



Erasmus School of Economics

# Improving Emotional Literacy: Effects of an Emotional Granularity Intervention on Altruistic Behavior

Master's Thesis Behavioral Economics

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## **Abstract**

Emotions play a key role in all aspects of human behavior and particularly impact economic decision-making. Better knowledge and regulation of emotions can be an important lever to influence prosocial behavior. In this experimental research, the impact of a learning-based Emotional Granularity (EG) intervention on altruism was assessed: treatment population was instructed to learn about emotions using the Emotion Typology website, while non-treated population was subjected to an active control through a similar website about the periodic table of the elements. Statistically significant results are found for the intervention incentivizing altruism measured through dictator game donations, contributing to make the case EG interventions can be leveraged to encourage socially and personally healthy behavior. Caution is recommended when interpreting these results due to low power of the sample (N=52) making it difficult to assess the reliability and size of the effects found. Further research to contribute evidence of the effects of EG in economic behavior is advised.

**Key terms:** Emotional differentiation, altruistic behavior, emotion regulation, social preferences, dictator game

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# Introduction

*How do I feel right now, emotionally?* If required to answer this question, the reader might need a few seconds (or even minutes) of introspection to reply appropriately. Chances are many different words pop into their mind, labels for emotions of varying valence and intensity. Maybe they have an ill-defined feeling they can't quite put into words, or maybe the proper descriptive term stands out on their mind as clearly as a full moon in a starless sky. The ability to accurately label emotional experiences is more than an exercise on verbal intelligence (Barrett, 2004), it can be an indication of an individual's attunement to themselves and can exert influence in many aspects of their life, not least of them economic decision-making.

Emotional granularity (EG for short) refers to the level of specificity with which a person can conceptualize and verbalize their emotions. High-granularity individuals can describe their emotions with considerable levels of precision, while low-granularity individuals describe them using less specific, more global terms (Barrett, 2004). After scoring the winning goal in the last minute of a football match, a player with high EG might say they're feeling ecstatic and proud with a hint of relief, whereas one with low EG would simply say they're feeling happy about the win.

Emotional granularity has grown in popularity in recent years as behavioral economists have realized its significance. As research on EG grows, studying its implications on economic behavior becomes more relevant. Emotions have long been known to be a key driver for human behavior: the heavy influence psychological underpinnings exert on *Homo economicus* is the very reason Behavioral Economics emerged as a field in 1980s. Since EG is a trainable trait (Kashdan et al, 2015) there is potential to influence microeconomic variables through EG interventions. The main goal of this paper is to understand the potential influence EG has on altruistic behavior.

In economics, altruism is identified when an agent engages in behavior which directly produces economic benefits for a third party but none for themselves. Neoclassical models of economics assume, through the concept of rationality, that people are maximizing agents of their own utility only. However, there is abundant empirical evidence pointing to the contrary: agents choose to engage in altruistic behavior consistently, even in absence of incentives (Charness & Rabin, 2002). People pick up trash from the streets, help strangers with directions, and donate anonymously to charity even when those activities come at a personal cost to them in the form of time or money they won't get back. Charitable donations in 2022 amounted to more than eur 499 bn in the United States alone (National Philanthropic Trust, 2023), showcasing the high value society gives to altruistic behavior and further gives reason to study it.

### Bridge between worlds: EG and altruism

There is evidence of EG improving empathy and reducing aggression (Salguero et al, 2013), academic success (Oberle et al, 2014), improved coping mechanisms in the face of distress (Kashdan et al, 2015). However, there is not a lot of research evaluating the impact of EG on economic behavior. EG can be an important driver of decision making through its influence on people's immediate emotions- those experienced by the individual at the time of decision-making (Rick & Loewenstein, 2008). Immediate emotions can alter the decision frame of an agent when engaging in economic behavior. Decision frames are comprised by the decision-maker's conception of the acts, outcomes, and contingencies associated with a particular choice (Tversky, Kahneman, 1981), and are influenced by immediate emotions as emotion dispositions determine appraisal tendencies, which in turn influence individuals' perception of judgment and choices (Loewenstein & Lerner 2003).

The present document aims to answer this question through an experiment evaluating the effect of an EG intervention on individuals' prosocial behavior. Some empirical evidence is provided through the results of experimental research, which despite some limitations should encourage the further study of this

influence. This document is structured in the following sections: literature review, methodology, analysis and discussion of results, and conclusion.

## **Literature review**

EG is an aspect of emotional intelligence – the ability to understand and manage emotions (Mayer & Salovey, 1997), and as such permeates into all aspects of human behavior, particularly those where emotional states play an important role. According to Barrett (2004), emotions serve an adaptive function in humans as signals to inform about current needs. Particularly, emotions play a role as catalysts of action, driving individuals to engage directly with their environments to achieve a specific goal (Tamir, 2009). Fear is a great example of this, often triggering the ‘fight or flight’ response which, in certain contexts (such as walking alone in a dark alley and getting scared when hearing an unfamiliar noise nearby) will prove to be an adaptive advantage since it makes people more capable of dealing with the situation at hand appropriately.

### **EG and emotional regulation**

Precise labeling of emotions can itself be conducive to better strategies for processing them. Saying one feels ‘off’ does not inspire any action. On the other hand, saying one feels ‘lonely’, ‘guilty’, or ‘bored’, immediately puts actionable associations in the mind almost involuntarily. If a person is lonely they must seek company, if they feel guilty they must try to make amends, if they are bored they must seek engagement. Other than the implicit call for action, informing individuals’ emotional experiences utilizing exact terms to qualify their states makes such states less prominent: labeled emotions are easier to regulate and therefore represent a smaller threat to people’s personal strivings (Kashdan et al, 2015).

The positive effects of EG have been explored in multiple ways. One of the most comprehensive efforts was that of Castillo et al (2013) who conducted a two-year intervention on 590 Spanish public-school adolescents. Half of the schools were randomly assigned to the treatment, consisting of twelve 1-hour sessions every six months in which practical activities were conducted in order to increase their emotion differentiation (e.g. working in groups to identify the emotions shown in specific pictures). Results of the

intervention were substantial: the treatment group showed statistically significant lower levels of physical and verbal aggression, hostility, and anger compared to the control group. Authors also assert that the intervention had positive effects on empathy for the treatment group. However, emotion differentiation was not measured, therefore putting into question the treatment effect mechanism: there is no objective way to tell if the differences between control and treatment groups occurred because of a positive influence on EG or other non-observed factors. Given its high costs of implementation (such as teachers being trained 22 hours by psychologists on how to impart the activities) there is not a significant sample size to compare this to other extensive implementations, but this research makes a promising case for interventions of this kind.

### **Emotions and economic decision-making**

Emotional states have a heavy influence on people's behavior. As observed since the creation of Behavioral Economics, human beings often do not act rationally and deviate from the behavior predicted by traditional economic frameworks. Both expected and incidental emotions play an important role in shaping agents' valuations of their possible choices and can therefore directly influence decision outcomes (Loewenstein & Lerner, 2003). Incidental emotions (i.e., those experienced at the moment of decision-making) are of particular interest, since they don't need to be necessarily related to the choice at hand. Anticipation of rejection might instill fear in a person thinking of asking someone out on a date, but if they feel *determined* and *inspired* in that particular moment they might just do it anyways. This is an example of two instances of incidental (or immediate) emotions influencing decision-making in opposite ways: expected emotions (an individual's current emotional response to the expected outcome) serve as deterrent for an action, but incidental emotions proved to have a stronger influence on the decision.



Though technically irrelevant for the decision at hand, incidental emotions have tremendous influence on economic behavior. In the context of intertemporal choice, for instance, individuals experiencing gratitude have been shown to behave more patiently while those experiencing sad emotions behaved more impulsively (Lempert et al, 2016). Incidental emotions also affect social preferences, as shown by Andrade & Ariely (2006), who tested the influence of induced happiness or anger on the behavior of an ultimatum game. They found happy respondents to be more likely to reject unfair offers on the first round of the game as responders, but also more likely to propose unfair offers themselves as proposers. However, the role of emotions in economic behavior must be investigated further, as there isn't currently a comprehensive framework able to reliably predict economic choice in the presence of emotions. Empirical evidence of directionality of effects is ambiguous, giving credence to the hypothesis that emotions have a differential modulatory effect on behavior which depends on contextual factors.

### **Altruism**

In a popular recent study, Iwamoto et al (2020) evaluated the effect of mindfulness in altruistic behavior. Consistent with the economic definition of altruism used in the current paper, authors employed a modified version of the dictator game, using donations to charity as an objective metric to gauge altruistic behavior. Findings show statistically significant evidence of positive effects of the mindfulness intervention on altruism: on average, treated population donated close to 11% of their allocation, compared to only 6% for the control group. This proportion is lower than that found by Engel (2011) who conducted a meta-study of over 400 instances of the dictator game which resulted on an average 28.35% of initial allocation shared with the other player. One limitation for Iwamoto et al, however, is the authors don't directly describe the underlying mechanism of mindfulness in altruism; they only mention the overall benefits of mindfulness practice in better emotional and pain regulation, higher empathy, and reduced stress.

This paper aims to help address this apparent gap in the literature. As mentioned before, EG implicitly provides actionable information to individuals about their emotional states and effectively improves emotional regulation. Since EG is fundamentally informative and has been shown to be trainable, positively influencing people's lives, the key question of this paper is whether it can also increase prosociality:

**RQ:** *To what extent does a learning-based EG intervention influence altruistic behavior?*

Enhancing emotional regulation enables the individual to pursue their personal strivings without the hinderance of any mental effects caused by their emotional states (Kashdan, 2015). Individuals displaying higher EG are less likely to retaliate aggressively when hurt (Pond et al, 2012), less prone to binge-drinking (Kashdan et al, 2010), and even show better handling of anxiety when exposed to fear-inducing stimuli (Kircanski, Liebman, & Craske, 2012). Being more attuned to one's own emotions and emotions of others potentially fosters greater empathy and compassion, attributes that are associated with acts of service. Given that altruism is widely regarded in modern society as ethically good, desirable behavior, individuals who enjoy the higher emotional regulation capabilities as consequence of increased EG will presumably be more altruistic:

**H1:** *A learning-based EG intervention will increase altruistic behavior as measured by difference in average donations (amount of total allocation shared to the other) between treatment and control groups in the dictator game.*

## Data & Methods

In order to answer the research question (extent of EG influence in altruism) data was collected through a survey experiment. Random assignment between treatment and control groups eliminates any potential selection bias and confounds, as it is expected for all individual characteristics correlated to the target variable to cancel each other on average.

For the current experiment half of respondents were assigned to the treatment group and given information to help them increase their EG (see full description of treatment intervention and control below), and the other half were assigned to the control group and shown information not relevant to EG. Subsequently, all respondents were evaluated on altruistic behavior through a dictator game, a widely used and accessible technique to elicit and test social preferences (Fehr & Schmidt, 2006). Finally, a manipulation check was conducted to assess the effectiveness of the treatment in influencing EG. Ethical checks were conducted before deployment of the survey, and data was handled anonymously throughout the analysis.

### Sample

Sample size requirements to minimize type 2 error were determined through a power analysis using *G\*Power* software. Recommended sample size to detect a moderate effect in this experiment ( $\delta = 0.5$ ) at the standard  $\alpha = 0.05$  significance level was 102 total participants: 51 per group, which is consistent with samples used in previous literature (Faul et al., 2007).

Since the EG training was in English, the sample was limited to native speakers, recruited online through social networks e.g. Instagram and WhatsApp. Respondents were not informed about financial incentives beforehand as this would have biased the outcomes of the dictator game. A total of 101 respondents started the survey, but only 61 finished it. Attrition appears non-random as most unfinished responses

came from the control group, not the treatment (potential implications of this issue are discussed in the limitations section). Invalid entries (N=9) were also filtered out for respondents who did not respond to the dictator game question (target variable) or finished the survey within 5 minutes, leading to a final sample of 52 respondents.

Demographic characteristics (independent variables) were collected at the beginning of the survey to serve as controls and ensure the success of the random assignment of treatment and control groups. As seen from the table below, there seem to be no balance issues in the experiment as groups show no significant differences in demographic characteristics -age, gender, income, or educational attainment- between treatment and control populations.

**Table 1. Sample description**

Distribution of Participants			
Variables	Categories	Treatment Group	Control Group
All, N(%)	N/A	27 (52%)	25 (48%)
Gender, N(%)	Female	10 (40%)	10 (37%)
	Male	13 (52%)	17 (63%)
	Other	2 (8%)	0
Age, Mean (SD)	N/A	43 (18.3)	38 (17.8)
Nationality, N(%)	United States	16 (64%)	12 (44%)
	United Kingdom	3 (12%)	5 (19%)
	Other	6 (24%)	10 (37%)
Educational Level, N(%)	Masters Degree	8 (33%)	13 (48%)
	Bachelors Degree	15 (63%)	8 (30%)
	High School Degree	0	5 (19%)
	Other	2 (8%)	1 (4%)
Income Level, N(%)	More than €70.000	7 (28%)	10 (37%)
	€40.001 - €70.000	9 (36%)	3 (11%)
	€20.001 - €40.000	0	4 (15%)
	less than €20.000	6 (24%)	6 (22%)
	Prefer not to say	2 (8%)	4 (15%)

## Experimental design

After demographic data was collected, respondents were asked to fill out one of two possible surveys - depending on their randomly assigned group- to undergo their training. After the training was completed, all respondents were evaluated on the dictator game and subjected to a manipulation test. Each of these steps is outlined below:

### ***Treatment intervention***

The treatment consisted of helping respondents differentiate and understand emotions better by using the open-access tool *Emotion Typology* (<https://emotiontypology.com/>) from Delft University of Technology. The site showcases 60 emotions (24 positive and 36 negative), provides formal definitions of each of them, explanations of causes and responses, three clips from popular movies expressing that emotion, as well as typical verbal expressions for them.

negative emotions			positive emotions	
ANGER	INDIGNATION	RESENTMENT	AMUSEMENT	SCHADENFREUDE
ANNOYANCE	DISSATISFACTION	FRUSTRATION	SENSORY PLEASURE	SERENITY
CONTEMPT	HATE	DISGUST	RELIEF	SATISFACTION
BOREDOM	RELUCTANCE	SADNESS	EUPHORIA	HAPPY-FOR
DISAPPOINTMENT	PITY	LONELINESS	LUST	AFFECTION
REJECTION	HUMILIATION	LONGING	TENDERNESS	ELEVATION
ENVY	JEALOUSY	GUILT	GRATITUDE	WORSHIP
REGRET	SHAME	EMBARRASSMENT	ADMIRATION	MOVED
FEAR	STARTLE	WORRY	PRIDE	DETERMINATION
ANXIETY	DISTRUST	DOUBT	FASCINATION	POSITIVE SURPRISE
NERVOUSNESS	INSECURITY	DISTRESS	INSPIRATION	AWE
DESPERATION	CONFUSION	SHOCK	EXCITEMENT	HOPE

**Figure 1. List of emotions in *Emotion Typology***

It is key to note that the website does not show any prescriptive information on how any of these emotions *should* be handled, it uses neutral language when describing them, and is generally void of tone or value judgment. The site simply provides understandable, complete definitions for each emotion, highlights the differences between each emotion and similar ones when applicable (e.g. guilt vs regret), and lists relatable examples of each emotion so the user acquires a better understanding of them. This

makes this website ideal to use for an EG intervention as it enriches knowledge of emotions without influencing related aspects such as emotion regulation techniques.

### **Active control**

An active control was designed for the non-treated population, which were assigned a task very similar in look, feel, and time investment to the treatment intervention, but which had no influence on EG. Otherwise, the potential treatment effect can't be attributed to the intervention itself, as between-group differences in results arise only because one of the groups had more tasks to perform than the other.

The Interactive Periodic Table website ([www.chemistrytalk.org/interactive-periodic-table/](http://www.chemistrytalk.org/interactive-periodic-table/)) created by ChemTalk was chosen for the active treatment given it's design similarity to the Emotion Typology website, as well as the presence of both short and long descriptions for each element:

1 H Hydrogen																	2 He Helium				
3 Li Lithium	4 Be Beryllium															5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon
11 Na Sodium	12 Mg Magnesium	38 Sr Strontium 87.62												13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon		
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton				
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon				
55 Cs Cesium	56 Ba Barium	57 La Lanthanum	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon				
87 Fr Francium	88 Ra Radium	89-103 Ac Actinides	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Nh Nihonium	114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Oganesson				

**Figure 2. List of elements in *the Interactive Periodic Table***

### **Survey instructions**

Training instructions were kept as similar as possible between both groups, and tasked the respondents to follow the five steps below (full survey can be found in the Appendix A1):

1. Glance over the website and pick a specific color. For the treatment group the color should reflect their current emotional state, whereas for the control group the choice of color was free.

2. Read the short descriptions for at least five words (e.g. emotions or elements) within their chosen color
3. Choose a single one (for the treatment group the chosen emotion should be the one which reflects their emotional state the best, whereas the choice was free for the control group) and perform a deep-dive by clicking on 'learn more'. This opened a new window for each group containing more information about their chosen term.

### ***Dictator game***

Once they completed the training, the target variable (altruistic behavior) was measured quantitatively as the total euro amount individuals decided to give away on a dictator game. To incentivize realistic behavior, respondents were also told a lottery would be held for a percentage of them to have their allocation of the prize distributed after the experiment. Based Iwamoto et al (2020), the actual question asked to the respondents was the following:

*Thank you for participating! A percentage of respondents will be chosen (at random) to receive €10 as payment for completing this survey.*

*If you are picked as one of the winners of this lottery, you will be paired with another survey respondent who was not selected. You can choose to split your payment with this person. Please enter an amount between €0 and €10 in whole numbers to give to them.*

### **Manipulation check: measuring EG fluctuation**

Reliability of results showing EG's influence on altruistic behavior relies on the effectiveness of the treatment: is the intervention truly increasing emotional differentiation for the treatment population? To answer this question, it is necessary to conduct a manipulation check to assess the impact of the proposed intervention on respondents' EG.

People with higher granularity will utilize a wider arrangement of labels to describe their own emotional experience (Barret, 2004). For this reason, fluctuations in emotional granularity are typically assessed by asking respondents to rate their current feelings and measuring the covariation between like-valenced emotions across measurements (Erbas et al, 2021). When exposed to different situations eliciting the full spectrum of positive emotions, someone with no emotion differentiation would describe their emotional state using the same label in each scenario, whereas a highly differentiating individual would make distinctions based on the nuances of his emotional experience. Experiential sampling (asking subjects to describe their emotional states several times on their day to day and drawing patterns on the emotional labels they use) is the most common way to assess emotion differentiation. However, for laboratory settings scenario rating tasks have proven to be a robust, low-cost alternative to measure EG. Prioritizing pragmatism, SRT was the chosen methodology to evaluate treatment effects on EG.

### ***Scenario Rating Task***

In the current experiment, individuals were asked to rate their emotional reactions to hypothetical scenarios. After the dictator game experiment, all respondents were presented with 8 situations depicting positive hypothetical life events. Task instructions (reworded for simplicity), as well as vignettes for positive emotions were adapted from the *Differentiation of Positive Emotions Scale (DOPE)*, as presented by Kirby et al in the *Handbook of Positive Emotions (2016)* (see Appendix A2 for details on exact changes made to the original survey). Participants were shown the SRT survey with a randomized order for vignettes. After reading each scenario, they were asked to rate how intensely they would feel each of the following emotions: affection, awe, determination, excitement, gratitude, hope, pride, and serenity. Respondents provided ratings in a 7-point Likert scale ranging from 0 (not at all) to 6 (extremely strongly) as is standard on SRTs (Schimmak & Diener; 1997, Erbas et al, 2014).



### ***Intra-class correlation (ICC)***

The aim is to understand the consistency of emotional ratings across scenarios for each respondent. Based on previous research (Barrett, 1998; Kashdan et al., 2010; Pond et al., 2012; Tugade et al., 2004), a positive differentiation index was calculated as the average intra-class correlation with absolute agreement for each participant. This statistic describes, for each subject, the percentage of total score variability that is due to differences *between* scenario scores as opposed to differences *within* them. An ICC coefficient of 1 would mean all variability comes from score differences across scenarios, while an ICC coefficient closer to 0 would mean the variability is caused by score differences within scenarios, which means the variability is caused by the differential use of emotional labels. For this reason, a higher ICC is associated with lower levels of EG and vice versa.

### ***RQ evaluation***

To answer the research question, statistical tests were conducted to check for systematic differences between donations of the treatment population in comparison to the control population. Initially, parametric tests such as a one-tailed two sample t-test for difference in means were chosen to evaluate the response variable (average donations per group), but given the conditions of the sample (see Results for further elaboration) a non-parametric test was chosen in the form of a one-tailed Wilcoxon rank sum test.

## Results

### Descriptive statistics

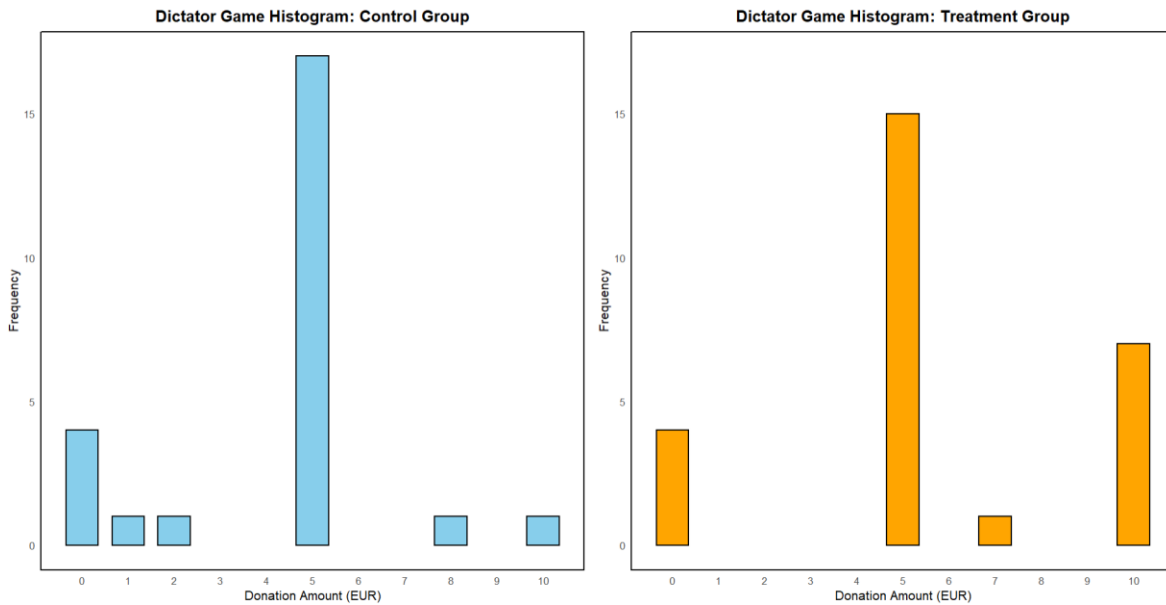
As noted in the methodology section, no significant differences were observed between treatment and control populations, and after removal of non-valid entries the sample was comprised of 52 total responses. Average donation amount for the control group was 4.24 eur, while for the treatment group it was 5.63, resulting in an observed difference of 1.39 eur in favor of the treatment group for the overall sample. Descriptive statistics of dictator game results are summarized in the table below:

**Table 2. Dictator Game Donations (EUR)**

<b>Group</b>	<b>Mean</b>	<b>Std. dev.</b>	<b>Min</b>	<b>Max</b>
Control	4.24	2.45	0.00	10.00
Treatment	5.63	3.21	0.00	10.00

Average donation amounts per group provide a useful indicator to describe respondent's aggregated behavior, but to obtain the full picture it is necessary to look at the distribution leading to this amount. Frequency of donation amounts for treatment and control group are showcased in the histograms below:

**Figure 3. Target variable histograms**



Several characteristics from the dictator game stand out on the histograms. First, the distributions appear to be similar visually except for the highest donations. In both groups the vast majority of respondents decided on an even split of 5 euro per person, and both groups have the same number of respondents (N=4) who decided to keep the full amount for themselves.

The difference between distributions is apparent in the 10 euro donation instances: 7 respondents (over 25% of total) from the treatment population decided to give away the full amount to the other person, while only one respondent (4% of total) from the control population chose to do so. It is clear that any potential differences in distributions between groups in this sample are driven by these instances.

### Test for statistical significance

As seen from the histograms, data do not appear to be normally distributed. This is confirmed by the Shapiro-Wilk test (H0 of normally distributed data is rejected for both groups,  $p < 0.01$ , see tables in Appendix), which in conjunction with the moderate sample size ( $N < 30$  for each group) results in non-suitability of parametric tests.

Wilcoxon rank sum test (also called Mann-Whitney U) was chosen as the non-parametric alternative to a two-sample t-test of difference in means. Wilcoxon rank sum does not require the normality assumption and is robust to outliers, and given that observations are independent it is a suitable alternative to the t-test. Since the intervention on EG is expected to positively affect altruistic behavior, a one-tail test is run testing the following hypotheses:

- Null hypothesis (H0): *there is no difference in donation amounts between treatment and control group populations.*
- Alternative hypothesis (H1): *treatment population donation amounts are systematically higher than control population donation amounts.*

Results of the test are summarized in the following table:

**Table 4. Wilcoxon rank-sum test for the dictator game**

Variable	Value
Test statistic (W)	420
P-value	0.0423
Sample (N)	52

As can be seen from the p-value, the null hypothesis is rejected at the 5% significance level, which means there is statistically significant evidence that treatment group donation amounts are systematically higher than control group donation amounts. In other words, there is statistically significant evidence that the implemented EG treatment increases prosocial behavior. This result was found despite the high prevalence of tied observations in the data, which can make it challenging to distinguish differences between groups due to loss of information.

## Effect size

To quantify the effect size, a multiple linear regression is employed using the dichotomous variable *treatment* (which takes value of 1 if the respondent belonged to the treatment group, 0 if they belonged to the control group) and the controls (demographic variables) as predictors of dictator game donation amounts. Seven observations were removed due to insufficient demographical data, leading to the following results in the linear model:

**Table 5. Multiple linear regression estimates for donation amounts (EUR) (N=45)**

Variable	Coefficient	Std. error	t-statistic	p-value
(Intercept)	4.958068	2.558974	1.937522	0.060784
<b>treatment</b>	1.228622	1.087478	1.129791	0.266248
<b>age</b>	-0.00302	0.031843	-0.0947	0.925097
<b>Bachelor's</b>	-1.15245	1.927366	-0.59794	0.553728
<b>Master's or PhD</b>	-1.63885	1.80477	-0.90806	0.370054
<b>Income €40.001 - €70.000</b>	1.964578	2.029414	0.968052	0.339661
<b>€20.000 or less income</b>	-1.11483	1.955818	-0.57	0.572316
<b>€70.000+ income</b>	1.373456	1.86394	0.736856	0.466121
<b>Male</b>	-0.37094	1.05337	-0.35214	0.726842
<b>Bachelors degree</b>	-1.15245	1.927366	-0.59794	0.553728

Multiple linear regression results show that being part of the treatment group increases donations in the dictator game by 1.23 euros on average, compared to the control group. This coefficient is not significant at the 5% level. The lack of statistical significance is understandable: assumptions for t-tests used for linear regression coefficient estimations are not satisfied, and the low power of the sample is exacerbated by the inclusion of controls. However, the linear model can still provide insight into the

potential magnitude of the effect. The linear regression estimated coefficient for *treatment* is very similar to the difference in mean donations described at the beginning of this section: linear model estimates differ only in 0.11 eur (eleven cents) from the difference observed in the sample. This points towards the fact that the effect size of the EG intervention on donation amounts is mostly driven by the treatment rather than respondent demographic characteristics influencing altruistic behavior. However, to accurately estimate true effect sizes, confidence intervals of estimates on the *treatment* variable coefficient should be computed using a fuller sample void of power issues (see Limitations section for further elaboration).

### Robustness check

To check for robustness, a Monte Carlo simulation was run on the data. A trivial quantity, uniformly distributed between  $[-1 \cdot 10^{-6}, 1 \cdot 10^{-6}]$  euro was randomly added to each observation to create a new sample. The Wilcoxon rank sum test was run on this new sample, and p-value was stored. This process was repeated through 10.000 iterations, and descriptive statistics for p-value distribution were computed with the following results:

**Table 6. Monte Carlo simulation robustness check (N=10.000)**

Variable	Min	1 <sup>st</sup> Quartile	Median	Mean	3 <sup>rd</sup> Quartile	Max
p-value	0.0008	0.0342	0.0666	0.0892	0.1224	0.5474

Even if the change per observation is very small, this methodology does introduce variability in the estimations, so it is expected to find larger p-values compared to those seen when conducting the test on the original sample. However, this check does inform about the robustness of the found results: the table shows non-significant p-values for over 50% of trials, which means the results found on the current research should be interpreted with caution.

## Manipulation check

As means to assess the effectiveness of the treatment on EG, average ICC with absolute agreement was computed per person and compared between both groups. As done with the dictator game, Wilcoxon rank sum was chosen for the analysis due to non-normality and sample size limitations (see Appendix for Shapiro-Wilk test on ICC per group). After removing incomplete entries of SRT, test was run with the following results:

**Table 7. Wilcoxon rank-sum test for average ICC per person**

<b>Variable</b>	<b>Value</b>
Test statistic (W)	217
P-value	0.1528
Sample (N)	46

P-value shows there is not enough evidence to reject the null hypothesis of difference in ICC distribution between treatment and control groups. This result provides evidence of the prescribed training not being successful at enhancing emotion differentiation for the control group. However, the lack of effect can be due to the methodological design of the SRT: mainly number and type of scenarios tested. The DOPEs assessment tests only eight different datapoints to estimate EG per person, and all evaluated scenarios are positive. These aspects may limit the test's capacity to capture EG variability fully, especially in the context of the intervention chosen for this study. Further elaboration is provided in the limitations section.

## Discussion

In the current study, the effects of an EG intervention on altruism were tested. The treated population was instructed to read about emotions using a web resource which enables users to enhance their understanding of different emotional terms, and even acquire new ones to better label their emotional experiences. Training's influence on EG was not reflected in significant differences in ICC between groups, but this could happen due to limitations of the EG measurement rather than the lack of effectiveness of the training.

Experimental data shows there are significant results of this EG intervention promoting altruistic behavior. The treated population behaved more generously on the dictator game, sharing 1.39 euros more on average than the control population. Considering the initial allocation was 10 euro, the observed behavior takes on an even greater impact: after learning about emotions, respondents chose to share -with an unknown person- 13.5pp more of their allocation compared to those who didn't acquire any information about emotional terms. This difference also carries an important implication: mean donations of 5.63 euro for the treated population make them a group which donates -on average- more than half of their initial allocation to others i.e., they give more than they keep for themselves. This insight further supports the hypothesis of EG motivating *truly* altruistic behavior: donating most of the prize to the other person is likely not motivated by fairness concerns but by truly selfless behavior.

Results from this study align with previous findings showcasing social preferences in behavior are influenceable through short trainings helping the individual to be more attuned themselves (Iwamoto et al, 2020). In fact, both treatment and control groups showed a higher propensity for altruistic behavior than what was found in previous literature: Engel (2011) showed the average shared allocation in the dictator game to be 28%, while for the sample of this study the average is close to 50%. Emotional



granularity is a potentially important lever to incite altruistic behavior and its role as influencing factor should be studied further.

## Limitations and further research

### Sample

#### *i. Power*

Sample size is unquestionably the largest limitation of this study. Data collection proved challenging when limiting the sample to native English speakers only, as it excluded most people the researcher had access to i.e. Spanish speakers in the form of friends and family, and Dutch speakers in the form of Erasmus University students. As noted in the methodology section, G-power calculations pointed to a requirement of N=102 participants, of which only 52% (N=52) was met. Low number of participants per group (N<30) also made it impossible to use parametric tests (i.e. t-test for difference in means, and linear regression to estimate treatment effects) which are more powerful than the non-parametric tests used. This all results in an under-powered sample, in which detection of true effects is less likely and estimated effect sizes are less reliable. Caution is advised when interpreting the results of this study as small samples can limit the ability to make inferences on the population.

#### *ii. Attrition*

About half of the respondents didn't finish the survey. Without further information about them, the external validity of experimental results could be compromised. Participants were not informed about the economic incentives beforehand, so it is valid to pose that their altruistic tendencies (the target variable of this study) could be correlated to attrition, since -all else constant- the least generous population would be the most likely to drop out of the survey. External validity issues would arise if, for instance, less altruistic individuals were likely to respond more strongly to the EG treatment. This

population would be underrepresented due to attrition, and therefore cause a downward bias in donation difference for the dictator game and produce overstated p-values.

### **Manipulation check**

The SRT used to estimate the differences in EG between control and treatment groups was based exclusively on positive scenarios. As noted on the methodology, DOPEs presented the advantage of parsimony, and having chosen another test (or having added negative scenarios to the DOPEs test) would have likely exacerbated the already significant attrition issue mentioned above. However, by computing only the positive differentiation index, the manipulation check fails to capture any improvement the treatment group could have had in negative emotion differentiation. Negative emotions represent the majority (60%) of emotions displayed in the Emotion Typology website, and failing to capture the treatment effect on them potentially understates the true impact of the intervention on EG. This limitation provides a plausible reason for the observed results of no statistically significant differences between treatment and control groups in average ICC, and should be addressed if this experiment were to be replicated.

### **Recommendations for future research**

In order to reliably determine whether there is a statistically significant influence of EG in altruistic behavior, all previous limitations should be addressed in future experiments:

- Sample size should increase significantly, at least to N=102 to guarantee power requirements of the statistical tests. The higher the sample, the more accurate the experiment results will be, which is particularly important to estimate the effect size of the treatment, which can't be reliably gauged on this dataset due to power issues.

- Attrition should be reduced to increase the confidence on external validity of the experiment results. This could be achieved by providing financial incentives upfront for respondents to fill in the survey.
- SRT should be supplemented to test negative scenarios as well as positive ones in order to fully capture the effects of the treatment on the EG measurements and reliably assess the differences between treatment and control populations. Positive and negative emotion indices must be computed separately and then aggregated into a single metric per person, enabling hypothesis testing to be conducted to check for differences in average EG between groups and assess treatment effectiveness.

## Conclusion

The present study explores the potential impact of EG on prosocial behavior. Treated population acquired a deeper and broader understanding of emotion labels through the Emotion Typology website, while the non-treated population served as a valid counterfactual through the randomly assigned active control condition. Experiment results show the intervention had a positive influence in altruistic behavior, as the treated group showed significantly higher levels of generosity, even to the point of choosing, on average, to donate most of their allocated price to someone else. There was a particularly large difference on big donations, as the treated group was 6 times more likely to donate the full allocation compared to the control group.

Even when interpreted with caution due to the limitations of the study, these results point on the direction of EG being an important factor to study in the context of economic decision-making. As noted in the literature review, there isn't yet a substantial body of evidence for the effects of emotional granularity on economic variables, but the results for this research are hoped to at least motivate future investigations to explore their relationship and give EG a place in traditional frameworks of economic decision-making models. If the results found on this research are validated and the hypothesized mechanism of EG influence confirmed, there would be major implications for economists and policymakers.

EG has an excellent influence on personal wellbeing. Through its enhancement of emotional regulation and enablement of better self-understanding, it potentiates people's capacities and helps them achieve their personal striving goals and act in accordance to their values. Looking for an economic case to help people improve their emotion differentiation and become more granular is a fully worthwhile endeavor as it will help align personal goals with societal goals. Policymakers could immensely help on important

social issues like poverty reduction, social inclusion, equality of opportunities, and many others through helping people behave more altruistically.

This change would not only be positive for the economic system, but would also produce an immeasurable amount of personal well-being for those who are helped to increase their emotional intelligence. Organically -not through nudges or other devices leveraging human irrationality- people can be helped to be more in contact with themselves, foster empathy and make them want to help, share, and cooperate with each other.

## References

- Barrett, L. F., Gross, J. J., Christensen, T. C., & Benvenuto, M. (2001). Knowing what you're feeling and knowing what to do about it: Mapping the relation between emotion differentiation and emotion regulation. *Cognition & Emotion*, 15(6), 713–724. <https://doi.org/10.1080/02699930143000239>
- Barrett, L. F. (2004). Feelings or Words? Understanding the Content in Self-Report Ratings of Experienced Emotion. *Journal of Personality and Social Psychology*, 87(2), 266–281. <https://doi.org/10.1037/0022-3514.87.2.266>
- Boot, W. R., Simons, D. J., Stothart, C., & Stutts, C. (2013). The Pervasive Problem With Placebos in Psychology: Why Active Control Groups Are Not Sufficient to Rule Out Placebo Effects. *Perspectives on Psychological Science*, 8(4), 445–454. <https://doi.org/10.1177/1745691613491271>
- Boden, M. T., Thompson, R. J., Dizen, M., Berenbaum, H., & Baker, J. P. (2013). Are emotional clarity and emotion differentiation related? *Cognition & Emotion*, 27(6), 961–978. <https://doi.org/10.1080/02699931.2012.751899>
- Castillo, R., Salguero, J. M., Fernández-Berrocal, P., & Balluerka, N. (2013). Effects of an emotional intelligence intervention on aggression and empathy among adolescents. *Journal of Adolescence*, 36(5), 883–892. <https://doi.org/10.1016/j.adolescence.2013.07.001>
- Charness, G., & Rabin, M. (2002). Understanding Social Preferences with Simple Tests. *Quarterly Journal of Economics*, 117(3), 817–869. <https://doi.org/10.1162/003355302760193904>

Davidson, R. J., Goldsmith, H. H., Scherer, K. R., Loewenstein, G., & Lerner, J. S. (2003). The Role of Affect in Decision Making. In *Handbook of Affective Sciences* (pp. 619–637). essay, Oxford University Press.

Erbaş, Y., Kalokerinos, E. K., Kuppens, P., Van Halem, S., & Ceulemans, E. (2021). Momentary Emotion Differentiation: The Derivation and Validation of an index to Study Within-Person Fluctuations in Emotion Differentiation. *Assessment*, 29(4), 700–716.

<https://doi.org/10.1177/1073191121990089>

Engel, C. (2011). Dictator games: a meta study. *Experimental Economics*, 14(4), 583–610.

<https://doi.org/10.1007/s10683-011-9283-7>

Fehr, E., & Schmidt, K. M. (2006). Chapter 8 The Economics of Fairness, Reciprocity and Altruism – Experimental Evidence and New Theories. In *Handbook on the economics of giving, reciprocity and altruism* (pp. 615–691). [https://doi.org/10.1016/s1574-0714\(06\)01008-6](https://doi.org/10.1016/s1574-0714(06)01008-6)

Kashdan, T. B., Barrett, L. F., & McKnight, P. E. (2015). Unpacking emotion differentiation. *Current Directions in Psychological Science*, 24(1), 10–16. <https://doi.org/10.1177/0963721414550708>

Lempert, K. M., & Phelps, E. A. (2016). The malleability of intertemporal choice. *Trends in Cognitive Sciences*, 20(1), 64–74. <https://doi.org/10.1016/j.tics.2015.09.005>

Lewis, M., Haviland-Jones, J., Rick, S., & Loewenstein, G. (2008). The Role of Emotion in Economic Behavior. In *Handbook of Emotions, third edition* (pp. 138–150). essay, Guilford Publications.

- Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence? In P. Salovey & D. J. Sluyter (Eds.), *Emotional development and emotional intelligence: Educational implications* (pp. 3–34). Basic Books
- Oberle, E., Schonert-Reichl, K. A., Hertzman, C., & Zumbo, B. D. (2014). Social–emotional competencies make the grade: Predicting academic success in early adolescence. *Journal of Applied Developmental Psychology, 35*(3), 138–147. <https://doi.org/10.1016/j.appdev.2014.02.004>
- Schimmack, U., & Diener, E. (1997). Affect intensity: Separating intensity and frequency in repeatedly measured affect. *Journal of Personality and Social Psychology, 73*(6), 1313–1329. <https://doi.org/10.1037/0022-3514.73.6.1313>
- Shiota, M. N., Kirby, L. D., Morrow, J., Ahrens, A. H., & Smith, C. A. (2016). Vive la Difference: The Ability to Differentiate Positive Emotional Experience and Well-Being. In *Handbook of positive emotions*. essay, The Guilford Press.
- Tamir, M. (2009). What do people want to feel and why?: Pleasure and utility in emotion regulation. *Current Directions in Psychological Science, 18*(2), 101–105. <https://doi.org/10.1111/j.1467-8721.2009.01617.x>
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 211*(4481), 453–458. <https://doi.org/10.1126/science.7455683>
- Vedernikova, E., Kuppens, P., & Erbas, Y. (2021). From knowledge to differentiation: Increasing emotion knowledge through an intervention increases negative emotion differentiation. *Frontiers in Psychology, 12*. <https://doi.org/10.3389/fpsyg.2021.703757>



# Appendix

## A1. Experiment survey

---

Start of Block: Consent

Q48 Dear participant,

Welcome! Your participation is completely voluntary and anonymous, and the answers will be used for scientific purposes only in a master thesis project at the Erasmus University of Rotterdam. This survey takes about 10-15 minutes to complete.

**Please make sure to respond to this survey on a laptop or PC (not mobile), and to have privacy while responding to the questions!**

In order to participate in this survey you must be over 18 years old.

In case you would like to proceed, thank you in advance for your help. For any other questions please contact: 621489do@eur.nl

Are you over 18 and do you consent to take part in the survey?

Yes (1)

No (2)

---

Page Break

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End of Block: Consent

---

Start of Block: Demographics

Q2 How old are you? (Please type your age as a number)

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Q8 Please indicate your gender

Male (1)

Female (2)

Other (3)

Prefer not to say (4)

---



country Where are you from (country)?

▼ Afghanistan (1) ... Zimbabwe (1357)

---

Q19 Is English your native language?

▼ Yes (1) ... No (2)

---

Q8 What is your highest level of education?

- High school degree (1)
  - Bachelors degree (or equivalent) (2)
  - Master's degree or PhD (3)
  - Other (4)
- 

Q25 What is your annual income (range)?

- less than €20.000 (1)
- €20.001 - €40.000 (2)
- €40.001 - €70.000 (3)
- More than €70.000 (4)
- Prefer not to say (5)

End of Block: Demographics

---

Start of Block: Treatment

Q10 You will be provided a link to the Emotion Typology website. This site aims to provide information about different emotions in an accessible way. The site looks as follows:

As can be seen above, emotions are grouped by similarity through colors. Upon entering the site, please follow these instructions:

1. Glance over the emotion list to identify which group (color) contains the emotion you are most closely feeling at the current moment. Note there are only five colors: red, purple, blue, green, and yellow.
2. Once you've identified the color, use your mouse to hover over at least **five** of the emotions and read their short descriptions. Make sure you understand each of them, and then pick the one you are feeling at the current moment.
3. For the emotion you picked, please click on the 'Learn more' button at the bottom of the prompt, which will redirect you to a page with resources about the emotion you chose. Please read the information in the page, as well as watching the media clips provided (note: press the back arrow in your browser to exit the clip once you've watched it).
4. Return to this survey.

Don't worry, you will be reminded about the instructions in the next page, click on the bottom right arrow to start!

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Page Break

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Q11 Ready? Let's go!

Please **don't rush** on this exercise, it is important you spend a few minutes on the webpage for this training to be effective!

Click 'next' when you followed the four steps outlined earlier.

**(1- Pick a color, 2- Read at least 5 short descriptions and pick an emotion, 3- Click 'Learn more' and do a deep-dive, 4- Return to survey)**

Here is the emotion typology link. [www.emotiontypology.com](http://www.emotiontypology.com)

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Page Break

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Q13 Thank you for following the instructions! Which emotion did you choose for your deep-dive?

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Page Break

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Q14 Please rate your level of agreement with the following statement:

	Completely disagree (1)	Strongly disagree (2)	Slightly disagree (3)	Neither agree nor disagree (4)	Slightly agree (5)	Strongly agree (6)	Completely agree (7)
The exercise I performed helped me achieve a better understanding of emotions. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Treatment

---

Start of Block: Control

Q15 You will be provided a link to the Interactive Periodic Table of Elements website. This site aims to provide information about the elements in an accessible way. The site looks as follows:

As can be seen above, elements are grouped by similarity through colors. Upon entering the site, please follow these instructions:

1. Glance over the element list and choose one chemical group (i.e. color).
2. Once you've identified the color, use your mouse to hover over at least **five** elements of your choice and read their short descriptions. There is no need to memorize them, just getting a sense of the use cases for each element.
3. Pick one specific element (whichever you want), and please click on it. Click on the 'Learn more about' button below the description text, which will redirect you to a page with extra information about the element you chose. If your choice of element does not have the 'Learn more' button, please pick another one.
4. Please read only the 'Introduction' and 'Fun facts' section of the page and return to this survey.

Don't worry, you will be reminded about the instructions in the next page, click on the bottom right arrow to start!

---

Page Break





Q16 Ready? Let's go!

Please **don't rush** on this exercise, it is important you spend a few minutes on the webpage for this training to be effective!

Click 'next' when you followed the four steps outlined earlier.

**(1- Pick a color, 2- Read short descriptions for 5 elements, then pick a single one, 3- Click 'Learn more' to read 'Introduction' and 'Fun facts', 4- Return to survey)**

Here is the interactive periodic table link: [www.chemistrytalk.org/interactive-periodic-table/](http://www.chemistrytalk.org/interactive-periodic-table/)

---

Page Break

---

Q17 Thank you for following the instructions! Which element did you choose for your deep-dive?

---

---

Page Break

---

Q18 Please rate your level of agreement with the following statement:

	Completely disagree (1)	Strongly disagree (2)	Slightly disagree (3)	Neither agree nor disagree (4)	Slightly agree (5)	Strongly agree (6)	Completely agree (7)
The exercise I performed helped me achieve a better understanding of elements. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Control

---

Start of Block: Dictator game

Q12 Thank you for completing the training! A percentage of respondents will be chosen to receive €10 as payment for completing this survey.

If you are picked as one of the winners of this lottery, you will be paired with another survey respondent who was not selected.

You can choose to split your payment with this person. Please enter an amount between €0 and €10 in whole numbers to give to them.

---

End of Block: Dictator game

---

Start of Block: Contact

Q24 Please provide an email to contact in case you are chosen to receive the prize!

---

End of Block: Contact

---

Start of Block: Manipulation check instructions

Q26 You will now be presented with a set of hypothetical scenarios with brief descriptions for each. Try to imagine yourself in each scenario as vividly as possible and pay special attention to how you would feel if you were in it. You will then be asked to rate the extent to which you would feel different emotions if you were in each scenario. Remember, there are no right or wrong answers, just try to be as authentic as possible.

Ready? Let's go!

End of Block: Manipulation check instructions

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Start of Block: Manipulation check

Page Break

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Affection You are the best man at your best friend's wedding. In your speech, you talk about the experiences you have shared together and have made you both grow, and tell anecdotes showing his kindness and strength of character. After you finish your speech, your friend stands up from his chair and gives you a big hug.

---

Q32 Please indicate on the following scale the extent to which you would feel the following if you were in this situation:

	Not at all (1)	Very slightly (7)	Slightly (3)	Medium (5)	Slightly strongly (8)	Very strongly (9)	Extremely strongly (10)
Affection (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awe (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determination (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excitement (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gratitude (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hope (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pride (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serenity (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Awe You are walking up a hill through thick woods. It was raining earlier, but the rain stopped a short time ago, and the sun is now shining. All of a sudden, you come to a clearing near the top of the hill and enter a beautiful meadow filled with wildflowers and butterflies. A clear stream is running through the meadow, and there is a rainbow in the sky. Off in the distance you can see the snow-capped peaks of a nearby mountain range.

---

Q27 Please indicate on the following scale the extent to which you would feel the following if you were in this situation:

	Not at all (1)	Very slightly (7)	Slightly (3)	Medium (5)	Slightly strongly (8)	Very strongly (9)	Extremely strongly (10)
Affection (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awe (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determination (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excitement (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gratitude (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hope (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pride (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serenity (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break



Determination You have been spending a fair bit of time trying to solve a difficult problem that is part of an important project on which you have been working. So far you have been unable to solve the problem, but you believe that a solution is possible, and you know that if you keep at it, you will be able to solve the problem and make the project a success.

---

Q29 Please indicate on the following scale the extent to which you would feel the following if you were in this situation:

	Not at all (1)	Very slightly (7)	Slightly (3)	Medium (5)	Slightly strongly (8)	Very strongly (9)	Extremely strongly (10)
Affection (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awe (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determination (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excitement (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gratitude (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hope (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pride (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serenity (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Excitement Your all-time favorite band/artist announced they will be playing in your city. You have been waiting for this for a long time, and make sure to book the tickets as soon as they become available. You have never seen them perform live but have been told their concerts are incredible and their music sounds even better on-stage. The day before the concert you barely sleep in anticipation of watching them.

---

Q30 Please indicate on the following scale the extent to which you would feel the following if you were in this situation:

	Not at all (1)	Very slightly (7)	Slightly (3)	Medium (5)	Slightly strongly (8)	Very strongly (9)	Extremely strongly (10)
Affection (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awe (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determination (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excitement (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gratitude (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hope (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pride (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serenity (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Gratitude You are walking around in a strange city and suddenly realize that you are lost. As you are standing at a street corner, intensely studying your map to try to figure out where you are, someone comes up to you and asks you in a friendly way where you are trying to go. After you answer, this person says that he or she is headed that way and suggests that you go together. Within a few minutes this person has taken you to your destination, having pointed out some interesting sights along the way.

---

Q31 Please indicate on the following scale the extent to which you would feel the following if you were in this situation:

	Not at all (1)	Very slightly (7)	Slightly (3)	Medium (5)	Slightly strongly (8)	Very strongly (9)	Extremely strongly (10)
Affection (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awe (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determination (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excitement (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gratitude (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hope (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pride (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serenity (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break



Hope Things in your life have been somewhat difficult lately, but you are optimistic about what lies ahead. You know that there are new opportunities available to help things get better, and they seem promising. You trust that things will be better soon. You are looking forward to good things to come and a bright future ahead. You are thinking about the positive change that can happen.

---



Q33 Please indicate on the following scale the extent to which you would feel the following if you were in this situation:

	Not at all (1)	Very slightly (7)	Slightly (3)	Medium (5)	Slightly strongly (8)	Very strongly (9)	Extremely strongly (10)
Affection (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awe (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determination (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excitement (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gratitude (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hope (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pride (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serenity (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Pride You have been working very hard on a group project. The rest of your group members have been contributing, but you have gone the extra distance for the project. You know that the project wouldn't be nearly as good had you not worked so hard. Your group has just presented the project and it is extremely well received. As your group is receiving praise for an excellent job, a member of your group speaks up and indicates that the group owes its success to you, that you really pulled the project together. The other members of the group start spontaneously applauding you and your efforts.

---

Q34 Please indicate on the following scale the extent to which you would feel the following if you were in this situation:

	Not at all (1)	Very slightly (7)	Slightly (3)	Medium (5)	Slightly strongly (8)	Very strongly (9)	Extremely strongly (10)
Affection (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awe (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determination (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excitement (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gratitude (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hope (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pride (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serenity (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Serenity After working very hard for several weeks, you are finally able to take some time off. Right now you are relaxing on the beach. There is a nice breeze, you have a drink, and you are relishing the knowledge that there's nothing at all you need to be doing right now.

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Serenity Please indicate on the following scale the extent to which you would feel the following if you were in this situation:

	Not at all (1)	Very slightly (7)	Slightly (3)	Medium (5)	Slightly strongly (8)	Very strongly (9)	Extremely strongly (10)
Affection (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awe (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determination (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excitement (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gratitude (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hope (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pride (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serenity (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Manipulation check

Start of Block: Block 14

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Start of Block: Block 12

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## **A2. Scenario Rating Task survey**

Task instructions (reworded for simplicity), as well as vignettes for positive emotions were taken from the *Differentiation of Positive Emotions Scale (DOPE)*, as presented by Kirby et al in the *Handbook of Positive Emotions (2016)*. Original vignettes for ‘amusement’ and ‘interest’ were substituted by researcher-created vignettes for ‘affection’ and ‘excitement’. Participants were shown the survey below with a randomized order for vignettes (note: italicized bold text was not part of the survey but is included here as reference information for the reader):

### **Instructions**

Thank you for participating in this survey! You will now be presented with a set of hypothetical scenarios with brief descriptions for each. Try to imagine yourself in each scenario as vividly as possible and pay special attention to how you would feel if you were in it. You will then be asked to rate the extent to which you would feel different emotions if you were in each scenario. Remember, there are no right or wrong answers, just try to be as authentic as possible!

### ***Vignettes***

#### ***A. Positive emotions***

- 1. Affection:*** You are the best man at your best friend’s wedding. In your speech, you talk about the experiences you have shared together and have made you both grow, and tell anecdotes showing his kindness and strength of character. After you finish your speech, your friend stands up from his chair and gives you a big hug.
- 2. Awe:*** You are walking up a hill through thick woods. It was raining earlier, but the rain stopped a short time ago, and the sun is now shining. All of a sudden, you come to a clearing near the top

of the hill and enter a beautiful meadow filled with wildflowers and butterflies. A clear stream is running through the meadow, and there is a rainbow in the sky. Off in the distance you can see the snow-capped peaks of a nearby mountain range.

- 3. *Determination:*** You have been spending a fair bit of time trying to solve a difficult problem that is part of an important project on which you have been working. So far you have been unable to solve the problem, but you believe that a solution is possible, and you know that if you keep at it, you will be able to solve the problem and make the project a success.
- 4. *Excitement:*** Your all-time favorite band/artist announced they will be playing in your city. You have been waiting for this for a long time, and make sure to book the tickets as soon as they become available. You have never seen them perform live but have been told their concerts are incredible and their music sounds even better on-stage. The day before the concert you barely sleep in anticipation of watching them.
- 5. *Gratitude:*** You are walking around in a strange city and suddenly realize that you are lost. As you are standing at a street corner, intensely studying your map to try to figure out where you are, someone comes up to you and asks you in a friendly way where you are trying to go. After you answer, this person says that he or she is headed that way and suggests that you go together. Within a few minutes this person has taken you to your destination, having pointed out some interesting sights along the way.
- 6. *Hope:*** Things in your life have been somewhat difficult lately, but you are optimistic about what lies ahead. You know that there are new opportunities available to help things get better, and



they seem promising. You trust that things will be better soon. You are looking forward to good things to come and a bright future ahead. You are thinking about the positive change that can happen.

7. **Pride:** You have been working very hard on a group project. The rest of your group members have been contributing, but you have gone the extra distance for the project. You know that the project wouldn't be nearly as good had you not worked so hard. Your group has just presented the project and it is extremely well received. As your group is receiving praise for an excellent job, a member of your group speaks up and indicates that the group owes its success to you, that you really pulled the project together. The other members of the group start spontaneously applauding you and your efforts.
  
8. **Serenity<sup>1</sup>:** After working very hard for several weeks, you are finally able to take some time off. Right now you are relaxing on the beach. There is a nice breeze, you have a drink, and you are relishing the knowledge that there's nothing at all you need to be doing right now.

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<sup>1</sup> Originally listed as *contentment*, name was changed to *serenity* to match the nomenclature from [www.emotiontypology.com](http://www.emotiontypology.com)

### **A3. Statistical tests**

#### **A3.1 Shapiro-Wilk tests for normality**

##### **A.3.1.1 Dictator game**

<b>Group</b>	<b>W</b>	<b>p-value</b>	<b>N</b>
Control	0.7547	4.368e-05	25
Treatment	0.8048	0.0001663	27

##### **A.3.1.2 ICC**

<b>Group</b>	<b>W</b>	<b>p-value</b>	<b>N</b>
Control	0.8763	0.0070	22
Treatment	0.8883	0.0107	24