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ORIGINAL RESEARCH

## A discrete-choice experiment to assess treatment modality preferences of patients with anxiety disorder

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### ABSTRACT

**Aims:** The aim of this study was to elicit the preference of patients with an anxiety disorder regarding treatment modalities. Understanding patients' preferences could help optimize treatment uptake and adherence to therapeutic interventions.

**Materials and methods:** A discrete-choice experiment was used to elicit patients' preferences with regard to four treatment characteristics: waiting time until first treatment, intensity of treatment, face-to-face vs digital treatment, and group size. In 12 choice sets, participants were asked to choose between two treatment alternatives. A random parameters logit model was used to analyse the data.

**Results:** A total of 126 participants, aged 18 years and older, currently or in the previous year in treatment for an anxiety disorder, completed the survey. Respondents preferred short (over long) waiting times, face-to-face (over digital) treatment, individual (over group) treatment and a treatment intensity of one session per week rather than two sessions per week or one session every two weeks. Waiting time and treatment intensity were substantially less important to patients than level of digitalization and group size. Heterogeneity in preference was significant for each attribute, and sub-group analyses revealed this was partly related to education level and age.

**Limitations:** The convenience sample over-represented the female and younger population, limiting generalizability. Limited information on background characteristics limited the possibilities to explore preference heterogeneity.

**Conclusions:** This study demonstrated how different treatment components for anxiety disorders affect patients' preferences for those treatments. There is significant variation in treatment preferences, even after accounting for age and education. Incorporating patients' preferences into treatment decisions could potentially lead to improved adherence of treatments for anxiety disorders.

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## Introduction

Anxiety disorders are debilitating disorders<sup>1</sup> and are among the most prevalent of mental disorders worldwide, with a lifetime prevalence of 19.6% in the Netherlands<sup>2</sup>. In 2009, more than one million people in the Netherlands within the age range of 18–64 years were suffering from an anxiety disorder<sup>2</sup>. Anxiety disorders substantially reduce the patients' quality-of-life<sup>3</sup>. Research shows that approximately one out of three people who suffer from either a mood/anxiety disorder, or have symptoms of one of these disorders, waits at least a year to seek professional help<sup>4</sup>. Not seeking treatment reduces quality-of-life for a longer period of time, and could result in a longer time to recovery<sup>4</sup>. The societal costs of anxiety disorders

are substantial. Anxiety and depressive disorders together account for 12 billion days of lost productivity every year worldwide at an estimated cost of US \$925 billion<sup>5</sup>. This means that anxiety and depressive disorders are amongst the most prevalent and expensive disorders worldwide<sup>6–8</sup>.

Different treatments of anxiety disorders have been shown to be effective<sup>9,10</sup>. However, uptake and adherence to treatment is poor, with only one-third of the people with anxiety disorder seeking help for their problems in the past year<sup>2</sup>, resulting in a considerable treatment gap<sup>7</sup>. A possible explanation for low uptake rates is stigma surrounding anxiety disorders<sup>7</sup>, but treatment could also be avoided because people are not aware that treatment could be helpful<sup>11</sup>.

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\*These authors contributed equally to the study.

**Table 1.** Attributes and levels used in DCE.

Attribute	Levels	Modelled in the indirect utility function
Waiting time until first treatment	One week Four weeks Eight weeks	As continuous variable WAITTIME
Intensity of the treatment	Once a week during 8 weeks Twice a week during 4 weeks Once per 2 weeks during 16 weeks	Omitted category As categorical variable TWOWEEK As categorical variable HALFWEEK
Face-to-face vs digital	Face-to-face Digital Partly face-to-face, partly digital	Omitted category As categorical variable DIGITAL As categorical variable COMBI
Group size	Individual Small group (3–5 persons) Large group (6–10 persons)	Omitted category As categorical variable SMALL As categorical variable LARGE

Once in treatment, 20% of patients are estimated to dropout prematurely<sup>12</sup>.

Assessing patients' preferences for treatment modalities and incorporating them into clinical decision-making might be a step towards improving uptake rates, optimizing treatment adherence, and decreasing dropout during treatment<sup>7,13</sup>. Previous preference studies have been conducted for the treatment of mental disorders<sup>13,14</sup>. However, these studies did not specifically target treatment for anxiety disorders, but rather mental disorders in general. A report of the Netherlands Institute of Mental Health and Addiction concluded that it would be beneficial to better understand the preferences of patients with anxiety disorders, as this could reduce the number of protracted care users and the duration of their symptoms or disorder<sup>4</sup>.

Discrete-choice experiments (DCE) are increasingly used to elicit patients' preferences in healthcare<sup>15</sup>. A DCE is a questionnaire in which the respondent repeatedly chooses between hypothetical treatment alternatives<sup>16</sup> that differ on several key characteristics, the so-called attributes (i.e. treatment alternatives differ with regard to the levels of those attributes). A DCE allows us to elicit the preference of respondents towards, and to estimate the relative importance of those attributes<sup>16</sup>, conditional on the range of attribute levels.

The aim of this research was to elicit the preferences of patients with anxiety disorders for treatment modalities using a DCE. Understanding patients' preferences for available treatment modalities may help clinicians and decision-makers to optimize treatment, and thereby potentially reduce the personal and economic burden of anxiety disorders.

## Methods

### Discrete-choice experiment

We elicited patient preferences using a DCE, a commonly used method in choice experiments, based on the random utility theory<sup>17</sup>. In the DCE, patients were repeatedly offered two anxiety treatments (treatment A and B) that varied according to four characteristics (i.e. attributes), and patients were asked to choose the treatment alternative they preferred.

### Attributes and levels

Identifying the relevant attributes and levels is an important step in generating valid results<sup>16,18</sup>. PubMed and Google

Scholar were searched for articles on characteristics that are potentially important in the design of anxiety treatment. Additionally, we searched for studies in the mental health field with information on preference and or adherence, see, for example<sup>15,19,20</sup>. Seven attributes were identified (waiting time until first treatment, intensity of the treatment, face to face vs digital treatment, group size, specialization of the mental health professional, patient's own contribution within the treatment, and effectiveness of treatment). After consultation with two experts in mental health treatment, one client representative, and one DCE expert, the number of attributes was reduced to four (waiting time until first treatment, intensity of the treatment, face-to-face vs digital treatment, and individual vs group treatment), in order to reduce the complexity of the choice tasks. As we were interested in treatment modalities, attributes such as efficacy and cost were not considered. Based on a pre-test with three patients, the understandability and usefulness of the attributes/levels was judged to be appropriate. Only minor changes in the wording of the questionnaire were made. Table 1 shows the attributes with their corresponding levels.

### Experimental design and sample size

A sub-set of the full factorial design was selected for the study, allowing us to estimate all the relevant parameters, without needing respondents to assess each possible treatment profile. A Bayesian efficient experimental design was used to select the treatment profiles using Ngene (v1.1.1)<sup>21,22</sup>. A Bayesian efficient design maximizes the precision of the estimated parameters, by maximizing the D-efficiency, a summary measure of the variance covariance matrix, for a given number of choice questions. The experimental design used *a priori* information about patients' preferences based on expected results (e.g. that shorter waiting time is preferred over longer waiting time) and consultation with experts. An example of a choice set is shown in Figure 1.

Out of the different sources available for determining minimum sample size<sup>23–25</sup>, we started off with the rule of thumb as suggested by Orme<sup>23</sup>, defined as  $500 * (\text{the maximum number of levels (3)}) / (\text{the number of choice tasks (12)}) * (\text{the number of alternatives (2)})$ , indicating that a minimum sample size of 63 respondents was needed to estimate main effects. As this rule of thumb is sometimes insufficient, and to allow for sub-group analyses, we then doubled this

Attribute	Treatment A	Treatment B
Waiting time until first treatment	4 weeks	1 weeks
Intensity of the treatment	Once a week during eight weeks	Once per two weeks during sixteen weeks
Face-to-face vs digital	Completely face-to-face	Partly face-to-face, partly digital
Group size	Individual	Small group (3-5 persons)
Which treatment would you choose? (Tick one box only)	<input type="checkbox"/>	<input type="checkbox"/>

Figure 1. Example question of DCE.

sample size, resulting in a targeted sample size of 126 respondents.

**Participants, measures, and procedures**

Respondents were recruited via social media channels of the Trimbos Institute and other mental health organizations. Participants were included if they were currently, or in the previous 12 months, under any kind of treatment for anxiety, and excluded if they were younger than 18. Prior to entering the study, participants were informed about the aim and procedure of the study, after which they needed to provide consent in order to enter the study.

The main outcome measure of the study was the relative preference for the attributes and levels defined in the DCE, which was elicited using 13 choice sets, including one duplicate choice set to assess test-re-test reliability. This number of choice sets is commonly used in DCEs<sup>15</sup> and was further checked when pre-testing the DCE. The questionnaire elicited self-reported information on demographics, level of education and depression treatment, and measured patients' level of perceived impairment during daily activities (i.e. household, work, and social relationships) on a 1–10 scale, using the Sheehan Disability Scale (SDS)<sup>26</sup>.

The questionnaire was administered online via LimeSurvey<sup>27</sup>. Patients providing consent to participate and satisfying eligibility criteria entered the questionnaire. The questionnaire started with the DCE, which was preceded by a thorough description of each attribute-level and an example of a choice task, to promote consistency in participants' understanding of the choice sets. After completion of the choice sets, respondents were asked to scale the difficulty of the choice tasks on a five-point Likert scale. The questionnaire ended with a section on patients' characteristics, socio-demographics, treatment history, and perceived level of impairment

**Statistical analyses**

The DCE provided us with the patient's preference for each of the attributes used to describe the treatment profiles in each choice set. Responses were analysed using the random utility theory<sup>17</sup>. The model estimates  $V_{ij}$  the utility that a patient  $i$  assigns to a treatment  $j$ .  $V_{ij}$  is modelled as the sum of the utility of each of the attribute levels that make up a treatment profile, plus an error  $\epsilon_{ij}$ , and is specified as:

Table 2. Respondents' characteristics.

Characteristic	n	Percentage
Gender		
Female	113	89.68%
Male	13	10.32%
Age		
18–24	49	38.89%
25–30	25	19.84%
31–40	17	13.49%
41–50	14	11.11%
51–60	19	15.08%
61+	2	1.59%
Education level		
Lower occupational	6	4.76%
Higher occupational	42	33.33%
Academic	78	61.90%
Mean Sheehan Disability Scale		
7.5 or lower	59	46.83%
7.5 or higher	67	53.17%
Treatment history*		
Yes	91	72.22%
No	35	27.78%
Medication used		
Yes	65	51.59%
No	61	48.41%

\* "Besides your current treatment, have you been treated for symptoms of anxiety before?"

$$\begin{aligned}
 V_{ij} = & \beta_0 + (\beta_1 + \eta_{1i}) \text{WAITTIME}_j + (\beta_2 + \eta_{2i}) \text{TWOWEEK}_j \\
 & + (\beta_3 + \eta_{3i}) \text{HALFWEEK}_j + (\beta_4 + \eta_{4i}) \text{DIGITAL}_j \\
 & + (\beta_5 + \eta_{5i}) \text{COMBI}_j + (\beta_6 + \eta_{6i}) \text{SMALL}_j \\
 & + (\beta_7 + \eta_{7i}) \text{LARGE}_j + \epsilon_{ij}
 \end{aligned}$$

where waiting time is a continuous variable and all other variables represent levels of categorical attributes. Waiting time was modelled as a continuous linear variable, as the fit of the model (pseudo-R-squared) was better than when modelling waiting time as a categorical variable, suggesting that a linear relationship was most appropriate. The constant  $\beta_0$  was included in the model to test for a systematic preference for either treatment A or B.  $\beta_1$  to  $\beta_7$  represent the mean attribute utility weights and  $\eta_1$  to  $\eta_7$  are error terms representing individual unexplained variation in utility weights. Effect coding was used to describe all categorical attributes (i.e. treatment intensity, face-to-face vs digital treatment and group size). The levels not included in the regression analysis for treatment intensity, face to face vs digital and group size were "once a week", "face-to-face", and "individual", respectively. They were subsequently estimated from the other levels of the attributes and normalized towards zero. Using effect coding, the preference weights are relative to the mean effect of the different levels of the attributes. The sign of the coefficients indicates whether the attribute level has a positive or negative effect on treatment utility compared to the mean. The range of the beta-coefficients for each attribute was used to estimate the conditional relative importance of each attribute.

A random parameters logit model was fitted to the data using Nlogit, version 5.0<sup>28</sup>. Within this model, the parameter for each attribute-level could vary within the sample due to the specification of the random parameters. The random parameters for all attributes were drawn from a normal distribution. The estimation was conducted using 1,000 Halton

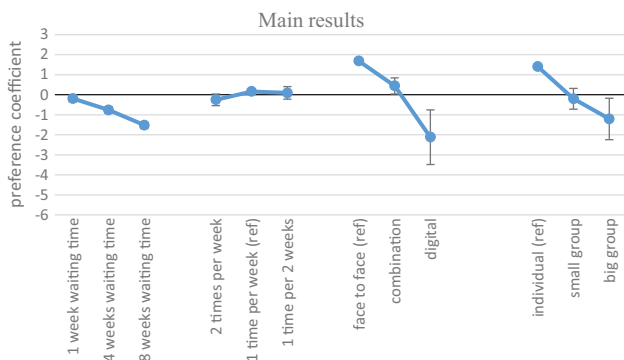
**Table 3.** Main results random parameters logit model.

Attributes and levels	Estimate (95% CI)	<i>p</i> -value <sup>a</sup>	SD	Conditional relative importance
Constant	0.05 (−0.14, 0.24)	0.60		
Waiting time				16.1%
Per 1 week	−0.19*** (−0.26, −0.13)	0.00	0.16*** (0.09, 0.24)	
Treatment intensity (reference level: once a week)	0.16* (−0.02, 0.34)			5.0%
Twice a week	−0.25*** (−0.43, −0.08)	0.00	0.29* (−0.02, 0.59)	
Once per 2 weeks	0.09 (−0.08, 0.26)	0.29	0.31** (0.01, 0.61)	
Face-to-face vs digital (reference level: face-to-face)	1.68*** (1.10, 2.26)			47.2%
Digital	−2.12*** (−2.59, −1.64)	0.00	1.36*** (1.00, 1.71)	
Combination	0.44*** (0.25, 0.63)	0.00	0.40*** (0.11, 0.68)	
Group size (reference level: individual)	1.41*** (1.05, 1.77)			31.8%
Small	−0.20** (−0.38, −0.17)	0.03	0.52*** (0.25, 0.79)	
Large	−1.21*** (−1.54, −0.88)	0.00	1.03*** (0.70, 1.35)	

Data presented as estimate (95% CI).

<sup>a</sup> *p*-value was estimated in a joint model with interaction terms.

\**p* < 0.1; \*\**p* < 0.05; \*\*\**p* < 0.01. Pseudo-*R*<sup>2</sup> = 0.39. Log likelihood = −634.6.

**Figure 2.** Main results random parameters logit model with standard deviation.

draws<sup>29,30</sup>. The random parameters logit model shows attributes for which preference variation is significant. However, it does not explain why these levels are preferred<sup>18</sup>. To learn more about possible variation in preferences, several sub-group analyses were conducted, taking scale heterogeneity into account. The sub-group analyses were conducted for sub-groups defined by age, education level, and level of perceived impairment when suffering from an anxiety disorder. Sub-groups for each of the three variables were defined by splitting the sample across the median. To assess significant differences between sub-groups, joint models were estimated using interaction terms to investigate potential preference heterogeneity amongst people from different sub-groups.

## Results

### Respondents' characteristics

The questionnaire was completed by 126 out of 247 participants that started the questionnaire. The 121 participants not completing the questionnaire were excluded from the analysis. The final sample of 126 completers consisted of 13 male (10.3%) and 113 (89.7%) female participants. Respondents' characteristics are presented in Table 2.

Respondents rated the difficulty of the DCE task on a five-point scale (1 = extremely easy to 5 = extremely difficult) with a 2.81 average, which lies between easy (= 2) and neutral (= 3); 72.2% of the completers rated the questionnaire

as not difficult (score  $\leq 3$ ). A total of 111 (88.1%) participants chose the same treatment alternative in the test–re-test question, suggesting high reliability and consistency in respondents' choices.

### Patients' preferences

The main results of the random parameters logit model are presented in Table 3 and Figure 2. The positive coefficient in the treatment intensity attribute, and the fact that the 95% confidence intervals did not overlap shows that respondents had a preference for treatment once a week compared to twice a week. Respondents also preferred face-to-face treatment compared to digital treatment. A combination of face-to-face and digital treatment was preferred over digital treatment only. For the attribute group size, individual treatment was significantly preferred over treatment in small groups and large groups and a small group was preferred when respondents had to choose between a small and a large group. Lastly, respondents preferred short waiting times. The non-significant constant indicated there was no systematic preference for either treatment A or B.

The conditional relative importance for the attributes face-to-face vs digital (47.2%) and group size (31.8%) was substantially larger than the conditional relative importance for waiting time (16.1%) and treatment intensity (5.0%), indicating that the first two attributes were more important to respondents when choosing between alternative treatment options. Moreover, the results indicate that patients are willing to accept a combination of face-to-face and digital treatment instead of face-to-face treatment alone, if it is accompanied by a 6–7 week reduction in waiting time (as the loss in utility of  $1.68 - 0.44 = 1.24$  is then offset by a gain in utility of  $6.5 \times 0.19 = 1.24$ ).

McFadden's Pseudo *R*-squared showed a model fit of 0.39, which can be considered a good fit<sup>31</sup>. The standard deviation parameters were statistically significant for all attributes, suggesting significant heterogeneity among the respondents resulting in variation in the importance of the attribute/level across respondents.

**Table 4.** Differences between older and younger respondents in preferences for anxiety treatment.

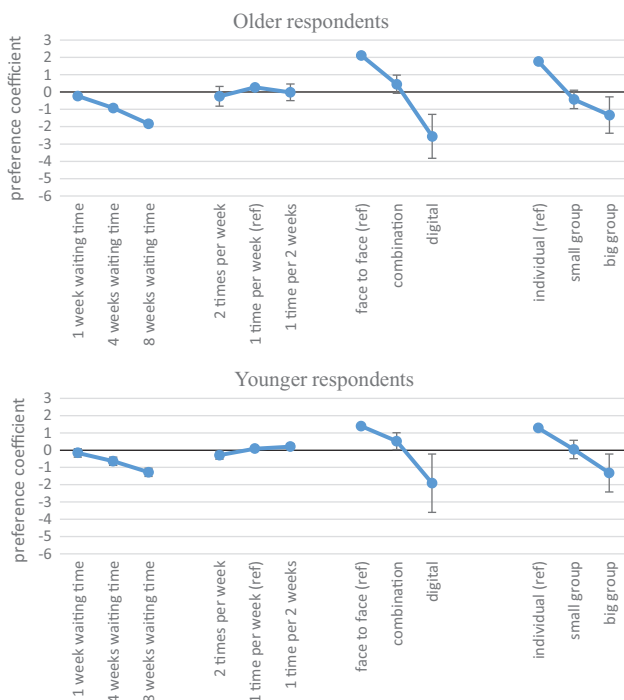
Attributes and levels	High age	Low age	p-value <sup>a</sup>
Number of patients	74	52	
Pseudo-R <sup>2</sup>	0.45	0.34	
Log likelihood	-337.43	-284.26	
Constant	0.18 (-0.11, 0.46)	-0.12 (-0.41, 0.18)	0.17
Waiting time			
Per 1 week	-0.23*** (-0.33, -0.13) SD: 0.15**	-0.16*** (-0.26, -0.06) SD: 0.24***	0.20
Treatment intensity (reference level: once a week)	0.27* (-0.06, 0.60)	0.09 (-0.17, 0.35)	
Twice a week	-0.25* (-0.54, 0.28) SD: 0.57***	-0.29** (-0.56, -0.03) SD: NS	0.41
Once per 2 weeks	-0.02 (-0.28, 0.24) SD: 0.48***	0.20 (-0.05, 0.46) SD: NS	0.21
Face-to-face vs digital (reference level: face-to-face)	2.11*** (1.16, 3.06)	1.39*** (0.51, 2.27)	
Digital	-2.56*** (-3.36, -1.75) SD: 1.27***	-1.91*** (-2.62, -1.19) SD: 1.69***	0.01
Combination	0.45*** (0.18, 0.72) SD: 0.52**	0.52*** (0.22, 0.82) SD: 0.49**	0.71
Group size (reference level: individual)	1.76*** (1.12, 2.40)	1.28*** (0.70, 2.86)	
Small	-0.43*** (-0.70, -0.16) SD: 0.53***	0.04 (-0.24, 0.32) SD: 0.53***	0.06
Large	-1.33*** (-1.88, -0.77) SD: 1.05***	-1.32*** (-1.86, -0.77) SD: 1.07***	0.44

Data presented as estimate (95% CI).

SD, standard deviation; NS, not significant.

<sup>a</sup>p-value was estimated in a joint model with interaction terms.

\*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01.



**Figure 3.** Sub-group analysis high vs low age.

### Sub-group analyses

In addition to the main analysis, several sub-group analyses were conducted.

#### Younger vs older respondents

The results of the model for younger respondents (aged 18–30 years) and older respondents (31 years and older) are presented in Table 4. The conditional relative importance of each attribute, indicated by the range in the preference coefficients for each attribute, is shown in Figure 3. Younger respondents have less preference against digital treatment compared to older respondents ( $p=0.01$ ). The analysis suggests there might be more preference against treatment in a small group in the older sub-group ( $p=0.06$ ).

#### Low educated vs high educated respondents

The results of the model for low educated respondents vs high educated respondents are presented in Table 5. The conditional relative importance of each attribute, indicated by the range in the preference coefficients for each attribute, is shown in Figure 4. Significant differences in preferences were found within these respondent groups for the waiting time and the treatment intensity. Higher educated respondents had a significantly stronger preference for shorter waiting times than low educated respondents ( $p=0.02$ ). Also, high educated respondents had a significantly stronger preference against a treatment intensity of twice a week than low educated respondents ( $p=0.02$ ).

#### Respondents with low vs high perceived impairment

The median of the respondents' mean SDS score had a value between 7 and 8. Therefore, this sub-group analysis compared respondents with a mean score of 7.5 or lower to respondents with a mean score of 7.5 or higher. This roughly divided the sample between those feeling moderately impaired and those feeling markedly impaired by their symptoms.

The preference for treatment modalities in people with lower vs higher impairment are presented in Table 6. The conditional relative importance of each attribute, indicated by the range in the preference coefficients for each attribute, is shown in Figure 5. This sub-group analysis showed the same preference trends as the main analysis, with no significant differences between the two sub-groups.

### Discussion

To the best of our knowledge, this is one of the first studies to elicit preferences with regard to treatment modalities for patients with an anxiety disorder. Our study shows that patients with an anxiety disorder prefer a short (over long) waiting time, face-to-face (over digital) treatment, individual treatment or a group as small as possible, and treatment once a week over twice a week or once per 2 weeks. The choice between face-to-face vs digital treatment was the

**Table 5.** Differences between high and low educated in preferences for anxiety treatment.

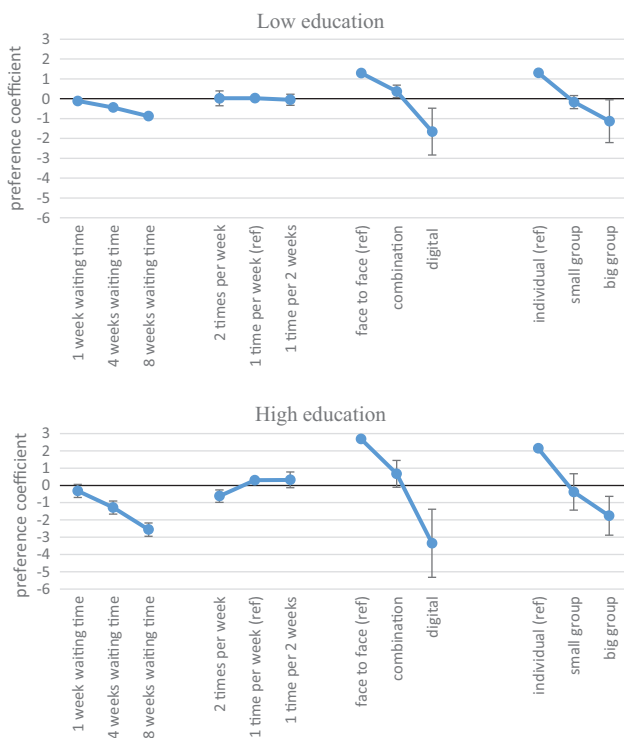
Attributes and levels	High education	Low education	<i>p</i> -value <sup>a</sup>
Number of patients	78	48	
Pseudo- <i>R</i> <sup>2</sup>	0.46	0.33	
Log likelihood	-348.39	-266.14	
Constant	0.48** (0.10, 0.85)	-0.26* (-0.54, 0.02)	0.09
Waiting time			
Per 1 week	-0.32*** (-0.46, -0.19) SD: 0.38***	-0.11*** (-0.18, -0.03) SD: NS	0.02
Treatment intensity (reference level: once a week)	0.30* (-0.01, 0.61)	0.03 (-0.24, 0.31)	
Twice a week	-0.62*** (-0.98, -0.26) SD: NS	0.02 (-0.24, 0.27) SD: 0.37**	0.02
Once per 2 weeks	0.32** (0.00, 0.64) SD: 0.46***	-0.05 (-0.30, 0.19) SD: NS	0.17
Face-to-face vs digital (reference level: face-to-face)	2.68*** (1.07, 4.29)	1.29*** (0.54, 2.04)	
Digital	-3.35*** (-4.62, -2.07) SD: 1.97***	-1.66*** (-2.26, -1.07) SD: 1.18***	0.10
Combination	0.67*** (0.25, 1.09) SD: 0.78***	0.37*** (-0.41, 0.06) SD: NS	0.53
Group size (reference level: individual)	2.14*** (1.24, 3.04)	1.30*** (0.78, 1.82)	
Small	-0.38* (-0.77, 0.02) SD: 1.05***	-0.17 (-0.41, 0.06) SD: 0.33*	0.46
Large	-1.76*** (-2.45, -1.07) SD: 1.12***	-1.13*** (-1.61, -0.64) SD: 1.08***	0.64

Data presented as estimate (95% CI).

SD, standard deviation; NS, not significant.

<sup>a</sup>*p*-value was estimated in a joint model with interaction terms.

\**p* < 0.1; \*\**p* < 0.05; \*\*\**p* < 0.01.

**Figure 4.** Sub-group analysis high vs low education.

most important for respondents, followed by individual vs group treatment, waiting time and treatment intensity, with the first two attributes being substantially more important to patients than the latter two.

We only identified one previous study assessing patients' preferences for certain anxiety treatment characteristics in a perinatal population<sup>32</sup>. This study suggests that costs and treatment type were the most important characteristics when choosing a treatment. Because of the differences in samples and attributes, it is difficult to compare the results in this study to our own results, although notably no preference against online treatment was found in Ride and Lancsar<sup>32</sup>. Other studies on patient preferences exist, but these either used a more qualitative approach<sup>33</sup> or did not focus on mental health specifically<sup>34</sup>.

Our main analysis showed significant heterogeneity in preference within our sample. Sub-group analyses found that older respondents had more preference against digital treatment. Respondents with lower education were less averse to a longer waiting time compared to higher educated respondents and, in addition, were less averse to a more intense treatment. These insights in variation in preference could potentially improve clinical practice. By involving patients in the various choices regarding treatment modalities, patient satisfaction might be enhanced, and the effectiveness and uptake of treatments might increase. However, the actual impact of providing treatment more in line with patients' preferences should be formally assessed in a randomized controlled trial. The significant variation in treatment preference, even within the considered sub-groups, calls for additional studies on the predictors for differential treatment preference.

### Limitations and future studies

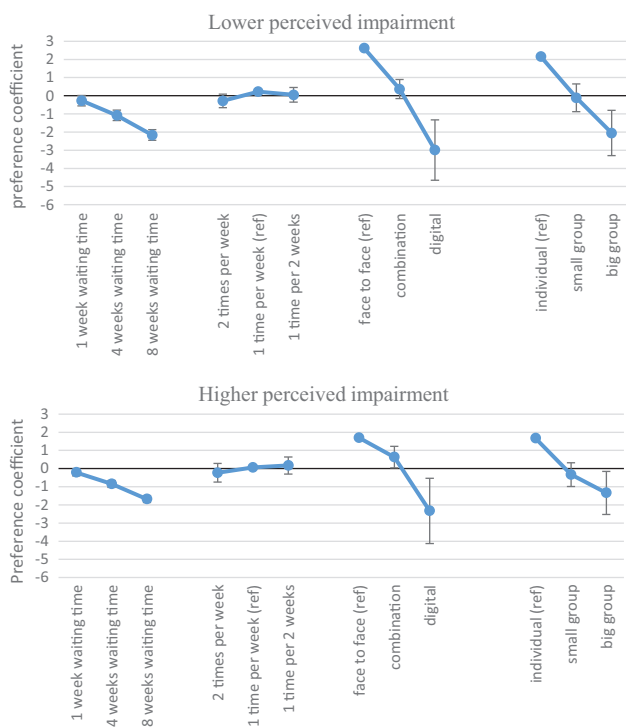
This study has a number of limitations. First, we used online channels (such as Facebook) for recruitment, which is likely to have led to a specific sample of potentially more motivated, more chronic, and more e-literate respondents. The bias towards e-literate respondents is likely to have impacted preference outcomes regarding digital treatment. This means our results are limited in their generalizability. This limitation is further emphasized by the uneven sample distribution of gender (predominately female) and education (predominately higher occupational and academic education), which specifically limits the generalizability of our study to males and lower-educated patients. In addition, due to the online data collection method, information was self-reported, including information on diagnosis, which could have resulted in bias. Furthermore, we could not assess whether respondent dropout of the questionnaire further compromised generalizability. Given the considerations regarding generalizability, it should be noted that an identical study targeting patients with depression resulted in very similar results<sup>35</sup>.



**Table 6.** Differences between respondents' preferences with a high and low perceived impairment.

Attributes and levels	High SDS	Low SDS	p-value <sup>d</sup>
Number of patients	67	59	
Pseudo-R <sup>2</sup>	0.38	0.43	
Log likelihood	-347.29	-277.85	
Constant	-0.18 (-0.47, 0.10)	0.41** (0.01, 0.80)	0.04
Waiting time			
Per 1 week	-0.21*** (-0.30, -0.11) SD: 0.19***	-0.27*** (-0.42, -0.13) SD: 0.29***	0.28
Treatment intensity (reference level: once a week)			
Twice a week	0.06 (-0.23, 0.35) SD: 0.51***	-0.23* (-0.51, 0.05) SD: NS	0.57
Once per 2 weeks	-0.23* (-0.50, 0.03) SD: 0.47**	-0.28* (-0.59, 0.02) SD: 0.40*	0.64
Face to face vs digital (reference level: face-to-face)			
Digital	1.70*** (0.66, 2.74) SD: 1.80***	2.62*** (1.58, 3.65) SD: 1.66***	0.44
Combination	-2.33*** (-3.15, -1.52) SD: 0.63***	-2.99*** (-4.45, -1.53) SD: 0.52**	0.28
Group size (reference level: individual)			
Small	0.63*** (0.31, 0.95) SD: 0.59***	0.37** (0.04, 0.71) SD: 0.76**	0.16
Large	1.67*** (1.05, 2.29) SD: 0.65***	2.16*** (1.54, 2.78) SD: 1.25***	0.27

Data presented as estimate (95% CI).  
SD, standard deviation; NS, not significant.  
<sup>a</sup>p-value was estimated in a joint model with interaction terms.  
\*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01.



**Figure 5.** Sub-group analysis lower vs higher perceived impairment.

Second, in the background questions we asked the respondents whether they were previously treated for their anxiety disorder. However, no questions were asked about the experience of this previous treatment nor about the type of treatment they received (e.g. cognitive behavioural therapy, e-health, etc.). Therefore, we could not assess to what extent the preferences stated in the answers in this study were affected by the previous treatment of respondents and respondents' experiences in those previous treatments. In general, the limited number of available background

variables in our study limited our ability to explain observed variation in treatment preference.

Third, the information that was and was not given while explaining the choice tasks to respondents is likely to have impacted on their responses. Specifically, it is important to emphasize that no information was given about the effectiveness of the treatment choices. Cuijpers et al.<sup>20</sup> showed that a higher treatment intensity can lead to improved treatment effectiveness. It is likely that this relationship was not known by respondents, and disclosing this information could have changed their preference toward more intensive treatment. Our results, therefore, need to be interpreted as implicitly incorporating patients' beliefs about attribute effectiveness. A related limitation is that it is not known to what extent respondents had a clear and uniform understanding of each of the considered attributes, which means that, in the extreme scenario, significant differences found in subgroup analyses could be reflecting differential understanding of treatment components, rather than actual differential preferences.

Fourth, our results on patients' preferences are limited to the attributes considered in our choice tasks. Other attributes, such as the nature of the treatment itself (e.g. pharmacological treatment, cognitive behavioural therapy), can be expected to be very important to patients. As our study focused on treatment modalities, future studies should also investigate preferences with regard to treatment cost, treatment effectiveness, or the nature of the treatment. In addition, the selection of attributes in our study could have benefitted from a more formal qualitative research approach to selecting a sub-set of the most relevant attributes with client experts, where ideally a larger number of experts would be consulted.

Fifth, no information was known about respondents' type of anxiety disorders. It could very well be that patients with

social phobia have different preferences towards individual vs group treatment or face-to-face vs digital treatment as compared to patients with post-traumatic stress disorder or generalized anxiety disorder. Future studies should try to distinguish treatment preferences for different types of anxiety disorders.

Sixth, non-significant findings could have been the result of a limited sample size, especially so in sub-group analyses.

## Conclusions

This study showed that patients with an anxiety disorder prefer treatment in a small group or individually, and that they prefer short waiting times, face-to-face treatment, and one treatment session per week. Combined face-to-face and digital treatment could be acceptable when waiting times are short. Individual and face-to-face treatment is substantially more important to patients than waiting time and treatment intensity. Individual-level variation in treatment preference highlights the need to take individual preferences into account when choosing a treatment.

## Transparency

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### Declaration of financial/other interests

The authors have no financial or other relationships to disclose. JME peer reviewers on this manuscript have no relevant financial or other relationships to disclose.

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## Previous presentations

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## References

1. NIMH. The National Institute of Mental Health. Anxiety Disorders; 2016 [updated March 2016; cited 2017 Jan 22]. Available from: <https://www.nimh.nih.gov/health/topics/anxiety-disorders/index.shtml>.
2. De Graaf R, Ten Have M, van Dorsselaer S. De psychische gezondheid van de Nederlandse bevolking. Nemesi-2: Opzet en eerste resultaten [The mental health of the Dutch population. Nemesi-2: design and first results]. Utrecht: Trimbos-Instituut; 2010.
3. Bijl RV, Ravelli A. Current and residual functional disability associated with psychopathology: findings from the Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Psychol Med.* 2000; 30(03):657–668.
4. Nuijen J, ten Have M, Tuithof M, et al. Trendrapportage GGZ: Geen gebruik van professionele zorg bij stemmings- en angststoornissen: zorgelijk of niet? Utrecht, The Netherlands: Trimbos Institute; 2014.
5. Chisholm D, Sweeny K, Sheehan P, et al. Scaling-up treatment of depression and anxiety: a global return on investment analysis. *Lancet Psychiatry.* 2016;3(5):415–424.
6. Baxter A, Vos T, Scott K, et al. The global burden of anxiety disorders in 2010. *Psychol Med.* 2014;44(11):2363–2374.
7. Whiteford HA, Degenhardt L, Rehm J, et al. Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010. *Lancet.* 2013; 382(9904):1575–1586.
8. De Graaf R, Tuithof M, van Dorsselaer S, et al. Verzuim door psychische en somatische aandoeningen bij werkenden. Resultaten van de 'Netherlands Mental Health Survey and Incidence Study-2' (NEMESIS-2) [Absenteeism due to psychological or somatic disorders in workers Results of the 'Netherlands Mental Health Survey and Incidence Study-2' (NEMESIS-2)] Utrecht: Trimbos-Instituut; 2011.
9. Tyrer P, Baldwin D. Generalised anxiety disorder. *Lancet.* 2006; 368(9553):2156–2166.
10. Bandelow B, Reitt M, Röver C, et al. Efficacy of treatments for anxiety disorders: a meta-analysis. *Int Clin Psychopharmacol* 2015; 30(4):183–192.
11. Rüsç N, Müller M, Ajdacic-Gross V, et al. Shame, perceived knowledge and satisfaction associated with mental health as predictors of attitude patterns towards help-seeking. *Epidemiol Psychiatr Sci.* 2014;23(02):177–187.
12. Taylor S, Abramowitz JS, McKay D. Non-adherence and non-response in the treatment of anxiety disorders. *J Anxiety Disord* 2012;26(5):583–589.
13. Swift JK, Callahan JL, Vollmer BM. Preferences. *J Clin Psychol.* 2011;67(2):155–165.
14. McHugh RK, Whitton SW, Peckham AD, et al. Patient preference for psychological vs pharmacologic treatment of psychiatric disorders: a meta-analytic review. *J Clin Psychiatry.* 2013;74(6):595–602.
15. Clark MD, Determann D, Petrou S, et al. Discrete choice experiments in health economics: a review of the literature. *Pharmacoeconomics.* 2014;32(9):838–902.
16. Bridges JFP, Hauber AB, Marshall D, et al. Conjoint analysis applications in health—a checklist: A report of the ISPOR Good Research Practices for Conjoint Analysis Task Force. *Value Health.* 2011;14(4):403–413.
17. McFadden D. Conditional logit analysis of qualitative choice behavior. In: Zarembka P, editor. *Frontiers in econometrics.* Wiley, New York; 1974. p 105–142.
18. Hiligsmann M, Dellaert BG, Dirksen CD, et al. Patients' preferences for osteoporosis drug treatment: a discrete-choice experiment. *Arthrit Res Ther.* 2014;16(1):R36.
19. Kenter R, Warmerdam L, Brouwer-Dudokde Wit C, et al. Guided online treatment in routine mental health care: an observational study on uptake, drop-out and effects. *BMC Psychiatry.* 2013;13(1):43.
20. Cuijpers P, Huibers M, Ebert DD, et al. How much psychotherapy is needed to treat depression? A meta-regression analysis. *J Affect Disord.* 2013;149(1–3):1–13.
21. Ratcliffe J, Van Haselen R, Buxton M, et al. Assessing patients' preferences for characteristics associated with homeopathic and conventional treatment of asthma: a conjoint analysis study. *Thorax.* 2002;57(6):503–508.

22. CMP Ltd. Ngene Software. 2017 [cited 2017, May 15]. Available from: <http://choice-metrics.com>.
23. Orme BK. Getting started with conjoint analysis. Madison (WI): Research Publishers LLC; 2006.
24. de Bekker-Grob EW, Donkers B, Jonker MF, et al. Sample size requirements for discrete-choice experiments in healthcare: a practical guide. *Patient*. 2015;8:373–384.
25. Yang J, Johnson FR, Kilambi V, et al. Sample size and utility-difference precision in discrete-choice experiments: a meta-simulation approach. *J Choice Model*. 2015;16:50–57.
26. Leon AC, Olfson M, Portera L, et al. Assessing psychiatric impairment in primary care with the Sheehan Disability Scale. *Int J Psychiatry Med*. 1997;27(2):93–105.
27. LimeSurvey. 2017. [cited 2017, January 25]. Available from: <https://www.limesurvey.org/>.
28. Nlogit. Econometric Software I. 2016. [cited 2017, June 7]. Available from: <http://www.limdep.com/products/nlogit/>.
29. Train K. Halton sequences for mixed logit. Department of Economics, UCB. 2000, working paper No. E00-278.
30. Bhat CR. Simulation estimation of mixed discrete choice models using randomized and scrambled Halton sequences. *Transport Res B*. 2003;37(9):837–855.
31. Hauber AB, González JM, Groothuis-Oudshoorn CG, et al. Statistical methods for the analysis of discrete choice experiments: a report of the ISPOR Conjoint Analysis Good Research Practices Task Force. *Value Health*. 2016;19(4):300–315.
32. Ride J, Lancsar E. Women's preferences for treatment of perinatal depression and anxiety: A discrete choice experiment. *PloS One*. 2016;11(6):e0156629.
33. Cooper-Patrick L, Rowe NR, Jenckes MW, et al. Identification of patient attitudes and preferences regarding treatment of depression. *J Gen Intern Med*. 1997;12:431–438.
34. Say RE, Thomson R. The importance of patient preferences in treatment decisions—challenges for doctors. *BMJ*. 2003;327:542–545.
35. Lokkerbol J, Geomini A, van Voorthuijsen JM, et al. A discrete-choice experiment to assess treatment modality preferences of patients with depression. *J Med Econ*. 2018; DOI: [10.1080/13696998.2018.1555404](https://doi.org/10.1080/13696998.2018.1555404)