



Erasmus School of Economics

**Self-reflection, Beliefs, and the Demand for Mental Health
Support among University Students: Evidence From the
Netherlands and Taiwan**

Master's Thesis Behavioral Economics

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The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

Abstract

I conduct an online survey experiment in a sample of 235 university students studying in the Netherlands and Taiwan to test whether engaging in self-reflection increases the demand for mental health support. Asking respondents to self-reflect on their mental well-being increases the demand for mental health support which is measured in the willingness to pay for a mental health app among students in Taiwan. This effect is likely driven by subjects' perceived effectiveness of mental health apps. My evidence highlights that a simple and almost costless intervention can lead to a significant increase in the demand for mental health support through an increase in the perceived effectiveness of mental health treatments. The external validity of the treatment effect is indecisive; therefore, future research can conduct similar experiments in different cultural contexts.

Keywords: Demand for Mental Health Support, Self-reflection, Beliefs, Online Survey Experiment

Acknowledgement

This is my first time writing a thesis, and the process has never been easy.

I could not have done this without the help of my thesis supervisor: Dr. Francesco Capozza. Since our first meeting, he has always been really helpful and patient, giving me several inspiring ideas and stimulating me to become better. Besides, he never treated me like a student inferior to him, which I appreciated.

I also want to thank all my Taiwanese close friends and my sister, who helped distribute the survey to university students in Taiwan. Without their help, I could not have done the cross-cultural analysis part of this thesis. Undoubtedly, I thank all the survey takers for their time.

Lastly, I want to thank myself. Thank you for not giving up on yourself when you suffered from depression and anxiety. Thank you for saving yourself.

I wish this paper could help the people suffering from mental illness. You are not alone.

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1. Introduction

Around one in every two people in the world experience a mental health disorder at some point in their lives (*Mental Health - OECD*, n.d.). Yet, 67% of people still say they do not receive the mental health support they need (*Mental Health - OECD*, n.d.). Young people especially, are disproportionately affected. Three-fourths of mental health disorders emerge by the age of 24 (Kessler et al., 2005), and more than 60% of college students have at least one mental health problem (Abrams, 2022). However, younger people are less likely than older people to seek mental health support from professional sources (Barney et al., 2006).

The general public faces several identified barriers to seeking mental health care, including social and self-stigma, low mental health literacy¹, and negative attitudes toward mental health services (Aguirre Velasco et al., 2020; Andrade et al., 2014; Clement et al., 2015). Among young adults in the UK, Salaheddin & Mason (2016) found that stigmatizing beliefs, difficulty identifying or expressing concerns, self-reliance, fear of negative outcomes, and difficulty accessing help were significant barriers to seeking mental health care. The difficulty in identifying or expressing concerns is of particular interest to this study. Hui et al. (2014) also noted in their qualitative research that some participants did not realize they had mental illness and relied on others to recognize their symptoms. These barriers mean that they do not understand their mental health or they do not know how to express it well enough, which relates to a part of mental health literacy.

Inspired by these barriers, I ran an online survey experiment with a sample of 235 university students studying in the Netherlands and Taiwan. Half of the respondents are randomized to receive a treatment that asks them to reflect on their mental well-being by writing a couple of sentences, which I call “self-reflection treatment” and is meant to increase their understanding of their mental health through reflection and to give them a chance to organize their thoughts by writing. I want to assess how this treatment affects subjects’ demand for mental health support, which I measure in their willingness to pay (WTP) for a mental health app.

¹ According to Jorm et al. (1997), mental health literacy mainly consists of the ability to recognize different types of psychological distress, knowledge, and beliefs about self-help and professional help available, and attitudes that facilitates recognition of mental health and appropriate help-seeking.

Therefore, my research question is:

What is the effect of engaging in self-reflection on the demand for mental health support among university students in the Netherlands and Taiwan?

I document four sets of results. First, on average, the self-reflection treatment does not significantly increase the WTP for the mental health app ($p = 0.55$). On a scale of 0 to 5\$ (US Dollars), on average, the respondents in the control group are willing to pay 1.91\$ while the respondents in the treatment group are willing to pay 2.09\$. The self-reflection treatment increases the WTP by 8.50% of the standard deviation of the control respondents.

Second, the self-reflection treatment does not lead to heterogeneous effects by gender and baseline mental health, which are two common and intuitive heterogeneities. However, the treatment leads to heterogeneous effects by studying country ($p = 0.097$). Specifically, it only increases the WTP for students studying in Taiwan, and the effect size is 34.4% of the standard deviation of the control group.

Third, I proposed five possible mechanisms driving the treatment effect before running the experiment – self-awareness, self-stigma, app effectiveness belief, perceiving mental illness as not serious enough, and social stigma. The treatment does not significantly increase any of the five mechanisms in the whole sample. However, for students studying in Taiwan, app effectiveness belief is the main driver behind the observed increase in WTP. Furthermore, all mechanisms except self-stigma are significantly correlated with WTP.

Fourth, I use two ways to assess the seriousness of the treated responses to the self-reflection question – time spent and character count. From my data, treated respondents giving more serious responses do not have higher WTP.

My findings are relevant to a growing literature concerned with interventions to promote good mental health in young people (Maddock et al., 2021; Salazar de Pablo et al., 2020). In particular, this study contributes to the literature assessing the effectiveness of online psychological or psychoeducational interventions with the aim of preventing mental illness in heterogeneous populations (Rigabert et al., 2020). By focusing on university students, the study aims to contribute to the understanding of mental health care demand for this demographic and potentially inform the development of interventions that address the specific needs of this group.

Furthermore, most existing literature about self-reflection focuses on the definition, the way to practice it, or the effect of self-reflection in other contexts than the demand for mental health². Interventions targeting barriers to care-seeking have mostly focused on factors such as stigma and discrimination (Thornicroft et al., 2016) but not on difficulty identifying or expressing concerns. This paper aims to fill this gap by assessing experimentally how engaging in self-reflection affects the demand for mental health support. As far as the author's knowledge, this is the first paper to evaluate this relationship experimentally.

The paper proceeds as follows: In Section 2, I describe the data collection and the experimental design. In Section 3, I list the hypotheses I proposed before the experiment and the theoretical background behind my conjecture. In Section 4, I present my empirical findings. In Section 5, I discuss the policy implications of the results and limitations of this study. Finally, Section 6 concludes.

2. Sample and Experimental Design

2.1 Sample

I conducted an online survey experiment with a sample of students studying in universities in the Netherlands and Taiwan. I distributed the survey in two main ways: First, I distributed the survey link in my various group chats and social media platforms, such as WhatsApp and Facebook; second, I sent the survey link to multiple friends studying different subjects or in different study phases and asked them to help distribute the survey to their friends. This way, I can broaden both the sample size and the background of the respondents. The whole data collection process lasted for five days from March 20th to March 24th, 2023, and I completed the Erasmus Ethical Check Questionnaire before starting data collection.

The focus of this study is on university students for two main reasons. First, the prevalence of mental health disorders among university students is increasing, exacerbating an already high prevalence rate (Auerbach et al., 2018). Second, like the general public, a significant proportion of university students in need of mental health

² See for example Dewey (2022) for a definition of self-reflection; see for example Tyler et al. (2022) for the way to practice self-reflection; see Gerace et al. (2017), Lengelle et al. (2016), and Lew & Schmidt (2011) for the effect of self-reflection in other contexts such as career learning, academic performance, and the taking of another person's perspective.

support are not accessing it (Acampora et al., 2022). As a result, given that the author is also a student, this topic and the student population are of particular interest.

Besides, this paper collects responses from the Netherlands and Taiwan to conduct cross-cultural and continent research, which is inspired by a few studies. According to Chan et al. (2005), Australian Chinese is found to see depressive mood as stress while local Australians³ tend to see the same symptoms as the signs of depression. The different understanding of mental illness may in turn determine one's help-seeking attitudes. Kramer et al. (2002)'s Asian American study also identified that shame and saving face often prevent Asians from seeking mental health care and that Asian patients express psychological distress as physical complaints more often. These factors are related to both social and self-stigma. Moreover, Hui et al. (2014) pointed out that their Chinese people samples thought that society usually considered people with depression problematic, fragile, or incapable and that this linkage to weakness seemed to be more prevalent in Hong Kong, which is a stressful society that emphasizes personal achievement like Taiwan (Chyu & Chen, 2022).

2.2 Experimental Design

Below, I describe the design of the survey in detail including the questions asked and the survey flow. The complete survey can be found in Appendix F.

Block 1: Survey Introduction and Demographic Characteristics

On the introduction page of the survey, I stress some important characteristics of this survey in bold font. First, I inform them this survey takes around 5 minutes. Peytchev (2009) highlighted the importance of providing respondents with the estimated survey completion time. Therefore, I reckon informing respondents in advance how long they will spend on this survey would increase the response rate. Besides, the literature pointed out that the surveys whose length is shorter than 10-15 minutes obtain a higher response rate (Fan & Yan, 2010; Revilla & Höhne, 2020); therefore, I chose to only ask the necessary questions and keep the survey short. Next, I inform them that this survey is bilingual, so they can freely choose English or traditional Chinese to take this survey. In addition, I stress the anonymity of the responses, no deception or false information involved, and that the data gathered are only for academic purposes. Lastly, I also provide monetary incentives for participation. I state in both invitation messages and the survey introduction page that completing this survey entitles them to enter a lottery to win 10 euro cash.

³ The term *local Australian* here refers to non-Australian Chinese Australian, which consists mostly of white people.

Once the respondents join the survey, I first ask their willingness to join the lottery and some demographic questions including their age, gender, in which country they are studying, in which region they were raised, study program enrolled, parents' education level, their self-reported well-being, and their perceived level of financial stress.

Block 2: Randomization

I randomize the respondents into one of two groups. Half of the respondents are randomly assigned to receive the self-reflection treatment, which is the treatment group. I first give them some introduction text:

When you meet someone, a common greeting is “How are you doing?”, but perhaps nobody including you has ever seriously thought of how you really are doing, especially mentally/emotionally.

Following this, I ask them the following question:

How are you doing in terms of well-being, really? Please write in a couple of sentences.

It is worth noting that I allow them to answer this question in any language in which they find it comfortable to express themselves, which is meant to increase the chance that they engage in self-reflection and express their thoughts. Besides, I add a minimum length requirement for this question, which is 50 characters. This is meant to increase the effort of self-reflection on their current mental well-being but not merely give a casual response such as “I am doing ok.” The 50 characters requirement should not be hard to meet because two English sentences with an average length would fulfill the requirement.

However, the two languages – English and Chinese, come from two different language families, which have distinct grammatical structures and characters. Thus, the 50 characters limit should not be applied to the traditional Chinese translated version. To look for the difference between the two languages, please see the example:

The sentence “I am doing quite well actually except that I will get irritated by others sometimes”, which is counted to have 83 characters including blanks by Qualtrics, is “我其實過得不錯，只是有時候我會被他人激怒” in traditional Chinese, which is counted as only 20 characters by Qualtrics.

Therefore, to resolve this difference, if respondents choose to use traditional Chinese to take the survey, the minimum character requirement for the treated respondents is only 20 characters.

The remaining half of the respondents are allocated to the Control group and are asked to answer a question irrelevant to mental well-being. The question prompt and question are as follows:

Food is a universal language for people from different countries.

What is your favorite dish? Please describe it in a couple of sentences.

Since control group respondents still need to do a writing task, it is an active control group design. Compared to a passive control group which does no writing, an active control group design can minimize the difference between treatment and control group, meaning whether to reflect and express things about their mental well-being is the only difference left.

For the same purpose of minimizing other differences between the two groups, same as the treated subjects, control subjects can freely choose the language to express themselves, and the minimum number of characters required is 50 while 20 for traditional Chinese takers.

Part 3: WTP for the Mental Health Support App

After the exposure to the treatment, I first give a short introduction to a mental health app⁴, which consists of its main functions including tools to help you engage in mood-enhancing activities such as mindfulness practices, identify and change unhealthy thinking, rate and chart mood across time, and create journal entries using custom templates designed to promote well-being (*MoodKit*, n.d.), and the fact that it has been proved effective by some studies (Dahne et al., 2019; Stawarz et al., 2018). Subsequently, I elicit all the respondents' WTP for it using a slider where respondents can drag the bar to their preferred price from 0 to 5\$. The price is in the unit of US dollars for both the English and traditional Chinese version of the survey, which allows me to measure both respondents in the Netherlands and Taiwan on the same scale.

I use WTP for *Moodkit* as a proxy for my outcome of interest – demand for mental health care. This decision is supported by the findings of Acampora et al. (2022) – WTP

⁴ The app is called *Moodkit*, which has been proven effective in medical trials such as in Dahne et al. (2019). The current price of this app on the App Store is 5 USD. The author has no business relationship with the developer of *Moodkit*.

for a mental health app in a survey experiment is a strong predictor of the respondents' actual mental health care-seeking behavior afterward, including psychologists/psychiatrists, mental health apps or online platforms, and any other professional care. Therefore, even though I cannot do a follow-up survey to inquire if the respondents seek help after they took the survey like Acampora et al. (2022) did because of the limited sample size and limited resources to do a follow-up study, WTP for a mental health app, compared to directly asking subjects how likely they will go seek help, seems a more reasonable and effective proxy for the demand for mental health support.

Block 4: Post-Treatment Questions

In the post-treatment section, I first measure their self-awareness level by asking some questions on the Likert scale, and I add up the score of these questions to create a self-awareness index. Besides, I elicited the respondents' beliefs about the effectiveness of the mental health apps and how serious they think mental illness is. Also, I used questions to measure their self and social stigma toward mental illness and receiving mental health support, and I also created an index for self-stigma by adding up the score of some questions. All these questions are measured on a Likert scale.

Finally, I ask whether the respondents are receiving any mental health care and from which sources. As one of the main barriers to seeking mental health care is people's negative attitudes towards mental health services (Aguirre Velasco et al., 2020; Andrade et al., 2014; Clement et al., 2015), I also ask how good their previous experience of receiving mental health care was if they have received any.

Block 5: Mental Health Status

In the last block of the survey, I assessed the respondents' current mental health status by using the screening tool PHQ-4, which is a reliable and brief tool for detecting both depression and anxiety (Kroenke et al., 2009). I assess their PHQ-4 score at the end of the survey to minimize any priming effect at earlier stages of the experiment that may bias the results.

3. Hypotheses

Before I did the experiment, I proposed three hypotheses:

(1) First and main hypothesis: The self-reflection treatment increases the WTP.

The possible mechanisms through which the self-reflection treatment will have an effect on the demand for mental health care could be self-awareness, self-stigma, perceived effectiveness of mental health apps, perceiving mental illness as not serious enough, and social stigma.

For the first one, self-awareness refers to the ability to recognize and understand one's thoughts, emotions, and behaviors (Duval & Wicklund, 1972). Self-aware individuals are aware of their mental and emotional state and how their actions affect themselves and others positively and negatively (Morin, 2011). Increasing self-awareness leads to positive consequences associated with good mental health, such as increased self-knowledge and self-regulation (Li et al., 2021; Morin, 2011; Sutton, 2016). Several strategies and techniques can be used to improve self-awareness, including mindfulness practices, journaling, seeking feedback from others, and engaging in regular self-reflection (Ackerman, 2020). Besides, Eichstaedt & Silvia (2003) identified that subjects who were asked to write about distinctive self-aspects in a writing task increases self-awareness. Therefore, my conjecture is when taking the self-reflection treatment, treated subjects write down their mental well-being, which belongs to distinctive self-aspects, they will increase their self-awareness, knowing their mental health better, so those subjects who find out they are having mental issues or unstable mood disorders will have a higher demand for mental health support, which leads to higher WTP for the mental health app.

For self-stigma, it could be that after taking the treatment, the treated subjects suddenly realize that they actually have some mental health problems, which may make them feel worse about themselves (Corrigan & Rao, 2012). The increased self-stigma toward mental problems may further let them think they will feel less of themselves if receiving mental health care, leading to lower WTP, which is a proxy for the demand for mental health support.

As for the perceived effectiveness of mental health apps, I expect that the treated subjects will have a higher perceived effectiveness of mental health apps because after taking the treatment, they may realize they actually do not understand their mental

health or they want to know it better or more easily. Mental health app like *Moodkit* could satisfy their needs; their perceived effectiveness of these apps will thus increase, which naturally leads to higher WTP.

For the theory of perceiving mental problems as not serious enough, after the open-ended treatment question, subjects may find out that they have mental illness due to the sentences written after self-reflection. However, different than the self-awareness mechanism, from another perspective, subjects may interpret it as their mental problems are not serious enough, so they do not care enough to reach out for help but lived on with their life, relying on their own. This may decrease their demand for mental health support, manifested by lower WTP. The concepts behind this mechanisms could be either self-reliance (Salaheddin & Mason, 2016) or low mental health literacy (Aguirre Velasco et al., 2020), or a combination of them.

Similar to self-stigma, regarding social stigma, after taking the treatment, the treated subjects may suddenly realize that they actually have some mental health problems, which may make them worry about the prejudice and discrimination against people who have mental illness from the general public, which is identified also as one of the main barriers to mental health care seeking (Henderson et al., 2013). This subsequently leads to lower WTP.

With all the possible mechanisms considered, I conjectured that self-awareness and app effectiveness would play bigger roles, driving the effect of the self-reflection treatment to higher WTP.

(2) The treatment effect is smaller for respondents studying in Taiwan than in the Netherlands.

For the second hypothesis, I conjecture this result because as the literature points out, self-stigma and social stigma tend to be more evident and prevalent in Chinese-cultured society, especially social-stigma (Hui et al., 2014; Kramer et al., 2002), this cultural difference might manifest itself in the different magnitude of the treatment effects between respondents studying in the Netherlands and in Taiwan. I discuss the cultural difference in more details in Section 4.1 below.

(3) Treated respondents giving more serious responses to the self-reflection question have higher WTP than those giving less serious responses.

For the third hypothesis, I expect this correlation because if treated respondents give serious responses, to some extent their deeper self-reflection will lead to a higher understanding of their mental and emotional state, which may lead to higher self-awareness (Morin, 2011), thus leading to higher WTP.

4. Analysis

I recorded the responses of 352 respondents. Of these, 289 respondents reached the randomization phase, being allocated to either the treatment or control group, and 238 respondents completed the survey. Of these 238 respondents, 3 of them identified their gender as non-binary or prefer not to say. For the sake of statistical power, I exclude them and focus on the 235 respondents to do the analysis.

4.1 Randomization check and Attrition

I conduct a randomization check on these 235 respondents to test whether treated samples and control samples are balanced across a variety of pre-treatment characteristics. Table 1 shows that most pre-treatment characteristics are balanced between the two groups except for age, raised in the non-Asia Pacific region, and whether receiving any mental health support. The respondents in the treatment group are a little older than the ones in the control group. There are slightly more Westerners⁵ in the control group. Lastly, there are slightly more respondents that are receiving any mental health support in the treatment group, and it happened that the only 3 out of 235 respondents that are receiving mental health app treatment are all allocated in the treatment group, leading to the imbalance in the Digital apps category. Overall, these differences are minor, and to avoid any potential bias, I also control these covariates in the regression models when doing parametric tests.

I also check whether randomization worked on the full sample. I include all the 289 respondents who at least reached the randomization stage. Table A.1 shows that a slight difference in digital app users exists between the two groups, which is the same case as just mentioned. I further do a differential attrition test, which checks whether the respondents in the treatment group are more or less likely to finish the survey, and the results in Table A.2 show that there is no difference. Therefore, I conclude no differential attrition exists.

⁵ I classify respondents who were not raised in the Asia Pacific region as Westerners, which is a simple way to dichotomize the respondents based on raised region as the percentage of Asia Pacific raised respondents account for around 71% of the whole sample, which is a predictable number consisting of almost every respondent collected from Taiwan and a proportion of Asia Pacific raised respondents studying in the Netherlands.

Table 1: Balance Tests

Treatment	Control	Treatment	p-value
Age	21.80	22.68	0.03**
Female	0.59	0.66	0.28
The Netherlands	0.46	0.45	0.90
Westerner	0.35	0.28	0.04**
Master's	0.38	0.41	0.73
Mom's Education	0.69	0.64	0.47
Dad's Education	0.67	0.70	0.63
Low Mental Health	0.06	0.06	0.86
Financial Stress	0.13	0.19	0.27
PHQ4 score	3.61	3.71	0.78
Any Support	0.35	0.46	0.07*
Professionals	0.05	0.10	0.21
Coaching	0.009	0.008	0.95
Digital apps	0.00	0.02	0.10*
Family or friends	0.29	0.33	0.43
Observations	235	235	

Note: The table shows the pre-treatment characteristics for my sample that are divided into Treatment and Control groups. T-tests were used to assess whether the distribution of these variables is significantly different between Treatment and Control. The third column reports p-values. Age is a continuous variable of the age of the respondent. Female gets value 1 if the respondent identifies as the female gender. The Netherlands gets a value of 1 if the respondent is studying at a Dutch university. Westerner gets value 1 if the respondent was raised outside of the Asia Pacific region. Master's is a dummy that gets value 1 if the respondent is a Master's student. Mom's Education and Dad's Education get value 1 if the respondent's mother and father, respectively, have an education level above (including) the bachelor's. Low Mental Health gets value 1 if the self-reported mental health of the respondent is "Very Bad" or "Somewhat Bad". Financial Stress gets a value of 1 if the respondents report that the current financial situation is "Always stressful" or "Often stressful". PHQ4 score is a continuous variable for a diagnostic measure of the respondent's mental health by asking about their mental state over the last two weeks before the survey. This variable is measured after the allocation of the respondents to the Treatment, which does not affect the PHQ4 score. Any Support is a dummy variable that gets value 1 if the respondent is receiving from one of the following support sources: Professionals (i.e., GP, psychologists, psychiatrists, and counselors), Coaching, Digital Apps, Family, or friends. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

I gathered responses from both Taiwan and the Netherlands. To ensure that the two groups of respondents are comparable, I do a similar randomization check. Table A.3 shows that all pre-treatment characteristics are balanced between the two groups, with the exception of *Age* and *Master's*. Specifically, students studying in the Netherlands are slightly older than those studying in Taiwan. This difference, combined with the

difference in the education system⁶, may explain why there is a noticeable difference in the proportion of master's students between the two groups.

Overall, the results show that these two groups are comparable in these pre-treatment characteristics. Given the documented differences between Chinese people and westerners discussed in Section 2.1 and the differences in estimated scores⁷ in Hofstede's 6-D model used to understand cultural differences across countries (Hofstede, 2011), I conclude that the main differences between the respondents in Taiwan and the Netherlands are cultural differences.

4.2 Descriptive

WTP

Of these 235 respondents, 112 of them were allocated to the control group; 123 to the treatment group. In terms of study country, 106 of them are studying in the Netherlands; 129 are in Taiwan. On a scale of 0 to 5\$ with 0.5\$ as an interval, on average, the respondents in the control group are willing to pay 1.91\$ while the respondents in the treatment group are willing to pay 2.09\$. Figure B.1 shows the confidence interval of both mean WTP. Figure 1 displays the distribution of WTP and that the number that is chosen by most respondents is 0\$. Figure B.2 and Figure B.3 also show that the distribution of WTP of both the treatment and control groups are very similar.

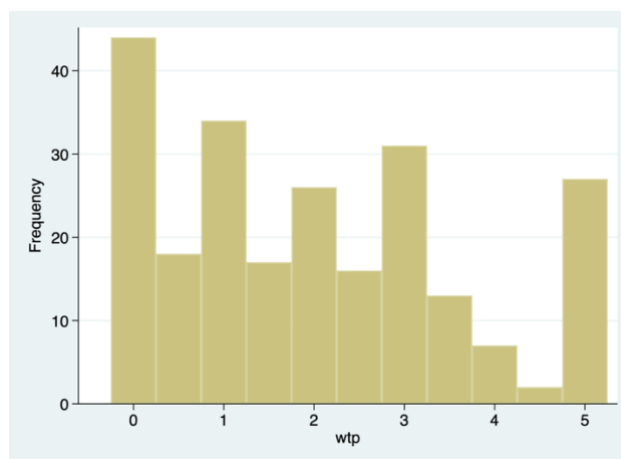


Figure 1: Distribution of WTP

⁶ In Taiwan, bachelor's programs last four years, and some medicine or law-related study programs require a longer time. In contrast, most bachelor's programs in the Netherlands require only three years, so many first-year master's students are 21 years old.

⁷ Figure A.1 shows the comparison of the values of the 6 dimensions. Specifically, the evident difference in individualism, masculinity, and indulgence may contribute to the possible heterogeneous treatment effect conjectured in hypothesis 2.

PHQ-4, Professional Support, and Self-reported Well-being

Error! Reference source not found. illustrates that a bulk of respondents have a PHQ-4 score between 0 and 4. If using Kroenke et al. (2009)'s way to assess how serious a person's mental problems are⁸ and if a person's PHQ-4 score suggests anxiety or depression⁹, I find that 63.40% of all respondents have mild, moderate, or severe mental problems, 22.98% may have anxiety, and 20.85% may have depression. These numbers correspond to the concurrent student mental health crisis (Abrams, 2022). Figure 4 shows the distributions of PHQ-4 scores of the two study countries. Although the means of two countries are not significantly different ($p = 0.53$), a chi-square test of independence reveals a significant association between PHQ-4 score and study country ($\chi^2(12, N = 235) = 26.10, p = 0.01$), with a large proportion of students in Taiwan having a score of 4 and generally having higher scores than students in the Netherlands.

Turning to the motivation behind this paper, **Error! Reference source not found.** illustrates that respondents with high PHQ-4 scores have a low rate of receiving professional mental health support, which I define as those who are receiving support from psychologists/psychiatrists or other professional counselors, coaching, and mental health apps¹⁰. More specifically, only 22% of people with severe mental health problems are receiving professional support, which matches Barney et al. (2006)'s finding. Instead, I find that in my data, half of the respondents with a median PHQ-4 score such as 7 are receiving professional support.

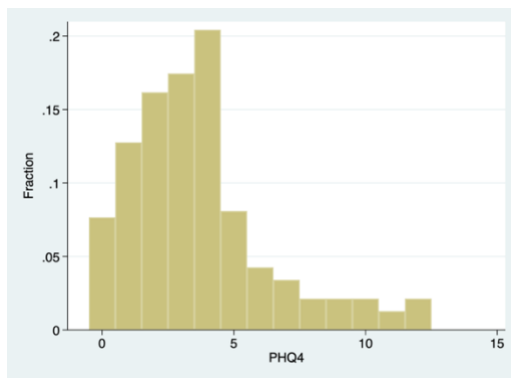


Figure 2: Distribution of PHQ-4 score

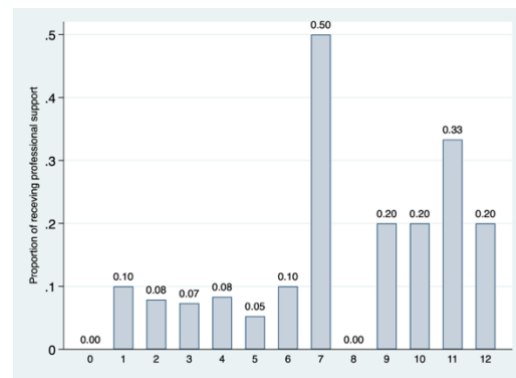


Figure 3: Receiving professional mental health support by PHQ-4 score

⁸ The PHQ-4 scores are rated as normal (0-2), mild (3-5), moderate (6-8), and severe (9-12). Figure B.4 shows the distribution of respondents' mental health status.

⁹ Total score ≥ 3 for the first 2 questions suggests anxiety; Total score ≥ 3 for the last 2 questions suggests depression.

¹⁰ Not all of the mental health apps in the market are scientifically proven effective, but the decision of classifying mental health apps as professional support should not bias the results as only 3 out of 235 respondents are receiving this treatment.

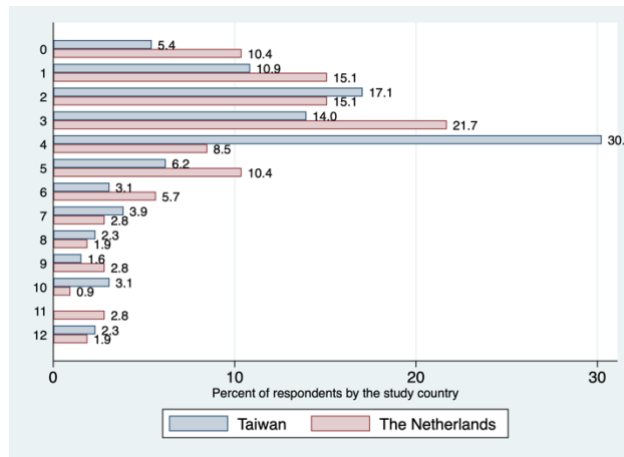


Figure 4: PHQ-4 score distribution by the study country

In addition, I also find that the correlation coefficient of respondents' self-reported well-being and their PHQ-4 score is -0.45^{11} , which is only moderately correlated. This number may support the finding that one of the prominent barriers to mental health seeking is that people do not understand their mental health (Hui et al., 2014; Salaheddin & Mason, 2016).

PHQ-4/Professional Support vs. WTP

As I mentioned in Section 2.2, WTP is a proxy for the demand for mental health care. Figure 5 shows that the respondents with high PHQ-4 scores (such as 11 and 12) are willing to pay quite little for the app, which counters the intuition that those with more serious mental problems should have a higher demand for mental health support. As for the correlation between receiving professional support and WTP, following the theory, on average, respondents who are receiving professional support pay more than respondents who are not ($Diff = 0.598, p = 0.09$).

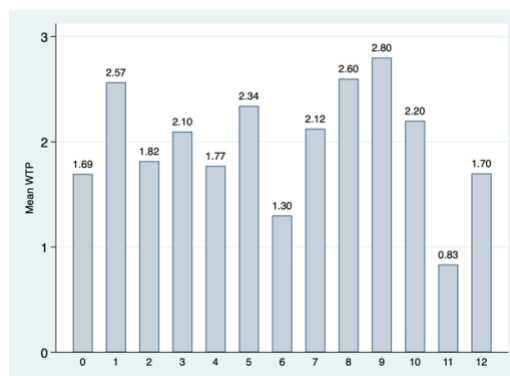


Figure 5: Mean WTP by PHQ-4 score

¹¹ The number is negative as their self-reported well-being is better if the number is larger, while it is the opposite for the PHQ-4 score.

Other Control Variables vs. WTP

I document some correlations between covariates and my dependent variable – WTP. To begin with, even though the relationship is not statistically significant, on average, female respondents pay more than male respondents ($M_{male} = 1.91, M_{female} = 2.06, p = 0.51$). Though not statistically significant, in the control group, respondents studying in Dutch universities pay more than ones studying in Taiwanese universities ($M_D = 2.21, M_T = 1.95, p = 0.38$); while it is the opposite in the treatment group ($M_D = 1.81, M_T = 2.03, p = 0.47$). Additionally, in the treatment group, Asia-pacific born respondents pay more than Westerners ($M_A = 2.24, M_W = 1.57, p = 0.06$). Lastly, in the control group, Master's students significantly pay more than Bachelor's ($M_B = 1.70, M_M = 2.26, p = 0.07$). Figure B.5 shows the correlations between all the control variables I use in the analysis and WTP. Lastly, I explore more correlations between WTP and demographic characteristics in Appendix 0.

Text Theme Analysis of the Treated Respondents

Besides quantitative analysis, I also do some text analysis on the treated respondents' answers to the well-being text entry question. I summarize the main themes below¹², and I perform a quantitative analysis of the text sentiment in Appendix 0.

Positive:

- Know what their goals are, feel like they are growing, feel like they are becoming who they want to be
- Already satisfied with what they have
- Friends, relationships, and family are good

Negative:

- School, group assignments, peer pressure, and thesis are stressing them out
- Worrying about what to do after graduation and whether to go back to their home country
- Homesickness: miss their family and friends in their home country
- Applying for jobs takes too much time and is too stressful
- Lack of sleep. Having little time to do what they really like

¹² In my data, negative responses are much more common than positive responses, which indicates the prevalence of mental illness among university students (Abrams, 2022) once again.

4.3 Main Results

Empirical specification

I assess whether taking the self-reflection treatment changes respondents' demand for mental health support using WTP as a proxy. I estimate the following OLS regression model:

$$Y_i = \beta_0 + \beta_1 treatment_i + \beta X_i + \epsilon_i \quad 4.1$$

where Y_i is the outcome of interest: WTP for the app on a scale from 0 to 10\$, and $treatment_i$ is a binary indicator for whether the respondent takes the treatment. X_i includes all available control variables including Age, Female, The Netherlands, Westerner, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. ϵ_i is an individual-specific error term. I will display robust standard errors throughout.

Main effect

Column 1 and column 2 of Table 2 present the effect of the self-reflection treatment on WTP without and with controls respectively, which shows that the treatment effect of interest does not change much. In order to minimize the residual variance, which improves the precision of the coefficient of interest, without further mention, I display and discuss the results with controls in the following analyses. Column 2 of Table 2 suggests that on average, the treatment effect is not statistically significant ($p = 0.55$). In terms of effect size, the self-reflection treatment increases the WTP by 8.50% of the standard deviation of the control respondents. Based on this result, I reject the first hypothesis I proposed.

Table 2: Main Results

	<i>Dependent variable:</i>	
	WTP (1)	WTP (2)
Treatment	0.179 (0.209)	0.134 (0.221)
Observations	235	235
Controls	NO	YES
Control group mean	1.911	1.911

Note: Both specifications are OLS models. Robust standard errors are reported in parentheses. Control variables include Age, Female, The Netherlands, Westerner, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Result 1. *On average, the self-reflection treatment does not significantly increase the WTP for the mental health app. Therefore, I reject the first hypothesis.*

4.4 Heterogeneity

I conjectured that three main heterogeneities – gender, subjects’ mental health, and study country, were worth exploring in my baseline results before the experiment.

First, females being more at risk of having mental illnesses such as anxiety and depression is among the most robustly documented phenomena in the mental health literature (McLean et al., 2011; Parker & Brotchie, 2010; Riecher-Rössler, 2017; Salk et al., 2017). I also find that on average, female respondents have a higher PHQ-4 score than male respondents ($p < 0.01$). Besides, the two genders’ attitudes toward mental health care are different. Women tend to have a more positive attitude toward mental illness, and, in consequence, are more in favor of psychotherapy (Holzinger et al., 2012; Wendt & Shafer, 2016). However, Wendt & Shafer (2016) identified that men showed similar attitudes as women toward informal help-seeking regardless of the problem but were less likely to seek formal help such as professional psychotherapy for depression. Lastly, female patients seem to be rejected by the public less than male patients (Holzinger et al., 2012), which could lead to a difference in the social stigma of men and women. All of these factors might contribute to the heterogeneous effect of the intervention between the two genders.

Second, it is very natural for people to think that people with worse mental health before taking the survey are more willing to pay for the mental health app, and the treatment effect on the treated subjects with worse mental well-being could be larger because they are more in need of this kind of app. Even though it seems not to be the case of my respondents as Figure 5 suggests, I still estimate the heterogeneous treatment effect on different levels of baseline mental health.

For the possible mechanism driving the heterogeneous effect by the study country, please refer to Section 3.

Empirical specification

I assess the heterogeneity of treatment effect on respondents’ demand for mental health support using WTP as a proxy. I estimate the following OLS regression model:

$$Y_i = \eta_0 + \eta_1 treatment_i \times X_i^* + \eta X_i + \epsilon_i \quad 4.2$$

where Y_i is the outcome of interest: WTP for the app, X_i^* is one of the heterogeneities of interest, and $treatment_i \times X_i^*$ is an interaction term of treatment and one of the heterogeneities. X_i includes all available control variables including Age, Female, The Netherlands, Westerner, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. ϵ_i is an individual-specific error term.

Results

Figure C.1 suggests that there is no heterogeneous treatment effect by gender. A reason for this could be that I asked respondents to state their WTP for a mental health app, which is not traditional professional health seeking such as psychiatrists, so men do not show different attitudes than women toward it (Wendt & Shafer, 2016). Figure C.2 suggests that there is no heterogeneous treatment effect by subjects' baseline mental health, for which I use the four-category classification by PHQ-4 score.

However, I documented a statistically significant heterogeneous treatment effect by the study country. The statistically significant ($p = 0.097$) interaction term in Table 3 indicates that the treatment works differently on respondents studying in the Netherlands and in Taiwan. Specifically, on average, the self-reflection increases the WTP by 0.453\$ for treated students in Taiwan, the magnitude of which is 0.319\$ larger compared to the insignificant general effect of treatment for all respondents shown in Table 2. In contrast, on average, the effect of the self-reflection treatment for students in the Netherlands is -0.271\$ (0.453 – 0.724). These results correspond to the WTP by studying country descriptive results in Section 0. Figure C.3 displays graphically the difference in the treatment effect between two groups of respondents. The heterogeneous treatment effect for students in Taiwan is significantly different from zero at a 10% significance level ($p = 0.099$) while the effect for students in the Netherlands is not ($p = 0.45$).

To further decrease the error variance, leading to a more precise estimation of the treatment effect of interest, I also split the sample and run equation 4.1 by the study country. Table C.1 confirms that the treatment works on students studying in Taiwan, and in terms of effect size, the self-reflection treatment increases WTP by 34.4% of the standard deviation of the control group. Besides, Table C.2 confirms that the treatment does not work on students studying in the Netherlands, and the effect is negative.

I explore the potential mechanisms through which the self-reflection treatment could have an effect on WTP for students studying in Taiwan in Section 4.5.

Table 3: Heterogeneous treatment effect by the study country

	<i>Dependent variable:</i>
	WTP
Treatment	0.453* (0.273)
The Netherlands	0.350 (0.334)
Treatment * The Netherlands	-0.724* (0.434)
Observations	235
Controls	YES
Control group mean	1.911

Note: This specification is an OLS model. Robust standard errors are reported in parentheses. Control variables are Age, Female, Westerner, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Result 2. *The self-reflection treatment does not lead to heterogeneous effects by gender and baseline mental health. However, the treatment leads to heterogeneous effects by the study country. Specifically, it only increases the WTP for students in Taiwan. Therefore, I reject the second hypothesis that the treatment effect is smaller for respondents studying in Taiwan than in the Netherlands.*

4.5 Mechanisms

I use the following specification to explore which mechanisms that I proposed in Section 3 drive the effect of the self-reflection treatment on WTP:

$$Y_i = \gamma_0 + \gamma_1 treatment_i + \gamma X_i + \epsilon_i \quad 4.3$$

where Y_i is one of the possible mechanisms, and $treatment_i$ is an indicator for receiving treatment. X_i includes all available control variables including Age, Female, The Netherlands, Westerner, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4.

For the five mechanisms, I construct an index by adding all the questions measured in the Likert scale for *self-awareness* and *self-stigma*; *perceived effectiveness of mental health apps*, *perceiving mental illness as not serious enough*, and *social stigma* are all measured in the Likert scale. I standardize all these metrics into a Z score respectively using the mean and standard deviation of the control group, so they can be used in the regressions as continuous variables. I use bar charts to display the distribution of responses to each mechanism question by treatment groups from Figure D.1 to **Error! Reference source not found.**

Table 4 shows that none of the proposed five mechanisms works on the whole sample from the insignificance of the coefficients. However, as I documented in Result 2, the treatment leads to heterogeneous effects by the study country. Specifically, it only increases the WTP for students in Taiwan. Therefore, I split the sample by the study country and estimate equation 4.3 to explore if any mechanism works for either group. Table 5 shows that the app effectiveness belief increases following the treatment for students studying in Taiwan. In terms of effect size, the treatment increases the app effectiveness belief by 32% of the standard deviation of the control group.

Table 4: Mechanisms

	<i>Dependent variable:</i>				
	Self-Awareness	Self-stigma	App Effectiveness	Not Serious Enough	Social-stigma
Treatment	0.061 (0.131)	0.006 (0.138)	0.075 (0.136)	-0.065 (0.124)	-0.099 (0.134)
Observations	235	235	235	235	235
Controls	YES	YES	YES	YES	YES
Control group mean	0	0	0	0	0

Note: All specifications are OLS models. Robust standard errors are reported in parentheses. I z-score all the mechanisms questions, meaning I subtract the mean of the control group and divide it by the standard deviation of the control group, so the control group means are all 0. Control variables include Age, Female, The Netherlands, Westerner, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 5: Mechanisms by the study country

	<i>Dependent variable:</i>				
	Self-Awareness	Self-stigma	App Effectiveness	Not Serious Enough	Social-stigma
Taiwan					
Treatment	0.074 (0.172)	-0.093 (0.184)	0.320* (0.172)	-0.098 (0.160)	-0.196 (0.187)
Observations	129	129	129	129	129
Controls	YES	YES	YES	YES	YES
Control group mean	0	0	0	0	0
The Netherlands					
Treatment	-0.015 (0.192)	0.213 (0.213)	-0.213 (0.226)	0.010 (0.194)	0.100 (0.189)
Observations	106	106	106	106	106
Controls	YES	YES	YES	YES	YES
Control group mean	0	0	0	0	0

Note: All specifications are OLS models. Robust standard errors are reported in parentheses. I keep respondents studying in a university in either Taiwan or The Netherlands. I z-score all the mechanisms questions, meaning I subtract the mean of the control group and divide it by the standard deviation of the control group, so the control group means are all 0. Control variables include Age, Female, Westerner, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

The fact that none of the proposed five mechanisms works on the whole sample as shown in Table 4 inspired me to explore the correlations between each mechanism and WTP. I visualize the 95% confidence interval of these correlations in Figure 6. The significant correlations between these mechanisms and WTP align with my conjectures with one exception: Contrary to expectations, perceiving mental illness as not serious enough is positively correlated with WTP. This finding may be due to the fact that individuals who hold this perception may be less likely to seek professional help and instead rely on self-help methods such as mental health apps, leading to a greater willingness to pay for such tools.

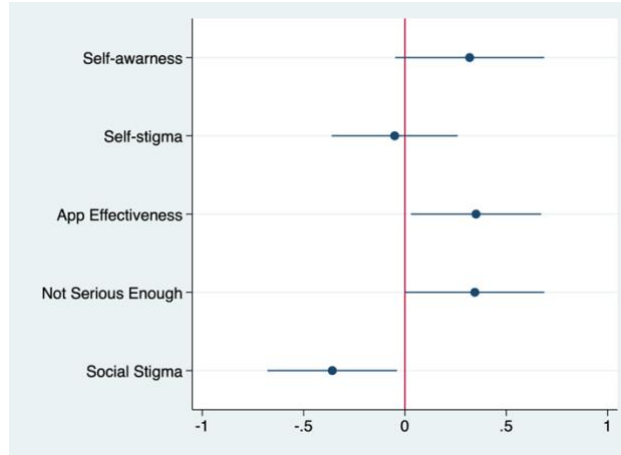


Figure 6: Correlations between WTP and mechanisms

Result 3. *None of the five mechanisms works on the whole sample. However, for students studying in Taiwan, app effectiveness belief is the main driver behind the observed increase in WTP. Finally, self-awareness, app effectiveness belief, perceiving mental illness as not serious enough, and social stigma are significantly correlated with WTP.*

4.6 Robustness checks

The seriousness of the treated text responses

To answer my third and last hypothesis, I explore the correlation of the seriousness of treated respondents' text responses to the self-reflection question and WTP. I use two ways to assess the seriousness of the responses – time spent on the writing task and the character count¹³. For the latter, to be consistent with the English-traditional Chinese difference mentioned in Section 2.2, I time 2.5 to the responses answered in traditional Chinese. Treated respondents are classified as giving serious responses if their time spent/character count is above the median¹⁴ of the treated group. Figure E.1 shows the distribution of time spent on the writing task; Figure E.2 shows the distribution of character counts.

I use the following OLS model to estimate this correlation:

$$Y_i = \varphi_0 + \varphi_1 \text{seriousness}_i + \varphi X_i + \epsilon_i \quad 4.4$$

¹³ To avoid being too subjective on this metric, I use two common measures adopted by researchers to identify whether respondents give serious responses to open-ended questions. However, these measures are not perfect, as a respondent could still provide a non-serious response if they spend a long time or write long sentences.

¹⁴ To avoid bias introduced by extreme responses, I use the median instead of the mean as the threshold.

where Y_i is the outcome of interest: WTP for the app, $seriousness_i$ is assessed by either time spent or character count, and X_i includes all available control variables including Age, Female, The Netherlands, Westerner, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. ϵ_i is an individual-specific error term.

Table E.1 shows that time spent is significantly negatively correlated with WTP ($p = 0.09$), while character count is positively correlated with WTP, although not significantly ($p = 0.25$). The correlation coefficient between seriousness, assessed by time spent and character count, is 0.11, indicating that spending more time on the self-reflection question does not necessarily result in a longer response. This suggests that respondents who spend a lot of time may have trouble understanding and expressing their mental health, resulting in a lower WTP, which indicates a lower demand for mental health support. This finding aligns with the existing barrier to care-seeking where people may not understand their mental health well enough (Hui et al., 2014; Salaheddin & Mason, 2016).

Result 4. *Treated respondents giving more serious responses to the self-reflection question do not have higher WTP. Therefore, I reject the third hypothesis.*

Fast and slow respondents

To address the concern that in survey experiments, some people spend too much or too little time completing the survey, I drop the respondents whose completion time lies outside the interval of the 10th to 90th percentile and estimate equation 4.1 again. Table E.2 confirms that the estimates have negligible change compared to those in Table 2. Thus, I conclude that the estimates of the main effect are robust to the potential inattentive respondents.

5. General Discussion

Policy implications of the results

This research identified that for the whole sample, the treatment effect is not significant. Nonetheless, the heterogeneity analysis by the study country shows that it works for students in Taiwan. The possible explanation for why app effectiveness belief serves as a mechanism of the treatment effect is that the self-reflection treatment does let students in Taiwan realize that their mental health is not good, or that they need a personal helper to monitor their mood volatility so that they can know their mental health more easily, and *Moodkit* can satisfy their needs. In terms of policy implications, it could mean that a simple and almost costless intervention (asking people to reflect on their mental well-

being) can lead to a significant increase in the demand for mental health support through an increase in the perceived effectiveness of mental health treatments (such as mental health apps). It is evident that if individuals experiencing mental health issues can recognize their conditions and promptly seek appropriate medical care, significant advantages can be realized.

Limitations and Future Directions

As mentioned in Section 2.2, I reckon using WTP for a mental health app is the best option to serve as a proxy for the demand for mental health support in my study. However, if I had enough resources to do a follow-up study, meaning I get to know if the subjects have sought any mental health care between the first and second survey, I could use this care-seeking behavior as the dependent variable to see if the self-reflection treatment received in the first survey experiment has an effect on it. This way, the measurement of the demand for mental health support can be more precise and direct.

In addition, the treatment in this experimental study is a one-time self-reflection on the subjects' mental health. Future research can investigate the effect of regular self-reflection that lasts for a longer time. As subjects engage in regular self-reflection, they may be more likely to increase their self-awareness (Ackerman, 2020) and have a more thorough understanding of their mental health status. Besides, with regular self-reflection, the difference in the demand for mental health support by the seriousness of respondents' self-reflection might be more salient compared to this study.

Lastly, Result 3 mentions the significant correlation between several mechanisms and WTP. Future research can also manipulate these mechanisms and explore the causal effect of them on the demand for mental health support.

External validity

This study finds that the self-reflection treatment makes students in Taiwan willing to pay more for a mental health app with app effectiveness being the driver of the effect; however, the treatment does not work on students in the Netherlands. Therefore, I conjecture that for different countries and cultures, the direction and magnitude of the treatment effect might be different, leading to the unsure external validity of the treatment effect found in this study. Future research can investigate the effect of self-reflection in different cultural contexts and assess through which channel the self-reflection treatment influences the demand for mental health support.

6. Conclusion

I conduct an online survey experiment aimed to explore whether engaging in self-reflection increases the demand for mental health support among university students in the Netherlands and Taiwan. The results indicate that the self-reflection treatment has a positive effect on the willingness to pay for mental health apps among students in Taiwan. Moreover, the findings suggest that this effect is driven by the perceived effectiveness of mental health apps. Two main directions for future research are to examine the impact of regular self-reflection on mental health support and to conduct similar experiments in other cultural contexts.

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Appendix

A. Randomization check and Attrition

Table A.1: Balance tests (full sample)

Treatment	Control	Treatment	p-value
Age	22.93	22.38	0.25
Female	0.59	0.66	0.22
The Netherlands	0.44	0.46	0.76
Westerner	0.34	0.26	0.13
Master's	0.40	0.38	0.79
Mom's Education	0.69	0.64	0.31
Dad's Education	0.71	0.67	0.44
Low Mental Health	0.05	0.05	0.82
Financial Stress	0.14	0.18	0.30
PHQ4 score	3.61	3.71	0.78
Any Support	0.49	0.55	0.32
Professionals	0.04	0.08	0.16
Coaching	0.007	0.007	0.99
Digital apps	0.00	0.02	0.09*
Family or friends	0.22	0.28	0.27

Note: The table shows the pre-treatment characteristics for our sample that are divided into Treatment and Control groups. T-tests were used to assess whether the distribution of these variables is significantly different between Treatment and Control. The third column reports p-values. Age is a continuous variable of the age of the respondent. Female gets value 1 if the respondent identifies as female. The Netherlands gets value 1 if the respondent is studying in a Dutch university. Westerner gets value 1 if the respondent was raised outside of Asia pacific region. Master's is a dummy that gets value 1 if the respondent is a Master's student. Mom's Education and Dad's Education get value 1 if the respondent's mother and father, respectively, have an education level above (including) the bachelor's. Low Mental Health gets value 1 if the self-reported mental health of the respondent is "Very Bad" or "Somewhat bad". Financial Stress gets a value of 1 if the respondents report that the current financial situation is "Always stressful" or "Often stressful". PHQ4 score is a continuous variable for a diagnostic measure of the respondent's mental health by asking their mental state over the last two weeks before the survey. This variable is measured after the allocation of the respondents to the Treatment, which does not affect PHQ4 score. Any Support is a dummy variable that gets value 1 if the respondent is receiving from one of the following support sources: Professionals (i.e., GP, psychologists, psychiatrists, and counselors), Coaching, Digital Apps, Family or friends. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A.2: Differential attrition tests

	<i>Dependent variable:</i>	
	Finished (1)	Finished (2)
Treatment	0.059 (0.046)	0.064 (0.047)
Observations	289	289
Controls	NO	YES

Note: The specification is an OLS model. Robust standard errors are reported in parentheses. The dependent variable is Finished, which gets value 1 if the respondent has been allocated to the Treatment or Control group and has completed the survey. Control variables are: Age, Female, The Netherlands, Westerner, Master's, Mom's Education, Dad's Education, Self-reported Mental health, and Financial Stress. We include the Self-reported Mental Health variable instead of the PHQ4 score, because most of the respondents who have dropped out did not reach the PHQ4 questions, which were placed at the very end of the survey. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A.3: Balance tests by the study country

Study country	Taiwan	The Netherlands	p-value
Age	21.78	22.85	0.01***
Female	0.60	0.65	0.47
Master's	0.23	0.60	0.00***
Mom's Education	0.65	0.68	0.65
Dad's Education	0.71	0.66	0.46
Low Mental Health	0.06	0.06	0.86
Financial Stress	0.18	0.14	0.45
PHQ4 score	3.76	3.54	0.53
Any Support	0.40	0.42	0.85
Professionals	0.08	0.08	0.95
Coaching	0.02	0.00	0.20
Digital apps	0.02	0.00	0.12
Family or friends	0.29	0.34	0.39
Observations	129	106	

Note: The table shows the pre-treatment characteristics for my sample that are divided by the study country. T-tests were used to assess whether the distribution of these variables is significantly different between respondents studying in Taiwan and the Netherlands. The third column reports p-values. All the variables' explanations are the same as in Table A.1.

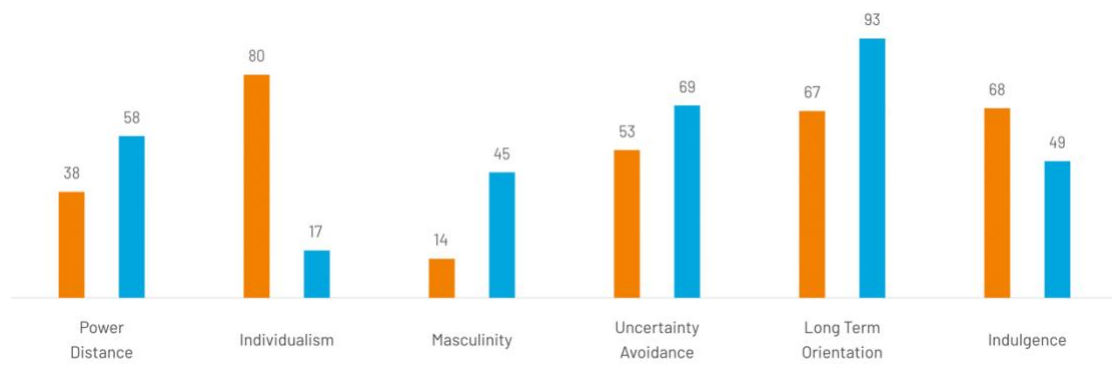


Figure A.1: Cultural differences between the Netherlands and Taiwan

Note: Orange bars display the Netherlands' scores; blue bars display Taiwan's. The higher the score, the stronger that factor is.

Adapted source: Hofstede (2011)

B. Descriptive

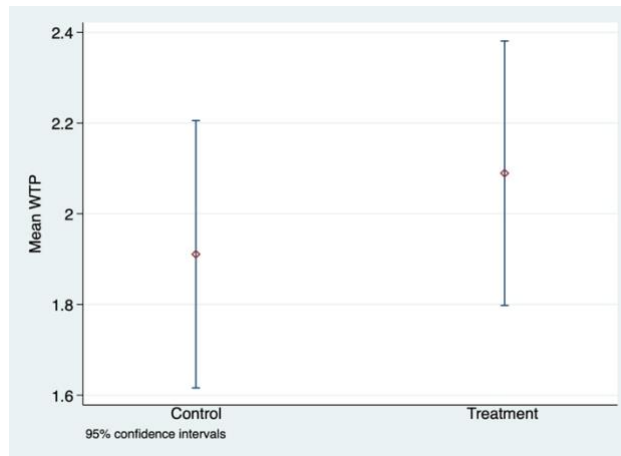


Figure B.1: Confidence intervals of mean WTP by treatment

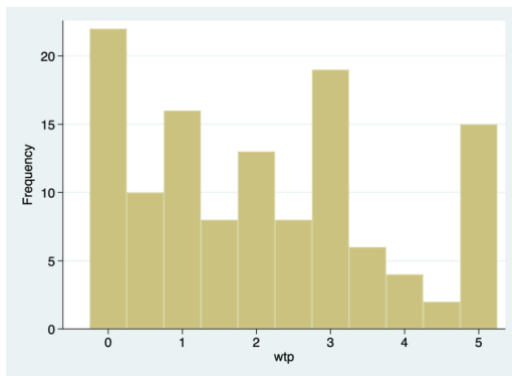


Figure B.2: WTP of the treatment group

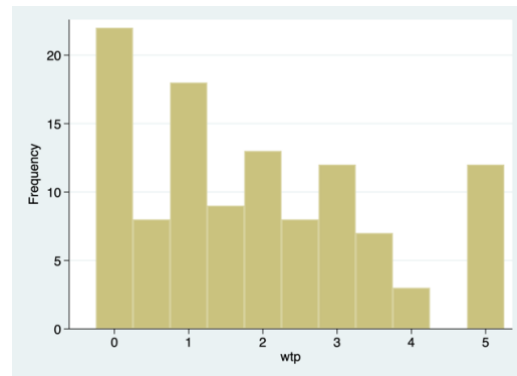


Figure B.3: WTP of the control group

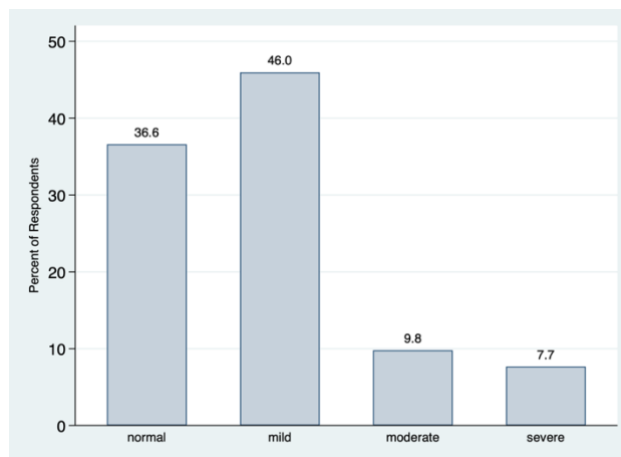


Figure B.4: Distribution of mental health status

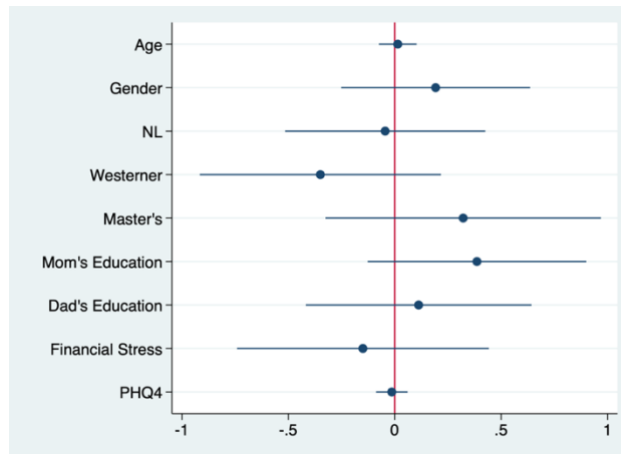


Figure B.5: Correlations of controls vs. WTP

Additional analysis of demographics

Due to the highly diverse background characteristics and the cross-country data collection, I can explore more heterogeneities in my respondents. The most obvious and interesting one is international students¹⁵ studying in both countries. Studies in Western country contexts have pointed out that international students encounter a wide range of challenges including mental well-being (Altinyelken et al., 2020). In my sample, there are 51 international students studying in the Netherlands and 12 in Taiwan. Figure B.6 shows that international students do have a higher WTP, but the difference is not statistically significant ($p = 0.26$).

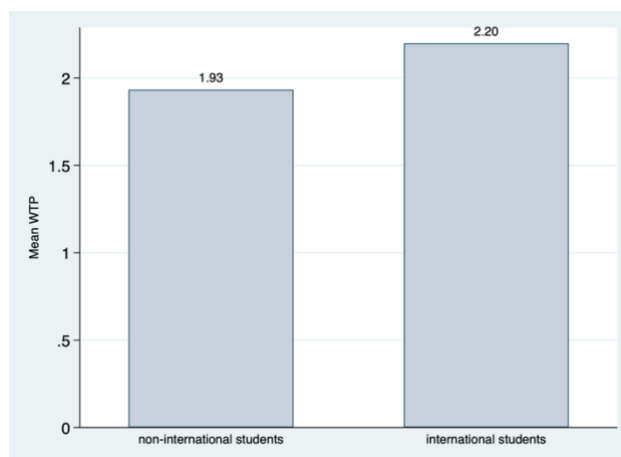


Figure B.6: Mean WTP by whether being international students

Additional analysis on treated text sentiment

As text can reflect people's feelings, I go through respondents' text and classify them into three categories: they are feeling bad, neutral, or good based on the sentiment I

¹⁵ I define international students as those who study on a different continent. Ex: Asian study in the Netherlands.

perceived. I regress WTP on treated respondents' feelings to see if feelings correlate with their WTP as people who feel good are less likely to demand mental health support. Table B.1 shows that this is the case – on average, treated people who felt good, compared to those who feel bad, are significantly less willing to pay for the app by 1.093\$.

I also find that the correlation coefficient is 0.47 between feelings assessed by their text and self-reported well-being. Just as the correlation coefficient I documented between self-reported well-being and PHQ-4 score is 0.45, this moderate correlation implies again that a bulk of respondents actually do not understand their mental health.

Table B.1: WTP by treated respondents' feeling

	<i>Dependent variable:</i>
	WTP
Feeling	
Neutral	-0.163 (0.397)
Good	-1.093** (0.529)
Observations	120
Controls	YES

Note: This specification is OLS model. Robust standard errors are reported in parentheses. I keep all the treated respondents except for three who gave answers unrelated to mental well-being at all. Control variables are Age, Female, Westerner, The Netherlands, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

C. Heterogeneity

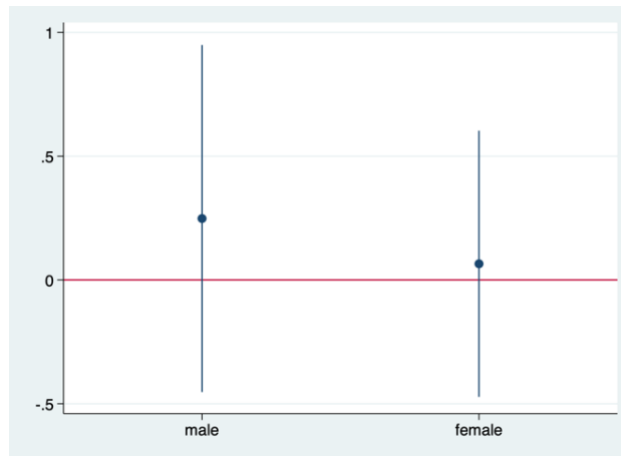


Figure C.1: Heterogeneity by gender

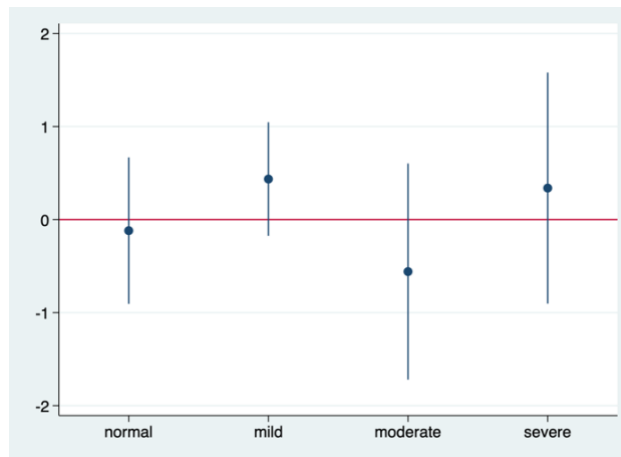


Figure C.2: Heterogeneity by subjects' mental health

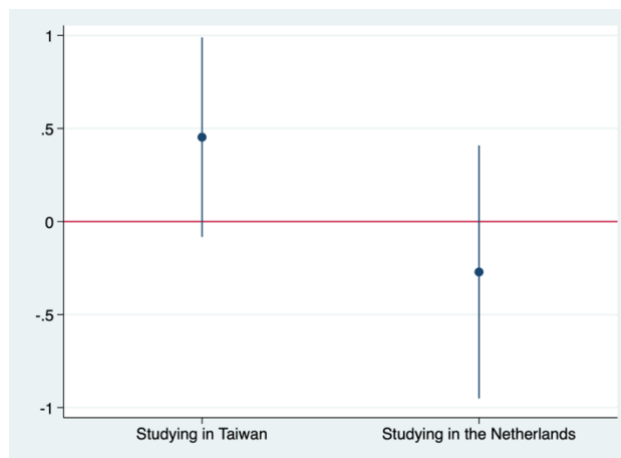


Figure C.3: Heterogeneous treatment effect by the study country

Table C.1: Heterogeneous treatment effects – study country (Taiwan)

<i>Dependent variable:</i>	
	WTP
Treatment	0.483* (0.280)
Observations	129
Controls	YES
Control group mean	1.811

Note: This specification is OLS model. Robust standard errors are reported in parentheses. I only keep respondents who study in a university in Taiwan. Control variables are Age, Female, Westerner, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table C.2: Heterogeneous treatment effects – study country (The Netherlands)

<i>Dependent variable:</i>	
	WTP
Treatment	-0.312 (0.355)
Observations	106
Controls	YES
Control group mean	2.029

Note: This specification is OLS model. Robust standard errors are reported in parentheses. I only keep respondents who study in a university in The Netherlands. Control variables are Age, Female, Westerner, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

D. Mechanisms

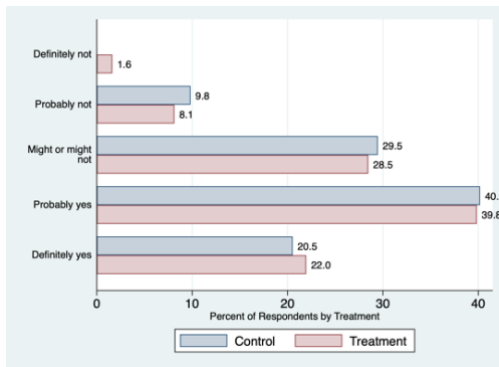


Figure D.1: Mental health awareness

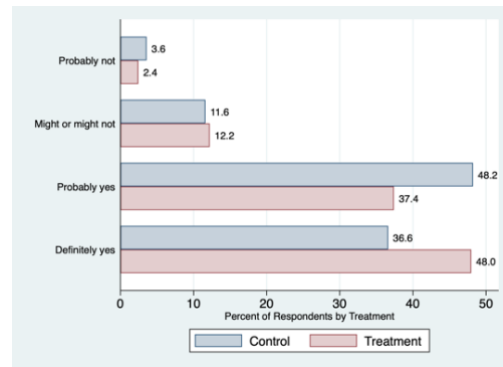


Figure D.2: Ability to identify their mood

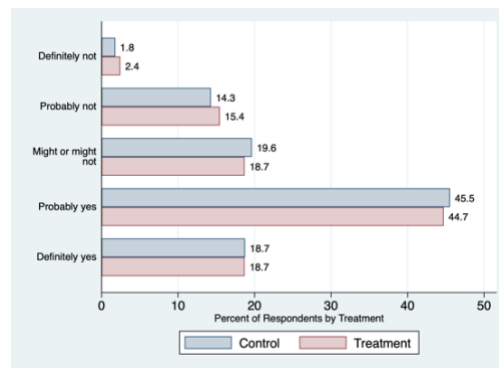


Figure D.3: Ability to know they may need psychological help

Figure D.4: Self-awareness components

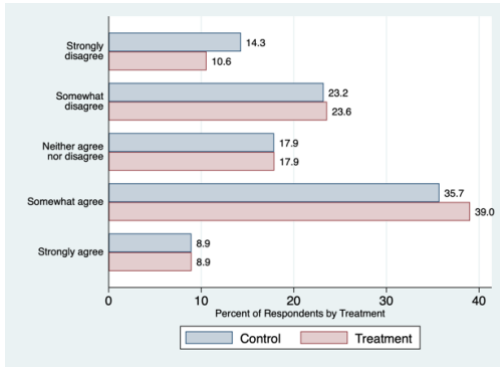


Figure D.5: Feeling worse

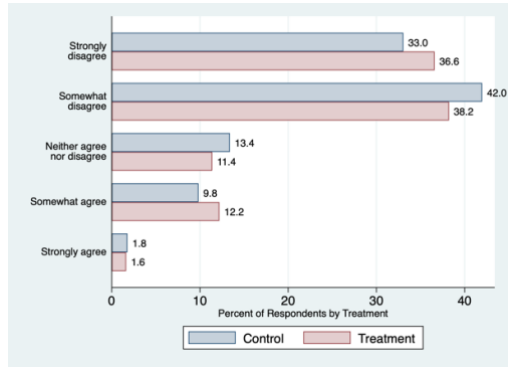


Figure D.6: Feeling less

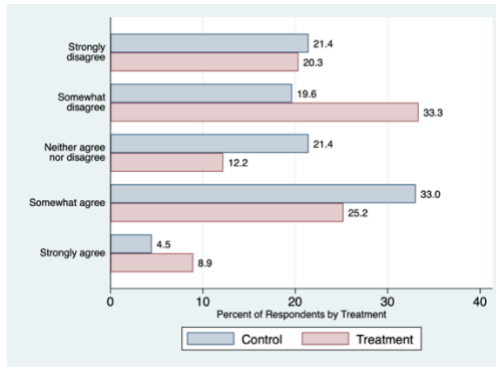


Figure D.7: Self-confidence

Figure D.8: Self-stigma components

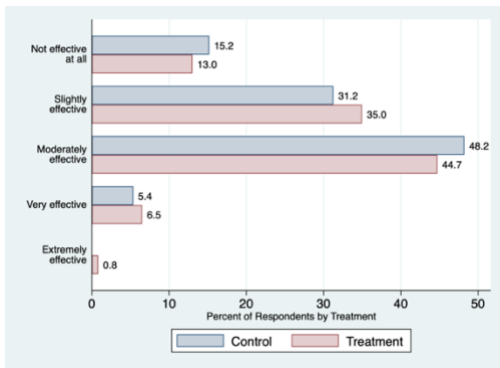


Figure D.9: App effectiveness

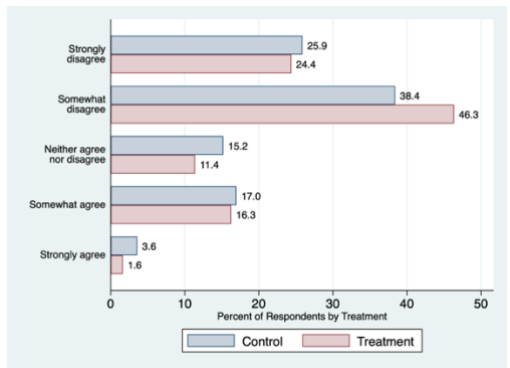


Figure D.10: Belief that mental illnesses is not serious enough

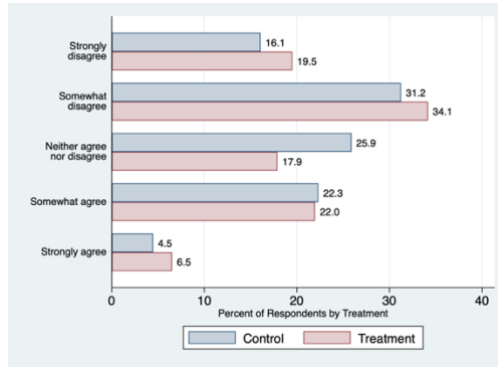


Figure D.11: Social stigma

E. Robustness checks

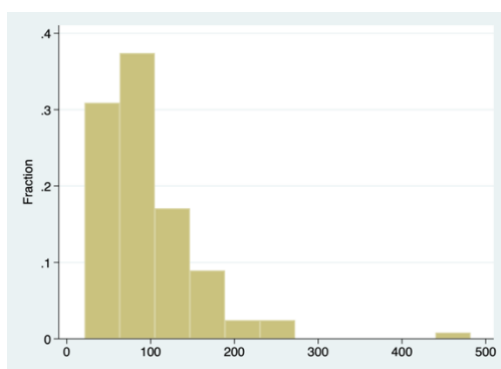


Figure E.1: Time spent distribution

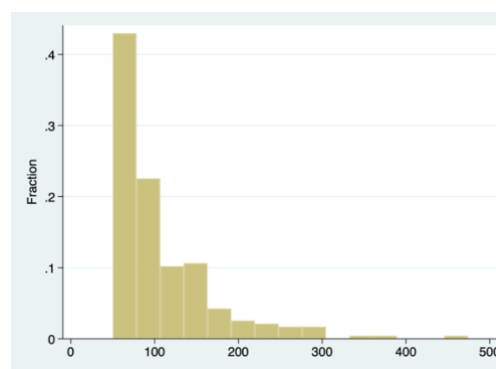


Figure E.2: Character count distribution

Table E.1: Robustness check – the seriousness of the treated text responses

	<i>Dependent variable:</i>
Time spent	WTP
Seriousness	-0.521*
	(0.301)
Character count	
Seriousness	0.338
	(0.292)
Observations	123
Controls	YES

Note: This specification is OLS model. Robust standard errors are reported in parentheses. Control variables are: Age, Female, Westerner, The Netherlands, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. Significance code: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table E.2: Robustness check – fast and slow respondents

	<i>Dependent variable:</i>
	WTP
Treatment	0.128 (0.258)
Observations	189
Controls	YES
Control group mean	1.928

Note: This specification is OLS model. Robust standard errors are reported in parentheses. I drop the respondents whose survey completion time lies outside the interval of the 10th to 90th percentile. Control variables are: Age, Female, Westerner, The Netherlands, Master's, Mom's Education, Dad's Education, Financial Stress, and PHQ4. Significance code: *** p < 0.01; ** p < 0.05; *p < 0.1.

F. Survey

English ▾

Hi! I am a Master's student at Erasmus University Rotterdam, and this is a survey about habits and well-being. On the top right corner you can switch the language to **English or traditional Chinese** to take the survey.

This online survey, which **takes around 5 minutes**, is **completely anonymous**, and you are free to leave the survey at any time though I definitely hope you can complete it. There is **no deception or false information** involved in any stage of the survey.

By completing the survey, you are eligible to enter **a lottery to win 10 euro cash**. Yes, cash, not any kind of voucher!

By clicking NEXT, you explicitly give your consent and agree that:

- I can collect your **anonymous** personal data, and I only use this data for **academic purposes**.
- You confirm that you are a **university student**.
- I reserve the right to exclude respondents from the lottery in case of multiple submitted responses or low-quality/inattentive responses.

If you have any question concerning the survey, do not hesitate to send an email to **640839ss@eur.nl**

Thank you for participating!

English ▾

Do you want to enter the lottery? (if you choose yes, I will subsequently ask for your email address for further contact if you win)

Yes

No

English ▾

Since this survey is completely anonymous, please give your email address for me to contact you in case you win the lottery!

English ▾

What is your age? (in Arabic number)

What is your gender?

Male

Female

Non-binary / third gender

Prefer not to say

Which country are you studying in?

The Netherlands

Taiwan

In which region were you raised?

Asia Pacific (Central & South Asia, Northeastern Asia, Eastern Asia, Southeastern Asia)

Australia and Oceania

Europe (Northern Europe, Southern Europe, Eastern Europe, Western Europe)

Middle East/Africa (Middle East, Northern Africa, Southern Africa)

North America

South America, Central America, Caribbean

English ▾

In what degree program are you currently enrolled?

Bachelor's

Pre-Master's/Master's (including MSc, MPhil, MA, LL.M, Medical Training)

What is the education level of your Mother/Parent A?

Elementary education or lower

Secondary education

Vocational education (MBO)

Bachelor's

Master's

Ph.D.

Not applicable

What is the education level of your Father/Parent B?

Elementary education or lower

Secondary education

Vocational education (MBO)

Bachelor's

Master's

Ph.D.

Not applicable

How well are you doing?

Very bad

Somewhat bad

Neither good nor bad

Somewhat good

Very good

How would you describe your current financial situation?

Always stressful

Often stressful

Sometimes stressful

Rarely stressful

Never stressful

Self-reflection question for the treatment group

English ▾

When you meet someone, a common greeting is "how are you doing?", but perhaps nobody including you has ever seriously thought of how you really are doing, especially mentally/emotionally.

How are you doing in terms of well-being, really? Please write in a couple of sentences.

(There's no right and wrong, and it's completely anonymous.)
(You can answer in any language in which you find it comfortable to express yourself.)

Mental health irrelevant question for the control group

English ▾
Food is a universal language for people from different countries.

Please describe your favorite food and its taste in a couple of sentences.

(There's no right and wrong, and it's completely anonymous)

(You can answer in any language in which you find it comfortable to express yourself)

The dependent variable: WTP

English ▾
Here is **an app for mental health support**. With four integrated tools, this app helps you to engage in mood-enhancing activities such as mindfulness practices, identify and change unhealthy thinking, rate and chart mood across time, and create journal entries using custom templates designed to promote well-being (if you want, you can read more about the app [here](#)). The app has been proven effective in medical trials (e.g., see this [study](#))

What is your stated price to purchase this app? Please move the slider to give your answer (in US dollars).

Once you make a purchase, there is no subsequent fee or subscription required to use this app. No agreement or consequence will be made after you state your price.

(The exchange rate is 1 USD equals 0.94 EUR on 17 March)

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5

Write your price

English ▾

Are you aware of your mental health?

Definitely not

Probably not

Might or might not

Probably yes

Definitely yes

Can you identify your mood, e.g., you can know when you are anxious, angry, thrilled or happy...etc.?

Definitely not

Probably not

Might or might not

Probably yes

Definitely yes

Are you able to know that you may need psychological help?

- Definitely not
- Probably not
- Might or might not
- Probably yes
- Definitely yes

How effective do you think digital apps are for mental health?

- Not effective at all
- Slightly effective
- Moderately effective
- Very effective
- Extremely effective

English ▾

Please indicate to what extent you agree or disagree with the following statements

Even if I know I may have mental illness, I believe it's no big deal, so I don't need to seek help.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

I would feel worse about myself if I had a mental health disorder (for example, depression/anxiety/panic disorder).

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree

- Strongly agree

I would feel less of myself if I received mental health support.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

I would worry about telling my family or friends if I sought professional psychological help.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

At school, the teaching staff and peers think less of students if they know they have mental health problems.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

English ▾

Which type of mental health care are you receiving now?

- Professional support (e.g., visiting a general practitioner, psychologist, psychiatrist or counselor)
- Coaching service
- Digital apps (e.g., medication or self-care apps)
- Support from family or friends
- None

How good was your previous experience of receiving mental health care if any?

- Extremely bad
- Somewhat bad
- Neither good nor bad
- Somewhat good
- Extremely good
- I have not received any mental health care

English ▾

Over the last two weeks, how often have you been bothered by feeling nervous, anxious or on edge?

- Not at all
- Several days
- More than half the days
- Nearly every day

Over the last two weeks, how often have you been bothered by not being able to stop or control worrying?

- Not at all
- Several days
- More than half the days
- Nearly every day

Over the last two weeks, how often have you been bothered by little interest or pleasure in doing things?

- Not at all
- Several days
- More than half the days
- Nearly every day

If you are experiencing mental health issues, remember that **you don't have to deal with this alone!** You can contact your general practitioner or use the university psychologist service if you wish to receive professional treatment. **If you urgently need help, please don't hesitate to dial 113.**

Please help me tick the box if you have read the information.

- I have read the information above