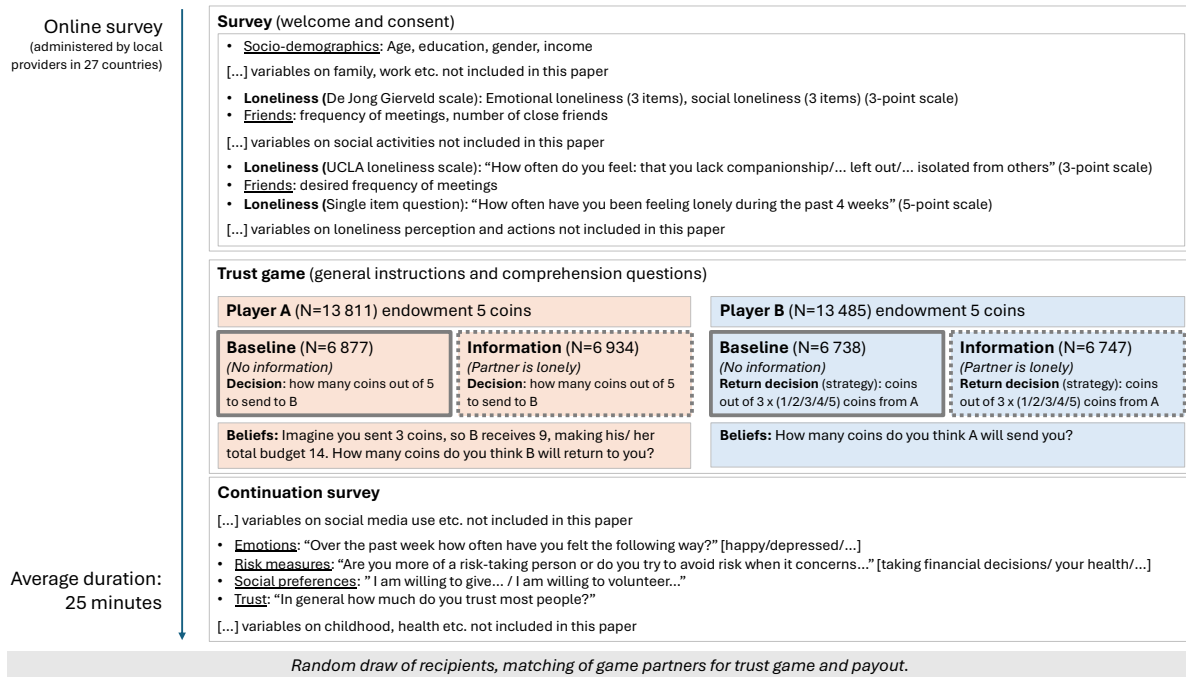


Figure 1: Overview of survey and experiment.

3.1. Trust game

We used a standard two-player, one-shot trust game (Berg et al., 1995). In the game, two anonymous participants were randomly matched and assigned to the role of either trustor (A player, N=13,811) or trustee (B player, N=13,485). Players in both roles and across all participating countries were endowed with an identical amount of five coins. The participant in the role of trustor had to decide how much of their five-coin endowment should be transferred to the trustee. Transfers were tripled, and trustees had to decide on how many of the available coins should be returned to their trustor (for instructions, see Appendix A.1. and A.2). After reading the instructions and an interactive tutorial, participants were asked two control questions to verify their level of understanding of the mechanisms and consequences of the game.⁶ Trustees (B players) reported how much they would send back in case the trustor had sent either 1, 2, 3, 4, or 5 coins (i.e., using the strategy method; Selten, 1967).⁷

⁶ The control questions were: "To test whether you understood the rules, please read through the scenario and answer the question below. Participants A and B start with 5 coins. Suppose A and B make the following decisions: A sends 2 coins to B. B sends 1 coin back to A. Comprehension_1: How many coins does A end up with in this scenario? Comprehension_2: How many coins does B end up with in this scenario? " For robustness checks we will present in the following also results on the sub-sample of participants that answered at least one of the two questions correct.

⁷ The strategy method is frequently used in experimental studies on the trust game (Casari and Cason, 2009; Brandts and Charness, 2011).

The game was introduced halfway through the survey. Participants were informed that upon completion of the survey, their coins would be exchanged into survey points (i.e., the 'currency' participants were paid with by the survey company) according to a predefined exchange rate specific for each country (see Appendix A.5.).⁸ Participants were also informed that whether they receive these additional survey points, would also depend on chance and that one out of each 25 participants would be selected for payout. Selecting only a small percentage of participants in large-scale studies is a frequently used method (Charness et al., 2016). In trust game experiments, it might reduce the amount sent but does not seem to influence reciprocity (Johnson and Mislin, 2011). Since all our participants were exposed to the same incentive methods, we did not expect an impact on our results. Applying this procedure, a total of 1,040 respondents were selected for payment. The average earnings of these participants were €7.41.⁹

Beliefs: After having made their decisions, both trustors and trustees were asked to make an incentivized guess regarding the behavior of their counterparts. Correct guesses were rewarded with one additional coin in earnings. Trustees were asked about the amount they believed the trustor had sent to them, and trustors were asked to predict the returns from trustees for one special case. Specifically, trustors (A players) were asked: "Imagine you sent 3 coins, so B receives 9 coins, making his or her total budget 14 coins. How many coins do you think B will return to you?". Belief reports by A players are thus all with respect to the same budget available for return and thus comparable across A players because they are independent of the actual amount sent by the participant. Trustees (B players) were asked: "How many coins do you think A will send you?".

Treatments: Both trustors and trustees were assigned to one of two treatments regarding the information disclosed about their counterparts (see Figure 1). In the baseline treatment, the participants (either trustor or trustee) obtained no information about their counterparts. In the information treatment, we informed participants that their partner had previously reported feeling lonely most or all of the time. They further knew that their partner had received no information regarding their own loneliness status. We focus in our information treatment on a comparison between knowing about the partner feeling lonely and having no information about the partner since we are interested in the consequences that lonely individuals should expect from putting less effort

⁸ The conversion between coins and survey points differed by country to ensure that the incentive payment was comparable across countries. The conversion was corrected for purchasing power parity.

⁹ These earnings were added to the fixed participation fee at survey completion that reflected the average length of the questionnaire. This incentive varied by country but was approximately €2.50. This monetary compensation had the aim of incentivizing participants to pay attention and provide answers to their best knowledge and ability.

into hiding their psychological state.¹⁰ Participants were not explicitly informed that their own loneliness status was exposed to their interaction partner as matching of partners was done ex-post. Through the ex-post matching of trustors and trustees, we guaranteed that all pairings made for payout were truthful to the information given in the treatments.

3.2. Survey

The overall survey (including the trust game described above) lasted approximately 25 minutes and covered many different items (see Figure 1 for an overview). The different questions regarding loneliness were spread out through the questionnaire, thus minimizing consistency biases. The questionnaire contained a first part on sociodemographic questions (age, gender, education, employment, etc.; for details, see Appendix A.3.) and many questions not related to the current study (e.g., use of social media, political preferences, health status, childhood experiences).¹¹ Note that participants when answering the survey questions about loneliness were not yet aware of the trust game to be played later.

In the following, we will discuss the items used for our analysis, specifically our measures of loneliness, emotions, preferences, and trust.

As loneliness is a subjective state, it can be best measured through self-reports. Our main measure of loneliness is a direct question that asked participants how often, during the past 4 weeks, they have been feeling lonely (5-point Likert scale: “None of the time” to “All of the time”). This single-item question has been previously used in large-scale population surveys. We further follow this literature by classifying individuals as lonely when they reported having felt lonely 'most' or 'all of the time' in the last four weeks (Sundstrom et al., 2009; Victor and Yang, 2012; Rapoliene and Aartsen, 2022).

We additionally employed two validated scales regarding loneliness: the UCLA loneliness scale (Russell, 1996) and the De Jong Gierveld scale (DJG) (Gierveld and Tilburg, 2006). Both scales preceded the direct question in the questionnaire. The UCLA loneliness scale consists of three items (How often do you feel that you lack companionship; How often do you feel left out; How often do you feel isolated from others) that are each rated on a three-point scale (Hardly ever; Some of the time; Often; see Appendix A.3.). The DJG scale does, in addition, distinguish between emotional loneliness and

¹⁰ An alternative treatment would have consisted in informing participants explicitly that their partners reported to be 'not' lonely. We would expect behavior in our baseline treatment to be in between the two types of information treatments, as having no information about the partner implies that they might be lonely or not.

¹¹ For details on other parts not discussed here see: joint-research-centre.ec.europa.eu/scientific-activities-z/loneliness

social loneliness. It is based on six questions related to the participants' emotional and social situation (see Appendix A.3.).

We also asked directly for the quantity of social interactions, specifically the number of close friends and the frequency of face-to-face meetings with them. We further included a question about the desired frequency of social contacts. We will use these to calculate the difference between desired and actual social interactions to classify individuals who have an 'unsatisfied' versus 'satisfied' need for social contacts. The number of close friends enables us to identify participants with no friends who might be socially isolated.

To evaluate the emotional state of the participants, we asked for their experience of feelings related to happiness and depression over the last week (6-point Likert scale, 'never' to 'always'). Social preferences were elicited by asking about the willingness to donate money and time (ten-point scale from 'not willing at all' to 'very willing to do so'; see also Falk et al., 2018). Concerning risk attitudes, we distinguish between financial and health risks (ten-point scale; see also Dohmen et al., 2012). Time preferences were elicited by asking participants how much they were willing to give up benefits today for future profit (ten-point scale from 'not at all' to 'highly willing to do so'; Falk et al., 2018).

Within the survey and independent of the trust game, we also asked participants to self-report their level of general trust, i.e., they were asked: "In general, how much do you trust most people?" (10-point Likert scale: from 'not at all' to 'completely'; OECD, 2017).

3.3. Hypotheses

We test two sets of hypotheses. The first set refers to the behavior of lonely individuals in the trust game. It will enable us to verify if lonely individuals behave differently from non-lonely individuals concerning trust and trustworthiness.¹² The second set refers to behavior with respect to lonely individuals in a trust setting. As loneliness is a subjective state, information about loneliness in others is usually not available. Our experiment thus enables us to investigate the impact that the availability of such information might have on social interactions. Specifically, it enables us to see whether stigma or pity dominates with respect to the lonely in a setting where loneliness is made explicit. All hypotheses were pre-registered in the Open Science Framework registry: osf.io/vc53k.

¹² We further pre-registered hypotheses concerning the role of emotions. These results are discussed in the appendix of this paper. Specifically, we assumed: *that the effect of loneliness on trust behavior is linked to lower levels of feeling happiness (hypothesis 2.1) and to higher levels of feeling depressed (hypothesis 2.2).*

Trust and trustworthiness of the lonely

Our hypotheses concerning the behavior and beliefs of lonely individuals in the trust game are grounded in the literature regarding self-reported trust and loneliness reviewed previously. In line with this literature, we hypothesize:

When being in the role of the trustor (A player), lonely individuals will send fewer coins to the trustee (B player) than non-lonely individuals (hypothesis 1.1).

We further assume that lonely individuals have lower expectations about the trust and trustworthiness of others:

Lonely individuals expect lower transfers by trustors (hypothesis 1.3) and lower back transfers by trustees (hypothesis 1.2).

While sending money in the trust game relies both on beliefs about trustworthiness by others and risk preferences, returning money is an act of reciprocity. We have no reason to expect lonely individuals to be more or less reciprocal than others and thus hypothesize:

When acting in the role of the trustee, lonely individuals will return as many coins to the trustor as non-lonely individuals (hypothesis 2.1).

Behavior when being aware of the loneliness status of the interaction partner

Our second set of hypotheses concerns behavior towards lonely individuals. The literature is less clear in this case. On the one hand, due to a discrimination of the lonely, they might be trusted less. However, if loneliness triggers pity, individuals might empathize with the lonely and treat them nicer than others. The explicit nature of our information treatment might also trigger social norms or reputation effects. These negative and positive effects might cancel out. We thus have no directional hypothesis:

Participants exhibit an equivalent level of trust towards their lonely counterparts as they do towards the general population. (hypothesis 3.1)

Participants don't have different expectations about lonely individuals compared to expectations about the general population. This applies to both the expectations about the number of coins returned when a lonely counterpart acts as a trustee (hypothesis 3.2) and the expectations about the number of coins sent when a lonely counterpart acts as a trustor (hypothesis 3.3).

As the negative impact of stigma regarding the lonely is assumed to be related to beliefs regarding their untrustworthiness, we expect no stigma effect in non-strategic situations. We therefore hypothesize that:

Participants in the role of trustee transfer back larger amounts to lonely individuals (hypothesis 4.1).

4. Results

4.1. Descriptive statistics

Sociodemographics

Overall, we collected loneliness reports and behavior in the trust game for a total of 27,296 participants¹³ (13,811 participants in the role of trustor and 13,485 participants in the role of trustee). As participants were asked to answer two comprehension questions, we will in the following also use these answers for robustness checks by presenting additional analysis on the sub-sample of participants who responded to at least one of the two questions correctly.

Table 1 (a) summarizes the general characteristics of our sample. As hard quotas on age, gender, and place of residence and soft quotas on income were applied for participant recruitment, we obtained balanced distributions across age, gender, education, income, and place of residence at the regional level.¹⁴ Our sample is well gender balanced (51 % are females). Middle-aged participants (36-45 and 46-55) represented the highest proportions (21 to 22 %). Younger (16-25 and 26-35) and older (56-65 and 65+) age groups account for 14 % to 19 % and 11 % to 13 % of the sample, respectively. The majority of participants (63 %) completed tertiary education. Respondents' income deciles were calculated based on free-form reports of income.¹⁵ Our sample exhibits a slight over-representation of individuals from higher income deciles (as indicated by the average decile of 6).

¹³ The agreement with the consortium was made for the provision of 25.000 completed questionnaires. The overall questionnaire contained many other items which are not considered in this article. Therefore, we use also incomplete questionnaires as long as participants completed the trust game, the direct loneliness question, and the questions used as controls.

¹⁴ According to the Nomenclature of territorial units for statistics we reach NUTS2 level, for details see Appendix A.4.

¹⁵ National income distributions were calculated based on EU statistics on income and living conditions (EU-SILC) microdata of 2019 and adjusted for the country-specific inflation rate between 2019 and 2022.

Table 1: Summary statistics of socio-demographic characteristics (a) and preferences (b)

(a) Socio-demographic characteristics of the overall sample (1) and loneliness prevalence per category (2)

	Number of observations (%) (1)	Percentage categorized as lonely (per category) (2)
Gender		
Female	13,923 (51%)	13%
Male	13,373 (49%)	12%
Age		
16-25	3,743 (14%)	18%
26-35	5,211 (19%)	15%
36-45	5,866 (21%)	13%
46-55	5,892 (22%)	12%
56-65	3,664 (13%)	9%
65+	2,920 (11%)	6%
Education		
Lower secondary or less	1,454 (5%)	18%
Upper secondary and post-secondary	8,721 (32%)	13%
Tertiary education	17,121 (63%)	12%
Income decile		
not reporting income	2,720 (10%)	10%
Decile 1	1,646 (6%)	23%
Decile 2	1,686 (6%)	20%
Decile 3	2,028 (7%)	16%
Decile 4	2,427 (9%)	14%
Decile 5	2,651 (10%)	13%
Decile 6	3,033 (11%)	12%
Decile 7	2,980 (11%)	11%
Decile 8	2,964 (11%)	10%
Decile 9	2,694 (10%)	9%
Decile 10	2,467 (9%)	10%

(b) Self-reports regarding preferences (risk and social), trust, and experienced emotions

	Number of observation s	Average	Average for subsample categorized as:		p-value
		total sample	non- lonely	lonely	lonely versus non-lonely
Self-reported risk and social preferences					
<i>Financial risk taking</i> (1=avoid risks to 10=take risks)	25,877	5.0	4.9	5.2	***
<i>Health risk taking</i> (1=avoid risks to 10=take risks)	25,925	4.8	4.7	5.5	***
<i>Volunteering - willing to volunteer...</i> (1=not at all to 10=perfectly)	25,836	5.7	5.7	5.9	***
<i>Donations - willing to give...</i> (1=not at all to 10=perfectly)	25,854	6.6	6.6	6.6	
<i>Patience - willing to give up something beneficial today in order to benefit more from that in the future</i> (1=not at all to 10=perfectly)	25,767	6.4	6.4	6.5	
Emotions - over past week, how frequently have you felt...:					
Happy (dummy) (1 if felt always or frequently in the last week)	27,296	0.4	0.4	0.2	***
Depressed (dummy) (1 if felt always or frequently in the last week)	27,296	0.1	0.1	0.5	***
Self reported generalized trust:					
In general how much do you trust most people (1=not at all to 10=completely)	26,171	5.9	6.0	5.2	***

Note: Mann-Whitney test significance concerning the difference between average values in the sample of lonely and non-lonely is as follows: *** p<0.001, ** p<0.01, * p<0.05

Participants were randomly selected to be in either the role of player A or player B and participants in both roles do not differ with respect to their sociodemographic characteristics (Table B.1.).

Loneliness prevalence

We observe that 13 percent of our participants stated in the direct question to have felt lonely *most* (N=2,571) or *all* (N=886) of the times in the last four weeks (total N=3,457). Similarly, 3,211 participants reached a score of either 8 or 9 on the UCLA scale, and 3,429 received a score of 6 on the De Jong Gierveld (DJG) scale. All three loneliness measures are strongly correlated (Table 2).

In the following, we will classify individuals as lonely based on our direct question (i.e., reporting to have felt lonely 'most' or 'all of the time' in the last four weeks). Given this definition, our observed loneliness prevalence is in line with other large-scale population surveys (European Social Survey, European Quality of Life Survey, EU-SILC), where the share typically ranges between 10 to 20 percent.

Loneliness is defined as the difference between a desired and actual level of social connections and not solely by absolute numbers of social connections. To verify this assumption, we link our loneliness classification to the self-reported desired and actual social connections of participants. We classify individuals as having an 'unsatisfied' social need if their reported desired connections exceed their reported actual connections. We observe that lonely individuals report less frequent meetings with friends but have similar desired levels (Table B.2). The desired frequency surpasses the actual frequency of meeting friends for 58.6 % of lonely individuals compared to 44.8 % of non-lonely individuals. In addition, we observe that for a given level of social interactions, a higher percentage is unsatisfied among lonely individuals. For example, amongst those who meet friends 'every week,' the need remains 'unsatisfied' for 42 % of lonely individuals and 29 % of non-lonely individuals.

Though self-reported loneliness and an unsatisfied social need are related, one does not automatically imply the other. Similar evidence comes from individuals who report having no close friends. Respondents without any close friends make up 7 % of our sample. While loneliness is high in this group (30 % report to feel lonely), also a sizable proportion of the participants who reported to have some close friends report to be lonely (12%).

Table 2. Correlation coefficients of the different loneliness measures

	Direct question	UCLA-scale	DeJong-scale	DeJong-scale <i>emotional</i>
UCLA-scale	0.66			
DeJong-scale	0.57	0.63		
DeJong-scale <i>emotional</i>	0.63	0.64	0.79	
DeJong-scale <i>social</i>	0.29	0.35	0.80	0.26

Note: The direct question was: 'How much of the time during the past 4 weeks have you been feeling lonely?' Possible answer options were: None of the time, A little of the time, Some of the time, Most of the time, All of the time. University of California Los Angeles (UCLA) 3-item scale: Possible answer options to three questions were: hardly ever (1), some of the time (2), or often (3). These are added up to build a 3-9 scale. De Jong-Gierveld (DJG) 6-item scale: Answers were dichotomized following the authors' instructions (Gierveld & Tilburg, 2006). The six binary variables are added up to build a 0-6 scale. DJG is further broken down into an emotional 0-3 sub-scale and a social 0-3 sub-scale.

The subjective nature of loneliness is confirmed by our measures of emotions. We focus on the reported frequency of experiencing two emotions over the last week: happiness and depression. We classify participants as happy or depressed when they reported having felt the respective emotion "very frequently" or "always". Overall, 38 % of participants can be classified as happy, while 14 % can be classified as depressed. These percentages change significantly when only focusing on lonely individuals. Amongst lonely individuals, 15 % can be classified as happy and 52 % as depressed. Further evidence comes from the emotional dimensions of the DJG loneliness scale. The emotional dimension of the DJG scale is much more strongly correlated with the direct loneliness question (Table 2).

Characteristics of the lonely

We provide details on the loneliness prevalence among the different socio-demographic groups of our participants in the last column of Table 1 (a).

In line with the previous literature, we observe the lonely participants to be younger and to dispose of less income (e.g., Luhmann and Hawkey, 2016). Among the young (aged between 16 and 25), 18 % can be classified as lonely. In contrast, among participants aged above 65, only 6 % can be classified as lonely. Similarly, among participants in the lowest three income deciles, loneliness prevalence exceeds 15 %, whereas it does not surpass 10 % in the highest three income deciles. Loneliness also varies across countries, and we report the share of lonely individuals per surveyed country in Table B.3. We observe a minimum of 9 % in Croatia and a maximum of 21 % in Ireland.

Preferences and emotions of the lonely are presented in Table 1(b). Lonely participants are more willing to take risks (Mann-Whitney test, $p=0.000$) and to volunteer (Mann-Whitney test, $p=0.000$). As discussed above, lonely participants also report less often being happy (Mann-Whitney test, $p=0.000$) and more often being depressed (Mann-Whitney test, $p=0.000$). Finally, participants classified as lonely report lower self-reported generalized trust (Mann-Whitney test, $p=0.000$).

4.2. Trust game behavior (baseline)

We will now turn to a discussion of the behavior in the trust game where participants had no information about their interaction partner (baseline). In the next sections, we will focus on the trust behavior (i.e., coins sent) by trustors (player A) and on the trustworthiness (i.e., amounts returned) by trustees (player B).

4.2.1. Trust behavior (coins sent by A players)

In the baseline treatment, trustors send, on average, 2.51 out of 5 coins (or 50 %) to trustees.¹⁶ This ranges within levels commonly observed in trust game experiments (Johnson and Mislin, 2011).

Lonely trustors send, on average, 2.61 out of 5 coins, while non-lonely trustors send, on average, 2.49 out of 5 coins (Mann-Whitney test, $p=0.003$). Lonely individuals thus send significantly more money than the non-lonely. The effect, though not large, is exactly opposite to the result that the literature has reported from self-reported trust questions. Meanwhile, we also replicate this finding. Participants classified as lonely report an average score of 5.21 on the generalized trust scale, while non-lonely participants report an average score of 6.03 (Mann-Whitney test, $p=0.000$). Thus, in line with the previous literature, we observe a significant negative correlation between loneliness status and self-reported generalized trust. However, we find no negative correlation concerning actual trust behavior in the game.

We confirm the non-negative relationship between loneliness and trusting behavior through regressions, controlling for country fixed-effects, gender, age class, and education. From the first column in Table 3(a), we observe that the amount sent by lonely participants is significantly higher.

¹⁶ We observe the same (average of 2.51 out of 5 coins) for the sub-sample of participants, that responded correctly to at least one of the two control questions (3682 respondents or 53% of the baseline treatment).

Table 3: Relation between loneliness and trust (a) and trustworthiness (b)

a) Relation between trust behavior by A players in trust game and loneliness

	Trust behaviour (coins send) by A player		
	(1)	(2)	(3)
Lonely (dummy)	0.139*	0.145**	0.117*
	(0.055)	(0.055)	(0.058)
Expectation about counterpart's trustworthiness behaviour		0.178***	0.181***
		(0.009)	(0.009)
Socio-demographic controls (YES)		(YES)	(YES)
Preferences controls (YES)			(YES)
Constant	2.870***	2.091***	1.862***
	(0.145)	(0.144)	(0.171)
Observations	6,877	6,877	6,372
R-squared	0.021	0.078	0.082

b) Relation between trustworthiness behavior by B players (average of the share of coins return across strategy set) in trust game and loneliness.

	Trustworthiness behaviour (average share returned) by B player		
	(1)	(2)	(3)
Lonely (dummy)	-0.006	-0.006	-0.006
	(0.008)	(0.008)	(0.008)
Expectation about counterpart's trust behaviour		0.023***	0.022***
		(0.002)	(0.002)
Socio-demographic controls (YES)		(YES)	(YES)
Preferences controls (YES)			(YES)
Constant	0.624***	0.574***	0.557***
	(0.019)	(0.019)	(0.022)
Observations	6,738	6,738	6,276
R-squared	0.023	0.052	0.055

Note: *** p<0.001, ** p<0.01, * p<0.05. Tables report OLS regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed-effects. Socio-economic preferences control variables used in regressions are risk-taking, donations, volunteering, patience, and self-reported trust.

Trust in the trust game is associated with social risk. Higher trust by lonely individuals might either be due to a larger willingness to take risk or to a biased perception regarding this risk. Specifically, one potential driver of the higher trust levels could be the more optimistic beliefs of the lonely.¹⁷ Beliefs

¹⁷ As we hypothesized an impact of the experienced negative emotions on trust behavior by lonely participants, we also test for this relationship (Appendix C). Indeed, the lack of happiness in lonely individuals leads to a reduction of trust behavior. Implying that in absence of these negative emotions, lonely individuals would trust even more in the trust game.

and thus expectations are indeed highly relevant for trust behavior (Table 3(a), (2)). However, the coefficient of loneliness is unaffected by the inclusion of beliefs. Indeed, average beliefs by lonely individuals (4.00 out of 5) are not statically different from beliefs by non-lonely individuals (4.03 out of 5, $p=0.642$). The slightly higher trust by lonely individuals, therefore, does not seem to be driven by more optimistic beliefs about returns but by a larger willingness to take social risk in an economic setting. Indeed, also controlling for the individuals' preferences (Table 3(a), (3)) leads to a slight reduction of the coefficient of loneliness.¹⁸ Robustness checks for the sub-sample of participants that correctly answered at least one control question are presented in Table B.5.

4.2.2. Trustworthiness behavior (share returned by B players)

To see whether lonely individuals differ in their trustworthiness behavior from non-lonely individuals, we present results regarding the aggregate share across the five possible scenarios (robustness checks regarding the individual answers are presented in Appendix B).

Trustees in the baseline treatment return, on average, 60 percent of transfers received.¹⁹ Recall that in our experiment, both trustors and trustees started with an initial endowment of 5 coins to mitigate potential influences of inequity aversion on trust decisions. The endowment to trustees might explain their relatively generous returns.

We observe, in line with hypothesis 2.1, that lonely individuals do not show any significant difference in their overall trustworthiness compared to non-lonely individuals (see Table 3(b)). The coefficient for loneliness is also unaffected by the stake size (Table B.6).²⁰

4.3. Behavior towards lonely individuals

The results from our previous section showed that lonely individuals are marginally more trusting and equally trustworthy in an incentivized trust game. This result is in stark contrast to what the literature using self-reported trust measures suggested. The self-reported trust measure might, however, reflect

¹⁸ We run comparable regressions using the variables of an unmet social need and having no close friends (Table B.4.). Neither of these two variables shows a significant negative correlation with trust behavior in the trust game. Also, neither of the two variables shows a significantly positive coefficient. This should not be very surprising, as previously discussed, though related, neither variable is very strongly correlated with loneliness (unmet social need: correlation coefficient: 0.09; having no close friends: correlation coefficient: 0.14).

¹⁹ The average amount for participants that correctly responded to at least one of the control questions is 61%.

²⁰ Robustness regressions using our variable of an unsatisfied social need or having no friends do not show any significant relationship between these variables and trustworthiness (Table B.4 (b)).

a common narrative concerning the lonely. It is thus possible that there is a mismatch between actual behavior and what is believed about how trustworthy and trusting lonely individuals are. To investigate this question, we analyze behavior from our treatment in which participants were informed that they were matched with another person who had previously reported feeling lonely *most or all of the time*.

Transfers to trustees known to be lonely

We observe that trustors send 0.18 coins more when being informed that their counterpart is lonely (2.69 out of 5 coins) compared to the baseline treatment when no information about the counterpart was revealed (2.51 out of 5 coins). Higher trust towards participants identified as lonely is observed for non-lonely (2.67 out of 5 coins versus 2.49 out of 5 coins) but also for lonely participants (2.78 out of 5 coins versus 2.61 out of 5 coins).²¹

In a regression setting, this result is confirmed (Table 4 (a), (1)). The result is robust to the inclusion of controls regarding expectations and individual preferences (Table 4 (a), (2) and (3)). The results are also robust for the sub-sample of participants who answered at least one of the control questions correctly (Table B.7. (b), (1)).

Higher trust towards individuals known to be lonely could also be driven by expecting higher returns from them. However, we observe no significant difference in the expectations of returns from lonely individuals (3.97 out of 9) compared to expectations of returns in the baseline treatment (4.01 out of 9; Mann-Whitney test, $p=0.14$). The same can be observed in a regression setting, controlling for socio-demographic characteristics of participants (Table 5, (1))²². Thus, the observed positive discrimination in trusting behavior towards lonely individuals cannot be attributed to strategic reasoning. Overall, we thus observe some positive discrimination of lonely individuals, which implies that the empathic effect (pity) must outweigh any kind of negative discrimination. Our design, meanwhile, does not allow us to determine whether this effect is driven by honest, empathic concerns, by some kind of internalized social norms, or by reputation concerns with respect to the experimenters.

²¹ The results are similar for participants that correctly responded to at least one of the control questions: trustors send 0.19 coins more when being informed that their counterpart is lonely (2.70 out of 5 coins) compared to the baseline treatment when no information about the counterpart was revealed (2.51 out of 5 coins).

²² Similar results are observed for the subsample of participants that answered correctly at least one control question (Table B.8.)

Table 4. Impact of knowledge about loneliness status of counterpart (Information treatment) on trust (a) and trustworthiness behavior (b)

(a) Relation between Information treatment, trust behavior by A players in trust game, and loneliness

	Trust behaviour (coins send) by A player		
	(1)	(2)	(3)
Treatment: informed that counterpart is lonely	0.176*** (0.025)	0.185*** (0.024)	0.186*** (0.025)
Lonely (dummy)	0.129*** (0.039)	0.131*** (0.039)	0.125*** (0.041)
Expectation about counterpart's trustworthiness behaviour		0.172*** (0.006)	0.172*** (0.007)
Socio-demographic controls	(YES)	(YES)	(YES)
Preferences controls			(YES)
Constant	2.631*** (0.102)	1.870*** (0.101)	1.636*** (0.118)
Observations	13,811	13,811	12,817
R-squared	0.022	0.078	0.082

(b) Relation between trustworthiness behavior by B players (average of the share of coins return across strategy set) in trust game and loneliness.

	Trustworthiness behaviour (average share returned) by B player		
	(1)	(2)	(3)
Treatment: informed that counterpart is lonely	0.030*** (0.004)	0.029*** (0.003)	0.029*** (0.004)
Lonely (dummy)	-0.006 (0.005)	-0.006 (0.005)	-0.005 (0.005)
Expectation about counterpart's trust behaviour		0.022*** (0.001)	0.022*** (0.001)
Socio-demographic controls	(YES)	(YES)	(YES)
Preferences controls			(YES)
Constant	0.600*** (0.013)	0.552*** (0.014)	0.527*** (0.016)
Observations	13,485	13,485	12,534
R-squared	0.026	0.053	0.060

Note: *** p<0.001, ** p<0.01, * p<0.05. Tables report OLS regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed-effects. Socio-economic preferences control variables used in regressions are risk-taking, donations, volunteering, patience, and self-reported trust.

Our result demonstrates that, in an incentivized task, lonely individuals are trusted more, even though their perceived trustworthiness is not higher. When it comes to reciprocity, we might thus expect this pity effect to become even stronger, following our initial hypotheses.

Table 5. Impact of knowledge about loneliness status of counterpart (Information treatment) on expectations regarding counterpart's trustworthiness and trust behavior.

	Expectations by A players about counterparts (B players) Trustworthiness behaviour	Expectations by B players about counterparts (A players) Trusting behaviour
	(1)	(2)
Treatment: informed that counterpart is lonely	-0.052 (0.035)	0.053* (0.026)
Lonely (dummy)	-0.009 (0.053)	0.007 (0.041)
Socio-demographic controls	(YES)	(YES)
Constant	4.429*** (0.136)	2.155*** (0.106)
Observations	13,811	13,485
R-squared	0.011	0.008

Note: *** p<0.001, ** p<0.01, * p<0.05. Tables report regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed-effects.

Returns to trustors known to be lonely

We observe that trustees informed about the loneliness status of their interaction partner return, on average, 63 % of the received amount, which is significantly higher than what is returned when no information about the trustor is provided (60 %; Mann-Whitney test, $p=0.000$).²³ We confirm the finding using regression analysis (Table 4(b), (1)). The coefficient of being informed about the loneliness status of the partner is unaffected by additionally including expectations or individual preferences as control variables (Table 4(b), (2) (3)). The impact is also remarkably constant in percentage terms across the different budget sets (Table B.7(a), (2) to (6)), which implies that participants adjust the share they want to return and do not add a fixed bonus to their returns to the lonely. The results are also confirmed when only considering participants who correctly answered at least one of the two control questions (Table B.7(b), (2) to (6)).

To compare the relative impact of knowing about an interaction partner's loneliness on either trust or trustworthiness, we present regressions using normalized variables of trust and trustworthiness (Table B.9). Indeed, in line with our hypothesis, we see a slightly stronger treatment effect for trustworthiness compared to trusting behavior (14% versus 12%). The stronger, positive treatment

²³ The result is similar for respondents that correctly answered the control questions: trustees informed about the loneliness status of their interaction partner return, on average, 65 % of the received amount, which is significantly higher than what is returned when no information about the trustor is provided (61 %; Mann-Whitney test, $p=0.000$).

effect in a non-strategic setting (i.e. trustworthiness) also hints at the presence of some negative, stigma-related effect that must be at work in the strategic setting (i.e. trust). However, this negative effect is largely outweighed by the positive pity or social norm effects.

It is further noteworthy that beliefs about the trust behavior of lonely individuals are marginally positive and thus in line with actual behavior (see Table 5).

5. Discussion and Conclusions

Based on an experiment with over 27.000 participants, we find reassuringly positive results in terms of trust behavior by lonely individuals in an incentivized trust game. Even if lonely individuals report significantly lower trust in self-reports, confirming the findings of the previous literature, they exhibit no less trust compared to the general population in a trust game. This result is surprising and highlights the importance of considering incentivized measures of trust.²⁴

Our results, meanwhile, also provide some insights into the origins of this seeming contradiction. Behavior in the trust game is future-oriented. It depends on beliefs about the trustworthiness of others but also on a willingness to take the social risk of trusting others. Our belief measures provide evidence that the lonely do not have more optimistic beliefs but seem to be more willing to take the social risk associated with trusting in the trust game. A behavior that can be linked to other types of behaviors, notably our measures regarding health risk and volunteering. Lonely individuals score higher on both, which could be driven by lonely individuals seeking social contacts. Regarding health risks, they might be more willing to trade a risk of infection against having social contacts. For volunteering these individuals might be more willing to take up volunteering as it provides a social environment (Bellucci, 2020). In contrast, self-reported generalized trust can be linked to past experiences. Having had negative social interactions in the past might lead to low reports of trust. A fact that can be linked to another observation from our data: notably, the correlation between having no close friends and the self-reported generalized trust question is stronger than the correlation with loneliness (Table B.10). The negative correlation reported by the previous literature, seems to be thus much more related to a lack of positive social interactions and less to the psychological and emotional components of loneliness.

²⁴ Indeed, a large literature has compared actual trusting behavior in experimental settings with survey questions on trust, concluding that both measures are loosely related and should be considered rather complementary (Glaeser et al., 2000).

Lonely individuals can thus be considered as willing to take social risks to interact with others. This highlights a misconception of the literature that characterizes lonely individuals as socially maladroit, less accustomed, and incompetent in interactions with others (Borys and Perlman, 1985; Christensen and Kashy, 1998). These findings are largely based on confusing loneliness with a lack of social skills (Barreto et al., 2022; Kerr and Stanley, 2021). More recent studies defining loneliness as “the subjective experience of dissatisfaction with one's social-relational life” (Huang et al., 2016) report no deficiency in the social skills of lonely individuals (Christensen and Kashy, 1998; Gardner et al., 2005; Qualter et al., 2015; Tsai and Reis, 2009).

Instead, behavior by the lonely might be linked to what is generally considered prosociality. Though our coefficient of loneliness on trust behavior is small, it is consistently positive. The previous empirical evidence regarding the link between loneliness and prosociality is scarce, but some studies suggest that social exclusion might be driving prosociality (Gerber and Wheeler, 2009; Ramos-Toro, 2023). Gerber and Wheeler (2009) find that experiences of social exclusion decrease prosocial behavior only towards people who caused the exclusion and observed a positive effect of social exclusion on prosociality towards new potential sources of affiliation. Similarly, Ramos-Toro (2023) shows, with the historical example of leper colonies in Colombia, that socially excluded individuals tend to be more prosocial but exhibit mistrust toward those who have excluded them. Research in social psychology has come to similar conclusions: socially excluded individuals tend to avoid interacting with those who excluded them while being likely to display empathy and altruism in general (Maner et al., 2007; Vollhardt and Staub, 2011; Greenberg et al., 2018). Findings by Bellucci (2020) suggest that lonely individuals show a stronger inclination towards engaging in prosocial behaviors such as helping others while at the same time reporting low interpersonal trust. Overall, these findings are also in line with the evolutionary theory of loneliness, according to which loneliness motivates individuals to approach others to decrease the negative associated feelings (Cacioppo et al., 2014; Qualter et al., 2015).

Our second set of results concerns behavior towards individuals identified to be lonely. Despite the common narrative that lonely individuals will suffer from discrimination, we find no evidence of negative discrimination and some evidence of positive discrimination. The observed positive discrimination evidenced by higher transfers to the lonely can not be attributed to strategic concerns because, again, beliefs reveal that lonely individuals are not expected to return more. Instead, loneliness, if explicitly made public, seems to trigger a pity reaction and thus kind behavior. Addressing this effect might thus release the pressure of hiding the loneliness status for concerned individuals and make them more accepting of their situation. This is likely to be beneficial through direct effects (i.e., acceptance) as well as indirect effects (i.e., kind treatment by others).

Overall, our results suggest that, in economic terms and beyond its health consequences, loneliness should not be seen as a problem as such but rather as an indication of an underlying problem. Persistently elevated levels of loneliness might indicate a lack of opportunities for individuals to satisfy their social needs, even though they are willing to incur costs to do so. Policymakers should be aware of this willingness and provide opportunities to re-equilibrate the social needs of the people. Policymakers should also be aware that given the willingness to incur costs and risk to have social contacts, the lonely might be especially susceptible to being exploited by opportunistic agents or organizations that promise the feeling of social connectedness.

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Appendix A: Methods

A.1. General introduction and consent

Welcome!

Thank you for your interest in this survey, which is being conducted as part of a research project looking at well-being across the European Union. The survey has been designed and funded by the European Commission and is being conducted by [panel provider]. It will take about 25 minutes to complete.

Please read all the information and answer the questions carefully. There are no right or wrong answers to questions asked in the survey. It is your honest opinion that matters to us.

In addition to other topics, we will ask a few questions related to your health and political opinion. Rest assured that a “Prefer not to say” option will always be available if you feel uncomfortable answering such questions. Your answers throughout this survey will be kept confidential. The European Commission will not receive any information that would allow you to be identified. Your responses will be grouped together with the responses provided by all participants, and your personal data will be held for no longer than 18 months. Your answers will be used strictly for research purposes and may be used to inform policy. Anonymized data from this survey – without any of your personal information included – may be made publicly available for further research.

Participation in the survey is voluntary, and you may withdraw consent at any time.

A.2. Trust game instructions

Next, we will move on to something slightly different. More specifically, we will ask you to complete one short task.

You have an opportunity to earn up to ___ survey points on top of those you will earn for the survey itself. The number of points you can earn will depend on the decisions you make as well as the decisions that other people filling in this same survey may make. We explain how this works later.

Because many people will fill in this survey, we cannot give everyone additional points. Instead, we will draw every 25th survey respondent filling in this survey, and if you are selected, you will earn additional points. If you are selected, the number of points you will receive will correspond to your earnings in the next task.

Your payment will be processed once everyone has completed the survey. As other people may not be online at the same time as you, this may take a while. We will inform you by email of the final results.

TASK Description (version 1)

Please read the task description carefully. We will ask you two questions regarding the content of the description on the next page.

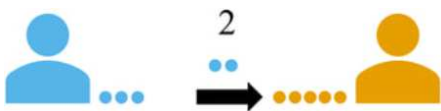
In the task, there are two participants: **A** and **B**.

The rules of the task are as follows:

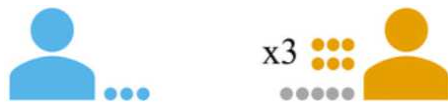
- At the beginning of the task, both participants receive 5 coins. A coin is equivalent to ___ survey points.



- **A** can then choose to give none, some, or all of the 5 coins to **B**. For example, **A** could send 2 coins.



- Whatever **A** sends to **B** is **multiplied by three**.



- If **B** receives coins from **A**, then **B** can send none, some, or all of the received coins back to **A**. These coins are **not multiplied** again. Also, **B** can only send back the coins received from **A**, not the original 5 coins. For example, **B** could send back 4 coins.



- After both **A** and **B** have made their decisions, both participants keep the number of coins they have at that moment.



Before proceeding to the next page, we kindly ask you to read the instructions carefully.

TASK Description (version 2)

Please read the task description carefully. We will ask you two questions regarding the content of the description on the next page.

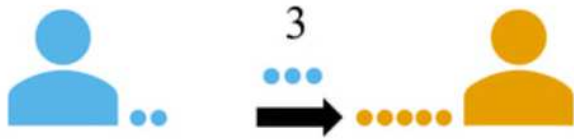
In the task, there are two participants: **A** and **B**.

The rules of the task are as follows:

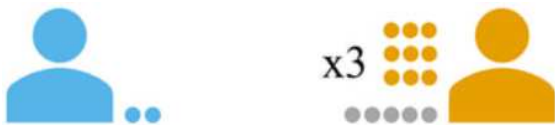
- At the beginning of the task, both participants receive 5 coins. A coin is equivalent to ___ survey points.



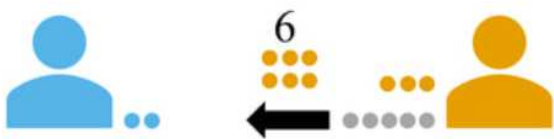
- **A** can then choose to give none, some, or all of the 5 coins to **B**. For example, **A** could send 3 coins.



- Whatever **A** sends to **B** is **multiplied by three**.



- If **B** receives coins from **A**, then **B** can send none, some, or all of the received coins back to **A**. These coins are **not multiplied** again. Also, **B** can only send back the coins received from **A**, not the original 5 coins. For example, **B** could send back 6 coins.



- After both **A** and **B** have made their decisions, both participants keep the number of coins they have at that moment.



TASK Simulation

To make sure the rules are clear for you, you can use the test screen below to experiment with the different choices for the two participants. Between each test, click the “reset to zero” button below to reset the screen.

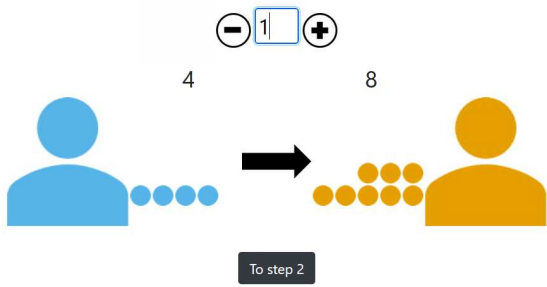
Step 1: Points sent by A

5

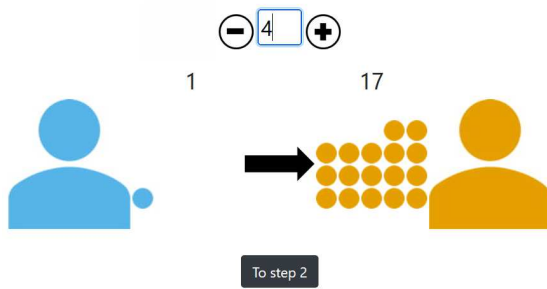
→

5

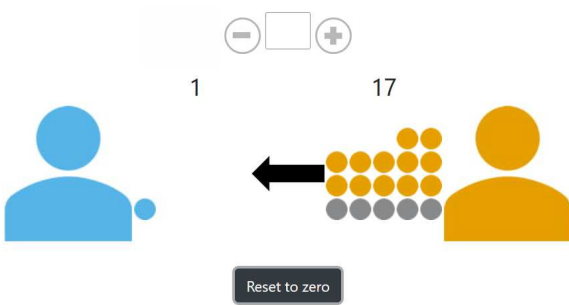
Step 1: Points sent by A



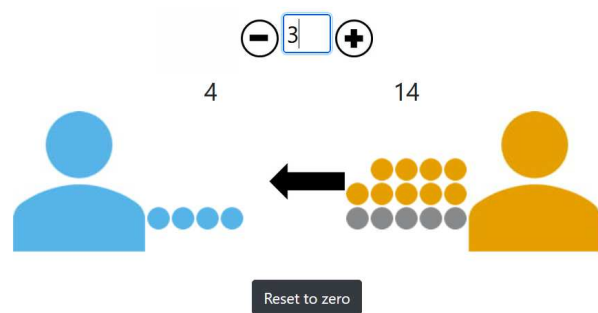
Step 1: Points sent by A

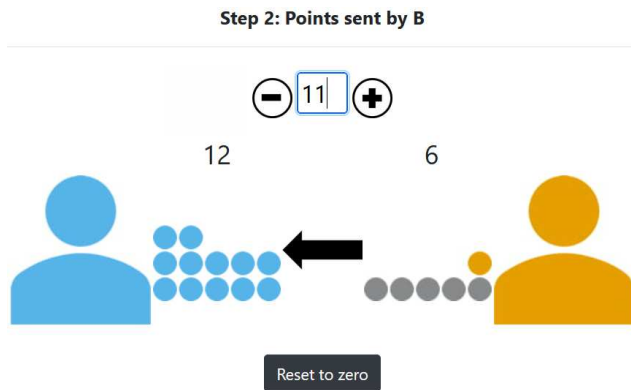


Step 2: Points sent by B



Step 2: Points sent by B





TASK Comprehension test

To test whether you understood the rules, please read through the scenario and answer the question below.

Participants **A** and **B** start with 5 coins.

Suppose **A** and **B** make the following decisions:

- **A** sends 2 coins to **B**.
- **B** sends 1 coin back to **A**.

How many coins does **A** end up with in this scenario?

How many coins does **B** end up with in this scenario?

If $\text{comprehension_1} = 4$ AND $\text{comprehension_2} = 10$: Well done, you answered correctly. Please go on to the real task.

If $\text{comprehension_1} \neq 4$ OR $\text{comprehension_2} \neq 10$: Unfortunately, you answered the question incorrectly. The outcome is actually as follows:

- **A** starts with 5 coins, gives away 2 coins, and gets 1 coin back. Therefore, **A** ends up with $5 - 2 + 1 = 4$ coins.
- **B** starts with 5 coins, receives 6 coins from A (2×3), and gives one coin back. Therefore, **B** ends up with $5 + 6 - 1 = 10$ coins

Please go on to the real task.

Now, the real task starts.

Once you have made your decision and clicked the “Next” button, you will not be able to return to this screen.

PARTICIPANT A

You are in the role of **A**. You and **B** begin with 5 coins each.

[In Information treatment:

B has reported feeling lonely all or almost all of the time during the past four weeks. B knows nothing about you.]

How many coins (if any) would you like to send to **B**? Your choice will affect how many points you and the other participant will receive at the end of the task.

Please enter a number from 0 to 5.

[Beliefs]

Imagine you sent 3 coins, so **B** receives 9 coins, making his or her total budget 14 coins. How many coins do you think **B** will return to you?

You might gain one extra coin if your guess is correct.

PARTICIPANT B

You are in the role of **B**. You have 5 coins. Remember that **A** also has 5 coins.

[In Information treatment:

A has reported feeling lonely all or almost all of the time during the past four weeks. A knows nothing about you.]

Below, we show the number of coins you can receive from A, which we have already multiplied by 3 for you. For each of these, how many coins (if any) would you like to send back to A? All of your choices below affect how many points you and the other participant you are paired with may receive at the end of the task.

If **A** sent you 1 coin and hence you received 3 coins?

Please enter a number between 0 and 3.

If **A** sent you 2 coins and hence you received 6 coins?

Please enter a number between 0 and 6.

If **A** sent you 3 coins and hence you received 9 coins?

Please enter a number between 0 and 9.

If **A** sent you 4 coins and hence you received 12 coins?

Please enter a number between 0 and 12

If **A** sent you 5 coins and hence you received 15 coins?

Please enter a number between 0 and 15.

[Beliefs]

How many coins do you think A will send you? You might gain one extra coin if your guess is correct.

Final Debriefing of respondents

[not selected]

We thank you for answering our survey a couple of weeks ago. Sadly, you have not been selected to receive additional survey points based on the task you performed during the survey. However, your participation will provide invaluable insights for future research.

[selected for payout]

We thank you for answering the survey a couple of weeks ago.

We are happy to tell you that you have been selected to receive additional survey points based on the task you performed during the survey!

The number of total points you will receive is [_____].

We thank you for your time and support.

A.3. Survey questions

Sociodemographic questions:

What is your date of birth?

What is the highest level of school you have completed or the highest degree you have received?

Which of the following describes how you think of yourself? [male/female/in another way/prefer not to say]

What is your household's total income, after tax and compulsory deductions, per year/month/week from all sources - including benefits, savings, and so on?

Loneliness measures:

De Jong Gierveld scale

Please indicate, for each of the statements, the extent to which they apply to your situation and the way you feel now. [yes/ more or less / no]

- I experience a general sense of emptiness
- I miss having people around
- I often feel rejected
- There are plenty of people I can rely on when I have problems
- There are many people I can trust completely
- There are enough people that I feel close to

UCLA scale

Please indicate how often you feel each of the following: [Hardly ever or never / Some of the time / Often]

- Feel that you lack companionship
- Feel left out
- Feel isolated from others

Direct question on loneliness

How much of the time during the past 4 weeks have you been feeling lonely? [All of the time / Most of the time / Some of the time / A little of the time / None of the time / Don't know / Prefer not to say]

Questions on friends:

Actual frequency of meetings: On average, how often do you do each of the following with any of your friends? Do not include friends who live with you. [Never / Every two months or less frequently / Once a month / Every two weeks / Every week / More than once a week / Daily]

Number of close friends: How many of your friends would you say you have a close relationship with? Please also include friends who live with you.

Desired frequency of meetings: In your perspective, how often does an average person of your age need to meet close friends and family members face-to-face to not feel lonely? Note: Interacting with household members or colleagues during working time should not be considered as meeting with friends and family members.

Emotions:

Over the past week, how frequently have you felt the following way? [Always / Very frequently / Occasionally / Rarely / Very rarely / Never / Prefer not to say]

Happy / Angry / Nervous / Hopeless / Restless or fidgety / Depressed / Worthless

Risk:

Are you more of a risk-taking person, or do you try to avoid risks when it concerns each of the following areas? [1=avoid risk,..., 10=take risk]

Driving, riding a bike, etc. / Taking financial decisions / With your health

Social preferences:

How well do the following statements describe you as a person? [1=not at all,..., 10=perfectly]

- I'm willing to give to good causes without expecting anything in return
- I'm willing to volunteer my time to a charity or a non-profit organization
- I'm willing to give up something that is beneficial for me today in order to benefit more from that in the future

General trust question:

In general, how much do you trust most people? [1=not at all,..., 10=completely]

A.4. Sample recruitment

Hard quotas on age, gender, education, and geographic location were used to obtain a representative sample of the general population for adults aged 16+ in all 27 EU Member States. For every country, the population statistics have been obtained from Eurostat. Data for all countries is for 2021. The respective databases used are as follows:

- **Gender and age:** DEMO_PJAN²⁵
- **Education:** DEMO_PJANEDU²⁶
- **Geographical distribution by NUTS1, NUTS2 and NUTS3:** DEMO_R_PJANGRP3²⁷

A soft quota was also used on household income and was based on income deciles (e.g., the lowest 10%, the second lowest 10%, etc.) of the national income distribution. These deciles were calculated based on micro-data contained in the European Union Statistics on Income and Living Conditions (EU-SILC) 2019 and adjusted for the country-specific inflation rate between 2019 and 2022.

The first section of the survey contained screening and profiling questions gathering information to implement the quotas. Respondents were screened out if they were not eligible based on age (i.e., less than 16 years old) or if their quota had already been filled.

The survey company responsible for data collection used proprietary AI-based techniques and tools to verify participants were genuine and to prevent fraudulent and duplicate participation. It also applied a series of quality checks to the obtained data to ensure its quality. This included screening out speeders, flagging interviews with many non-response answers (“Don’t know, “Prefer not to answer”), and detecting the presence of straight-liners (i.e., respondents rushing through the survey by often providing the same answer).

A.5. Monetary rewards

The coins won by each payee needed to be converted to survey points, the ‘currency’ in which survey participants are paid by the panel provider. The conversion between coins and survey points differed per Member State. To ensure that the incentive payment is comparable across countries, the conversion was corrected for purchasing power parity.

²⁵ Available at: https://ec.europa.eu/eurostat/databrowser/view/demo_pjan/default/table?lang=enVARIABLE

²⁶ Available at:

https://ec.europa.eu/eurostat/databrowser/view/demo_pjanedu/default/table?lang=enVARIABLE . Answers’ list of national/local options was provided for education level. Then answers were re-classified based on International Standard Classification of Education (ISCED) .

²⁷ Available at: https://ec.europa.eu/eurostat/databrowser/view/demo_r_pjangrp3/default/table?lang=en

Table A.1. Survey points exchange rates by country to experimental coins

Member State	Survey points per coin	Maximum winnable survey points^[a]
Austria	12	252
Belgium	12	252
Bulgaria	5	105
Croatia	7	147
Cyprus	9	189
Czechia	9	189
Denmark	13	273
Estonia	8	168
Finland	13	273
France	11	231
Germany	11	231
Greece	11	231
Hungary	6	126
Ireland	14	294
Italy	10	210
Latvia	8	168
Lithuania	7	147
Luxembourg	15	315
Malta	9	189
The Netherlands	12	252
Poland	6	126
Portugal	9	189
Romania	5	105
Slovakia	8	168
Slovenia	9	189
Spain	10	210
Sweden	14	294

[a] This includes the additional coin that can be won by answering the question on the counterpart's action correctly.

In particular, the EU average value of one coin was set equal to €1, and the target value of a coin for each Member State was then adjusted for purchasing power parity²⁸. Using the value of a survey point in each Member State, this was then converted to the number of survey points per coin. The value of a survey point differs somewhat by country but is roughly equal to €0.10. Lastly, this number was rounded to the nearest integer. The number of survey points per coin and the maximum winnable survey points per Member State are shown in the Table.

²⁸ Purchasing power parity based on actual consumption for 2021, EU27_2020 = 1. Extracted from Eurostat. Database: prc_ppp_ind

Appendix B: Additional statistics

Table B.1. Socio-demographics by role in trust game.

		Observations (sample distribution) in role of A player	Observations (sample distribution) in role of B player
Gender			
Female		7,057 (51%)	6,866 (51%)
Male		6,754 (49%)	6,619 (49%)
	<i>Total</i>	<i>13,811 (100%)</i>	<i>13,485 (100%)</i>
Age			
16-25		1,859 (13%)	1,884 (14%)
26-35		2,593 (19%)	2,618 (19%)
36-45		2,976 (22%)	2,890 (21%)
46-55		3,011 (22%)	2,881 (21%)
56-65		1,892 (14%)	1,772 (13%)
65+		1,480 (11%)	1,440 (11%)
	<i>Total</i>	<i>13,811 (100%)</i>	<i>13,485 (100%)</i>
Education			
Less than primary, primary & lower secondary		761 (6%)	693 (5%)
Upper secondary & post-secondary		4,399 (32%)	4,321 (32%)
Tertiary education		8,651 (63%)	8,471 (63%)
	<i>Total</i>	<i>13,811 (100%)</i>	<i>13,485 (100%)</i>
Income decile			
not reporting income		1,412 (10%)	1,308 (10%)
Decile 1		864 (6%)	782 (6%)
Decile 2		862 (6%)	824 (6%)
Decile 3		997 (7%)	1,031 (8%)
Decile 4		1,224 (9%)	1,203 (9%)
Decile 5		1,363 (10%)	1,288 (10%)
Decile 6		1,504 (11%)	1,529 (11%)
Decile 7		1,491 (11%)	1,489 (11%)
Decile 8		1,501 (11%)	1,463 (11%)
Decile 9		1,363 (10%)	1,331 (10%)
Decile 10		1,230 (9%)	1,237 (9%)
	<i>Total</i>	<i>13,811 (100%)</i>	<i>13,485 (100%)</i>

Table B.2: “Unsatisfied” need in frequency of meeting friends – distribution of respondents by actual and desired frequency of meeting friends

(a) Lonely respondents

<i>Desired frequency</i>	<i>Actual frequency of face-to-face meetings with friends</i>							Total
	Never	Every two months or less	Once a month	Every two weeks	Every week	More than once a week	Daily	
Never	2.1%	1.0%	0.7%	0.4%	0.3%	0.2%	0.4%	5.1%
Every 2 months or less	1.0%	2.6%	1.5%	0.8%	0.6%	0.4%	0.4%	7.3%
Once a month	1.1%	2.9%	3.7%	1.8%	1.4%	0.7%	0.7%	12.3%
Every two weeks	1.0%	3.5%	3.4%	1.6%	1.8%	1.0%	0.8%	13.1%
Every week	2.1%	7.2%	4.8%	3.2%	4.0%	2.4%	1.5%	25.2%
More than once a week	2.3%	5.3%	3.7%	2.8%	3.8%	3.1%	2.1%	23.1%
Daily	1.7%	2.0%	1.6%	1.3%	2.1%	1.8%	3.4%	13.9%
Total	11.3%	24.5%	19.4%	11.9%	14.0%	9.6%	9.3%	100%
<i>Total of 'unsatisfied' (desired frequency > actual frequency)</i>	9.3%	21.0%	13.5%	7.3%	5.8%	1.7%		58.6%

(b) Non-lonely respondents

<i>Desired frequency</i>	<i>Actual frequency of face-to-face meetings with friends</i>							Total
	Never	Every two months or less	Once a month	Every two weeks	Every week	More than once a week	Daily	
Never	0.6%	0.5%	0.3%	0.2%	0.4%	0.3%	0.3%	2.6%
Every 2 months or less	0.5%	2.3%	1.0%	0.7%	0.8%	0.3%	0.3%	5.9%
Once a month	0.6%	3.4%	3.9%	2.2%	2.0%	1.0%	0.7%	13.8%
Every two weeks	0.5%	2.8%	4.2%	4.2%	3.3%	1.5%	0.8%	17.3%
Every week	0.7%	3.7%	5.2%	5.2%	9.8%	4.9%	2.0%	31.5%
More than once a week	0.4%	1.8%	2.2%	2.4%	4.9%	5.5%	2.6%	19.8%
Daily	0.3%	0.7%	0.9%	0.7%	1.9%	1.9%	2.7%	9.1%
Total	3.6%	15.2%	17.7%	15.6%	23.1%	15.4%	9.4%	100%
<i>Total of 'unsatisfied' (desired frequency > actual frequency)</i>	2.9%	12.5%	12.4%	8.3%	6.8%	1.9%		44.8%

Note: Colored cells correspond to the actual frequency being higher than the desired frequency. Uncolored cells refer to an 'unsatisfied' need in the frequency of meeting friends because the desired frequency exceeds the actual frequency.

Table B.3: Number of observations by country (1) and loneliness prevalence per country (2)

	(1)		(2)
	Number of observations (Sample distribution)		Percentage categorized as lonely (per country)
Austria	1,094	(4%)	10.5%
Belgium	1,115	(4%)	14.2%
Bulgaria	1,044	(4%)	13.7%
Croatia	1,035	(4%)	8.8%
Cyprus	539	(2%)	16.1%
Czechia	1,041	(4%)	10.7%
Denmark	1,093	(4%)	13.9%
Estonia	1,078	(4%)	14.3%
Finland	1,089	(4%)	10.7%
France	1,034	(4%)	13.3%
Germany	1,187	(4%)	12.1%
Greece	1,063	(4%)	16.0%
Hungary	1,055	(4%)	11.2%
Ireland	1,092	(4%)	20.7%
Italy	1,083	(4%)	12.7%
Latvia	1,070	(4%)	11.8%
Lithuania	1,058	(4%)	11.5%
Luxembourg	419	(2%)	18.1%
Malta	566	(2%)	15.0%
Netherlands	1,127	(4%)	10.5%
Poland	1,048	(4%)	12.7%
Portugal	1,043	(4%)	11.9%
Romania	1,042	(4%)	13.1%
Slovakia	1,032	(4%)	10.2%
Slovenia	1,081	(4%)	10.5%
Spain	1,078	(4%)	10.0%
Sweden	1,090	(4%)	13.7%

Table B.4: Relation between unmet social need and having no close friends and trust (a) and trustworthiness (b)

c) Relation between trust behavior by A players in trust game, and having no friends (top) and having an unmet social need (bottom)

	Trust behavior		
	(coins send) by A player		
	(1)	(2)	(3)
No friends (dummy)	-0.072 (0.076)	-0.062 (0.074)	-0.035 (0.077)
Expectation about counterpart's trustworthiness behavior		0.178*** (0.009)	0.181*** (0.010)
Socio-demographic controls	(YES)	(YES)	(YES)
Preferences controls			(YES)
Constant	2.863*** (0.152)	2.066*** (0.151)	1.886*** (0.176)
Observations	6,311	6,311	5,949
R-squared	0.021	0.079	0.084

	Trust behavior		
	(coins send) by A player		
	(1)	(2)	(3)
Unmet need (dummy)	0.023 (0.037)	0.030 (0.036)	0.033 (0.037)
Expectation about counterpart's trustworthiness behavior		0.177*** (0.009)	0.180*** (0.010)
Socio-demographic controls	(YES)	(YES)	(YES)
Preferences controls			(YES)
Constant	2.881*** (0.150)	2.104*** (0.149)	1.872*** (0.176)
Observations	6,587	6,587	6,192
R-squared	0.021	0.078	0.082

b) Relation between trustworthiness behavior by B players (average of the share of coins return across strategy set) in trust game and having no friends (top) and having an unmet social need (bottom)

	Trustworthiness behavior (average share returned) by B player		
	(1)	(2)	(3)
No friends (dummy)	-0.016 (0.011)	-0.013 (0.011)	-0.008 (0.011)
Expectation about counterpart's trust behavior		0.023*** (0.002)	0.023*** (0.002)
Socio-demographic controls	(YES)	(YES)	(YES)
Preferences controls			(YES)
Constant	0.635*** (0.020)	0.586*** (0.020)	0.569*** (0.023)
Observations	6,211	6,211	5,866
R-squared	0.022	0.052	0.057

	Trustworthiness behavior (average share returned) by B player		
	(1)	(2)	(3)
Unmet need (dummy)	-0.008 (0.005)	-0.008 (0.005)	-0.007 (0.005)
Expectation about counterpart's trust behavior		0.023*** (0.002)	0.023*** (0.002)
Socio-demographic controls	(YES)	(YES)	(YES)
Preferences controls			(YES)
Constant	0.631*** (0.019)	0.581*** (0.020)	0.566*** (0.023)
Observations	6,488	6,488	6,107
R-squared	0.023	0.053	0.059

Note: *** p<0.001, ** p<0.01, * p<0.05 Tables report regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed effects. Socio-economic preferences control variables used in regressions are risk-taking, donations, volunteering, patience, and self-reported trust.

Table B.5. Robustness check concerning the relation between loneliness and trust (a) and trustworthiness (b) for the sub-sample of participants that correctly answered at least one control question.

a) Relation between trust behavior by A players in trust game, and loneliness

	Trust behavior (coins send) by A player		
	(1)	(2)	(3)
Lonely (dummy)	0.083 (0.074)	0.087 (0.074)	0.066 (0.077)
Expectation about counterpart's trustworthiness behavior		0.201*** (0.012)	0.204*** (0.013)
Socio-demographic controls	(YES)	(YES)	(YES)
Preferences controls			(YES)
Constant	2.987*** (0.197)	2.087*** (0.194)	1.917*** (0.224)
Observations	3,682	3,682	3,474
R-squared	0.034	0.107	0.115

b) Relation between trustworthiness behavior by B players (average of the share of coins return across strategy set) in trust game and loneliness.

	Trustworthiness behavior (average share returned) by B player		
	(1)	(2)	(3)
Lonely (dummy)	-0.007 (0.011)	-0.005 (0.010)	-0.003 (0.011)
Expectation about counterpart's trust behavior		0.024*** (0.002)	0.023*** (0.002)
Socio-demographic controls	(YES)	(YES)	(YES)
Preferences controls			(YES)
Constant	0.659*** (0.025)	0.609*** (0.026)	0.582*** (0.030)
Observations	3,655	3,655	3,470
R-squared	0.032	0.063	0.068

Note: *** p<0.001, ** p<0.01, * p<0.05. Tables report regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed effects. Socio-economic preferences control variables used in regressions are risk-taking, donations, volunteering, patience, and self-reported trust.

Table B.6: Relation between trustworthiness behavior by B players for each received amount (in the strategy set) in the trust game and loneliness

	Trustworthiness behavior number of coins returned (B player)				
	If A sent you 1 coin and hence you received 3 coins?	If A sent you 2 coins and hence you received 6 coins?	If A sent you 3 coins and hence you received 9 coins?	If A sent you 4 coins and hence you received 12 coins?	If A sent you 5 coins and hence you received 15 coins?
	(1)	(2)	(3)	(4)	(5)
Lonely (dummy)	0.013 (0.029)	-0.038 (0.055)	-0.047 (0.087)	-0.128 (0.120)	-0.170 (0.154)
Expectation about counterpart's behavior	0.096*** (0.006)	0.139*** (0.013)	0.185*** (0.019)	0.236*** (0.026)	0.272*** (0.034)
Socio-demographic controls	(YES)	(YES)	(YES)	(YES)	(YES)
Constant	1.957*** (0.072)	3.411*** (0.146)	4.867*** (0.224)	6.632*** (0.305)	8.352*** (0.406)
Observations	6,738	6,738	6,738	6,738	6,738
R-squared	0.047	0.036	0.033	0.034	0.032

Note: *** p<0.001, ** p<0.01, * p<0.05. Tables report regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed effects.

Table B.7. Information treatment effect on trusting behavior and trustworthiness per individual strategy question for the whole sample (a) and sub-sample of participants correctly answering at least one control question (b)

(a) Whole sample

	Trust behavior (A player)		Trustworthiness behavior number of coins returned (B player)			
		If A sent you 1 coin and hence you received 3 coins?	If A sent you 2 coins and hence you received 6 coins?	If A sent you 3 coins and hence you received 9 coins?	If A sent you 4 coins and hence you received 12 coins?	If A sent you 5 coins and hence you received 15 coins?
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment: informed that counterpart is lonely	0.185*** (0.024)	0.094*** (0.013)	0.166*** (0.026)	0.243*** (0.040)	0.348*** (0.055)	0.430*** (0.070)
Lonely (dummy)	0.131*** (0.039)	0.002 (0.020)	-0.030 (0.039)	-0.062 (0.061)	-0.116 (0.085)	-0.120 (0.108)
Expectation about counterpart's behavior	0.172*** (0.006)	0.097*** (0.005)	0.140*** (0.009)	0.172*** (0.014)	0.220*** (0.019)	0.273*** (0.024)
Socio-demographic controls	(YES)	(YES)	(YES)	(YES)	(YES)	(YES)
Constant	1.870*** (0.101)	1.882*** (0.052)	3.275*** (0.103)	4.772*** (0.157)	6.319*** (0.218)	7.917*** (0.278)
Observations	13,811	13,485	13,485	13,485	13,485	13,485
R-squared	0.078	0.048	0.039	0.031	0.032	0.032

Note: *** p<0.001, ** p<0.01, * p<0.05. Tables report regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed effects.

(b) Constraint to the sample of participants who correctly answered at least one of the two control questions

	Trust behavior (A player)		Trustworthiness behavior number of coins returned (B player)			
		If A sent you 1 coin and hence you received 3 coins?	If A sent you 2 coins and hence you received 6 coins?	If A sent you 3 coins and hence you received 9 coins?	If A sent you 4 coins and hence you received 12 coins?	If A sent you 5 coins and hence you received 15 coins?
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment: informing that counterpart is lonely	0.200*** (0.032)	0.136*** (0.017)	0.257*** (0.034)	0.401*** (0.051)	0.482*** (0.070)	0.680*** (0.088)
Lonely	0.117** (0.051)	0.017 (0.027)	0.012 (0.053)	-0.001 (0.079)	-0.120 (0.110)	-0.083 (0.136)
Expectation about Counterpart's behavior	0.190*** (0.009)	0.087*** (0.006)	0.134*** (0.012)	0.175*** (0.019)	0.229*** (0.025)	0.286*** (0.031)
Socio-demographic controls	(YES)	(YES)	(YES)	(YES)	(YES)	(YES)
Constant	1.869*** (0.137)	1.898*** (0.070)	3.406*** (0.133)	5.123*** (0.208)	6.833*** (0.284)	8.747*** (0.354)
Observations	7,381	7,267	7,267	7,267	7,267	7,267
R-squared	0.097	0.046	0.047	0.040	0.040	0.040

Note: *** p<0.001, ** p<0.01, * p<0.05. Tables report regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed effects.

Table B.8. Treatment impact on expectations about behavior by counterpart, for sub-sample of participants who correctly answered at least one of the two control questions

	Expectations by A players about counterparts (B players) Trustworthiness behavior	Expectations by B players about counterparts (A players) Trusting behavior
	(1)	(2)
Treatment: informing that counterpart is lonely	-0.070 (0.046)	0.083* (0.035)
Lonely	-0.024 (0.072)	-0.056 (0.054)
Socio-demographic controls	(YES)	(YES)
Constant	4.435*** (0.186)	2.116*** (0.139)
Observations	7,381	7,267
R-squared	0.016	0.011

Note: *** p<0.001, ** p<0.01, * p<0.05 Tables report regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed effects.

Table B.9: Impact of knowledge about loneliness status of counterpart (Information treatment) on normalized trust (a) and normalized trustworthiness behavior (b). Variables concerning trust and trustworthiness behavior were normalized by rescaling to have a mean of 0 and a standard deviation of 1 (i.e., subtracting the sample mean and then dividing by the standard deviation).

(a) Relation between Information treatment, normalized trust behavior by A players in the trust game, and loneliness

	normalized Trust behavior by A player		
	(1)	(2)	(3)
Treatment: informed that counterpart is lonely	0.118*** (0.017)	0.124*** (0.016)	0.126*** (0.017)
Lonely (dummy)	0.087*** (0.026)	0.088*** (0.026)	0.084** (0.027)
Expectation about counterpart's trustworthiness behavior		0.116*** (0.004)	0.116*** (0.004)
Socio-demographic controls	(YES)	(YES)	(YES)
Preferences controls			(YES)
Constant	0.023 (0.069)	-0.491*** (0.068)	-0.649*** (0.079)
Observations	13,811	13,811	12,817
R-squared	0.022	0.078	0.082

(b) Relation between normalized trustworthiness behavior by B players (average of the share of coins return across strategy set) in trust game and loneliness.

	normalized Trustworthiness behavior (average share returned) by B player		
	(1)	(2)	(3)
Treatment: informed that counterpart is lonely	0.145*** (0.017)	0.140*** (0.017)	0.142*** (0.017)
Lonely (dummy)	-0.027 (0.026)	-0.028 (0.026)	-0.024 (0.027)
Expectation about counterpart's trust behavior		0.108*** (0.006)	0.106*** (0.006)
Socio-demographic controls	(YES)	(YES)	(YES)
Preferences controls			(YES)
Constant	-0.094 (0.065)	-0.327*** (0.066)	-0.445*** (0.077)
Observations	13,485	13,485	12,534
R-squared	0.026	0.053	0.060

Note: *** p<0.001, ** p<0.01, * p<0.05. Tables report regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed effects. Socio-economic preferences control variables used in regressions are risk-taking, donations, volunteering, patience, and self-reported trust.

Table B.10. Relation between self-reported generalized trust and loneliness, unsatisfied social need, and having no friends

	Self-reported generalized trust		
	(1)	(2)	(3)
Lonely (dummy)	-0.769*** (0.046)		
Unmet need in meeting friends		-0.490*** (0.027)	
No friends			-1.435*** (0.057)
Controls	(YES)	(YES)	(YES)
Observations	26,171	25,372	24,283
R-squared	0.076	0.075	0.093

Note: *** p<0.001, ** p<0.01, * p<0.05. Tables report regression coefficients with robust standard errors in parenthesis. Socio-demographic control variables used in regressions are age, education, gender, income deciles, and country fixed effects. Self-reported generalized trust was measured on a Likert scale from 1 ('not at all') to 10 ('completely'). 'Unmet need in meeting friends' (dummy) is one when the difference between the desired frequency of meeting with friends (1 Never, 2 Every two months or less frequently, 3 Once a month, 4 Every two weeks, 5 Every week, 6 More than once a week, 7 Daily) exceeds the actual frequency reported by the individual. 'No friends' (dummy) is one when participants reported to have no close friends.

Appendix C: Emotions

There may exist certain indirect channels that could affect the behavior of and towards lonely individuals. As one of these channels, behavior might be affected by the consequences of loneliness on mental health. Although it has been shown that lonely individuals have as developed social skills as others, negative feelings and emotions induced through loneliness might affect behavior (Rotenberg, 1994; Lucas et al., 2010; Jones et al., 1983). This conjecture is based on a broad strand of literature showing the effect of emotions on behavior (Ibanez et al., 2017; Marini, 2022).

Against this backdrop, we assume that the lack of trust of lonely individuals is caused by negative emotions induced by the state of loneliness, we expect that the varying amounts sent by Trustors who are lonely are mediated by the emotions of happiness and sadness. We formalize these conjectures in the following set of hypotheses:

The effect in hypothesis 1.1 is linked to lower levels of reported happiness ($H_{emotions\ 1}$) and higher levels of reported sadness ($H_{emotions\ 2}$) among lonely individuals. }

To assess this, we exploit questions about the occurrence of feelings of happiness and depression within the last two weeks before filling in the survey. Both variables are captured by indicator values being equal to one if a participant reported to have felt happy/depressed always or very frequently over the past week and zero if having felt happy/depressed occasionally, very rarely, or never. Using a general structural estimation approach, we conduct a mediator analysis following the approach by Baron & Kenny (1986) to analyze how the trusting behavior of lonely individuals is driven by these emotions.

In the case of the emotion of happiness, we observe a significant correlation between lonely individuals and happiness since lonely individuals report to have experienced a lower degree of happiness ($p=0.0087$, Table 1 (b)). Moreover, happiness directly influences the trust choices in the experiment since participants who report feeling at least happy most of the time during the last two weeks send 0.06 more than other participants ($p=0.023$, Table C.1.). Based on this, our general structural model calculates the mediating effect of happiness within the relationship between lonely individuals and the trusting behavior. Figure C.1. shows the respective effects. While the total effect is equal to the observed effect of trusting behavior of lonely individuals, we observe the indirect effect to be negative. This implies that due to the lack of happiness, lonely participants trust less. Put differently, the respective indirect effect of 0.016 ($p=0.024$, the linear combination of coefficients of Table C.1.) means that 13% of the effect of loneliness on trusting behavior is mediated by happiness. Therefore, in the absence of this happiness gap, we observed even higher trusting behavior of lonely individuals, amounting to 0.142 coins ($p<0.0001$, linear combination of coefficients of Table C.1.) more send than the general population.

A similar exercise cannot be done for the emotion of depression since being depressed does not render the amounts sent to the Trustee ($b=0.017$, $p=0.667$). Therefore, we can rule out being depressed as a possible mediator of lonely individuals' choice to trust their counterparts.

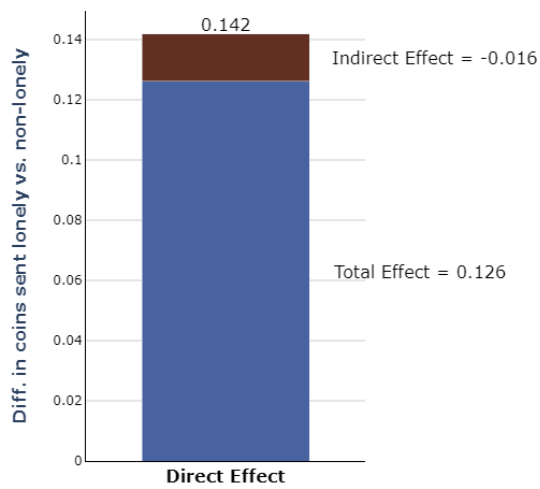


Figure C.1. Composition of the direct effect considering “happiness” as a mediator

Table C.1. Effect of happiness on trusting behavior and effect of loneliness on happiness

	(1) Trusting behavior (coins sent) by A player	(2) Happiness (dummy)
Happiness (dummy)	0.061* (0.027)	
Lonely (dummy)	0.142*** (0.039)	-0.261*** (0.009)
Constant	3.672*** (0.097)	3.40*** (0.022)
Observations	27,296	27,296

Note: Results from a general structural model approach using the indicator for loneliness as the main explanatory variable, happiness as the mediating variable, and coins sent in the trust game by the trustor as the dependent variable. Control variables comprise indicators for the EU27 countries, age of participants, income, risk behavior, education, time preferences, altruistic attitudes, volunteering behavior, and gender. Standard errors in parenthesis. *** p<0.001, ** p<0.01, * p<0.05