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Preferences of people with type 2 diabetes for tele-medical lifestyle programmes in Germany: Protocol of a discrete choice experiment

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	DIABETES & ENDOCRINOLOGY, QUALITATIVE RESEARCH

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2 **1 Preferences of people with type 2 diabetes for tele-medical lifestyle programmes in**
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4 **2 Germany: Protocol of a discrete choice experiment**
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23 **ABSTRACT**

24 **Introduction**

25 Tele-medical lifestyle programmes provide an opportunity to improve the adherence to
26 lifestyle-changing programmes for people with type 2 diabetes mellitus (T2DM). When
27 implementing new programmes into standard care, it is important to consider patients'
28 preferences in order to maximise their success. This study aims to examine the preferences of
29 people with T2DM with respect to tele-medical lifestyle programmes alongside a randomised-
30 controlled trial (RCT).

31 **Methods and analysis**

32 We outline the protocol of the development and assessment of a discrete choice experiment
33 (DCE) to examine patient preferences in a tele-medical lifestyle programme with regard to the
34 functions of the online portal, communication, responsibilities, group activities, and time
35 requirements. To develop the design of the DCE, we conducted pilot work involving health
36 care experts and in particular people with T2DM using cognitive pretesting. The final DCE is
37 being implemented alongside a RCT investigating whether participation in a tele-medical
38 lifestyle intervention programme sustainably improves the HbA_{1c} values of people with T2DM.
39 Preferences are being assessed before and after participants complete the programme. About
40 850 members of a large German statutory health insurance are being recruited to participate.
41 The DCE data will be analysed using regression analysis.

42 **Ethics and dissemination**

43 The DCE study has been approved by the ethics committee of the medical faculty of the
44 Heinrich Heine University Duesseldorf, registration number 2018-242-ProspDEuA, registered
45 on December 6th, 2018. The TeLIPro trial is registered at the U. S. National Library of
46 Medicine, registration number NCT03675919, registered on September 15th, 2018. We aim to
47 disseminate our results in peer-reviewed journals, at national and international conferences,
48 and among interested patient groups and the public.

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4 49 **Strengths and limitations of this study**

- 5
6 50 • We use a DCE to assess the preferences of people with T2DM participating in a tele-
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8 51 medical lifestyle programme, before and after they complete the programme.
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10 52 • DCE data enable us to retrieve relative preference weights from which we can learn
11
12 53 which characteristics of a tele-medical lifestyle programme are most important to the
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14 54 participants.
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16 55 • Since the DCE was developed on the basis of the TeLIPro trial, the transferability of
17
18 56 the DCE to other tele-medical lifestyle programmes is limited.
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23
24 58 **Keywords**

25
26 59 Patient preferences, discrete choice experiment, lifestyle changes, Type 2 diabetes mellitus,
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28 60 tele-medical coaching, lifestyle intervention, preference elicitation, preference assessment,
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30 61 lifestyle changing programme
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62 INTRODUCTION

63 The prevalence of diagnosed diabetes in the world is continuously increasing[1]. In 2019, more
64 than 9.5 million adults were diagnosed with diabetes in Germany, most of them with type 2
65 diabetes mellitus (T2DM)[2]. The health expenditures of people diagnosed with diabetes are
66 about twice as high as those of people without diabetes. Approximately two thirds of the total
67 expenditures for the medical treatment of diabetes in Germany are incurred for the treatment
68 of diabetes-related comorbidities[3]. Besides demographic aging, a lifestyle characterised by
69 little physical activity and a high caloric diet is assumed to be largely responsible for the
70 increasing prevalence of T2DM[2].

72 **Lifestyle programmes as part of T2DM treatment**

73 Besides antihyperglycemic treatment, an effective T2DM therapy includes programmes aimed
74 at lifestyle changes, including changes in dietary habits and improvements in physical activity.
75 Since these programmes have significantly reduced T2DM participants' haemoglobin A_{1c}
76 (HbA_{1c}) levels, they may help to reduce the progression of the disease[4–8]. Thus, lifestyle
77 programmes for improving diabetes self-management have been included in clinical guidelines
78 and international position statements for the treatment of people with T2DM[9–11]. Although
79 education tools and disease management programmes are available for all patients in Germany,
80 some patients may have difficulties implementing a successful lifestyle change in everyday life
81 in the long term[12].

83 **Tele-medical health programmes as an effective, easy-access treatment approach**

84 Tele-medical health programmes use digital health technologies to offer up-to-date easy access
85 and most notably a location-independent way to support patients in managing their diabetes
86 and integrating a healthier lifestyle into their daily lives. Besides technical aids such as apps,
87 internet platforms, and mobile measurement devices, a personal health coach is often an

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4 88 integral part of such a programme[13–16]. The health coach evaluates the digital health data
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6 89 that are obtained and derives recommendations (e.g., to increase physical activity or implement
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8 90 a healthy diet). A proof of concept study showed that participation in a tele-medical health
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10 91 intervention programme that focused on eating behaviour, but also included support from a
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12 92 personal health coach, led to significant reductions in HbA_{1c}, weight, blood pressure, and other
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14 93 cardiovascular risk factors in people with T2DM. Furthermore, a reduction in the medication
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16 94 demand, using the medication effect score which is based on the potency and dosage of diabetes
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18 95 medication, and the insulin demand was achieved, also quality of life and eating behaviour
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20 96 improved significantly[14].
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26 98 **Patient preferences as an essential part of patient centeredness**

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28 99 Although digital health technologies and coaching approaches play an increasingly important
29
30 100 role in diabetes care,[13–19] little is known about the underlying decision-making process
31
32 101 regarding the participation and adherence of the target groups to tele-medical lifestyle
33
34 102 programmes. One promising approach to examine why some people participate and succeed in
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36 103 lifestyle-changing programmes and others do not is to ask patients about their preferences for
37
38 104 different aspects of these programmes. Preferences answer the question of which alternative is
39
40 105 most favourably evaluated by patients (e.g., which type of lifestyle programme is preferred).
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42 106 According to Scholl et al., the consideration of patient preferences is an essential part of patient
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44 107 centeredness[20]. Moreover, consideration of patients' preferences has shown a significant,
45
46 108 albeit small, positive effect on treatment outcomes, (e.g., drug adherence)[21–23]. An
47
48 109 increasingly popular method for eliciting patient preferences in health care is the discrete
49
50 110 choice experiment (DCE),[24–28] a stated preference method. The DCE methodology – based
51
52 111 on the Random Utility Theory – allows researchers to estimate and contrast the relative
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54 112 strengths of preferences across a range of particular attributes. To date, studies using a DCE to
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56 113 elicit preferences in people with diabetes have mostly examined their preferences regarding
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4 114 treatment[29–23] and lifestyle changes[234–36]. Thus, there remains a need for a clarification
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6 115 of patients' preferences regarding the relative importance of attributes with respect to tele-
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8 116 medical lifestyle programmes and coaching approaches (e.g., involvement of the coach,
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10 117 internet platforms, mobile measurement instruments, or type of support). Knowledge of these
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12 118 preferences and identification of groups of patients with similar preferences may be helpful for
13
14 119 designing more tailored, patient-centred tele-medical lifestyle programmes.
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20 121 **Contribution to the field & Aims**

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22 122 With this study, we aim (i) to measure preferences of people with T2DM regarding tele-
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24 123 medical lifestyle programmes and (ii) to compare participants' preferences before and after the
25
26 124 intervention so that we have the preferences of uninformed naive programme participants and
27
28 125 informed experienced programme participants. The former will help to address new
29
30 126 programme participants when implementing tele-medical lifestyle programmes into standard
31
32 127 health care, whereas the latter will provide information about changes over the course of the
33
34 128 intervention. We also aim (iii) to study possible preference heterogeneity. Finally, we aim (iv)
35
36 129 to investigate whether tele-medical lifestyle programme preferences are able to predict
37
38 130 programme success because a match between programme preferences and content might
39
40 131 increase adherence to the programme. The results will contribute to improving future patient-
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42 132 centred lifestyle programmes so that they are better aligned with the preferences of potential
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44 133 participants.
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51 52 135 **METHODS AND ANALYSIS**

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54
55 136 The investigation of patient preferences for tele-medical lifestyle programmes will be
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57 137 performed alongside a randomised-controlled trial (RCT) of the Tele-medical Lifestyle
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59 138 intervention Programme TeLIPro[37]. Next, we briefly describe the TeLIPro Health

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4 139 Programme and the RCT, and then we outline the assessment of patient preferences via a DCE
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6 140 in detail.

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10 142 **The TeLIPro Health Programme**

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13 143 TeLIPro (TeLIPro Health Programme - Active with Diabetes) is a tele-medical lifestyle
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15 144 programme in Germany designed to help people with T2DM implement a healthy lifestyle
16
17 145 through patient-centred and personal care[37]. Participants receive tele-medical devices, access
18
19 146 to a secured tele-medical online portal, and tele-medical coaching from a personal health coach
20
21 147 who supports and accompanies them for the duration of the programme. The programme is
22
23 148 intended to improve blood glucose levels and therefore to improve or maintain the health status
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25 149 and the quality of life of the participants in the long-term. Ultimately, this should minimise the
26
27 150 risk for concomitant and secondary diseases. The integration of the technology also supports
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29 151 the scalability of the programme, enabling it to meet the individual preferences and needs of
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31 152 the participants.
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37 38 154 **The RCT: The TeLIPro trial**

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41 155 The TeLIPro trial is aimed at assessing whether participation in the TeLIPro Health Programme
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43 156 can improve HbA_{1c} levels through lifestyle changes in people with T2DM in Germany.

44 45 157 **Participants**

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48 158 For the RCT, 850 participants are currently being recruited from within the members of a
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50 159 German statutory health insurance (Allgemeine Ortskrankenkasse, Rhineland/Hamburg, AOK)
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52 160 via informational letters and reminder telephone calls. Inclusion criteria consist of a T2DM
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54 161 diagnosis (International Statistical Classification of Diseases and Related Health Problems,
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56 162 10th Revision: E11), age between 18 and 67 years, HbA_{1c} \geq 6.5%, Body Mass Index (BMI) \geq
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58 163 27 kg/m², and a willingness to participate in the study. Exclusion criteria consist of factors that
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60 164 would prevent successful participation in the programme, e.g., acute infections or chronic

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4 165 illnesses, addictions, acute depression, dementia, acute chemotherapy or cortisone therapy, and
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6 166 paralysis. Also excluded are women who are pregnant or breastfeeding as well as individuals
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8 167 who take weight-influencing medication, who have quit smoking in the last 3 months or plan
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10 168 to quit, who have already taken part in a study in the last 6 months, or who have insufficient
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12 169 knowledge of the German language. Recruitment for the TeLIPro trial began in the last quarter
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14 170 of 2018 and is anticipated until December 2019. Participants are being randomised (1:1) into
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16 171 two groups: the intervention group (IG) and the control group (CG).
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22 173 Intervention Group

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24 174 Participants of the IG are given a scale, a step counter, access to a tele-medical online portal, a
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26 175 data hub for transmitting the measured values to the online portal, a glucose meter with test
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28 176 strips for the self-monitoring of blood glucose, and tele-medical telephone coaching from a
29
30 177 personal health coach in addition to routine care. For the IG, the measures of blood glucose are
31
32 178 recorded continuously, and pedometer data and weight (on a daily or weekly basis) are
33
34 179 automatically transmitted to the online portal by the devices. The data can be viewed by both
35
36 180 the participant and the coach. If a previously determined target value is exceeded or not
37
38 181 reached, an alert is triggered, and the coach may decide to intervene. In addition to the
39
40 182 monitoring function, the online portal provides information to support the change in lifestyle
41
42 183 and enable participants to manage their illness autonomously. Furthermore, functions are
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44 184 available for communication and information exchange between the actors who are involved:
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46 185 participant and coach, as well as the attending general practitioner (GP) or relatives with the
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48 186 participant's consent. Therefore, it is easy to exchange information and adapt the therapy. The
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50 187 intervention will last 12 months.
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189 Control Group

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4 190 Participants of the CG are not accompanied by a coach. Except for this, they receive the same
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6 191 components of the programme as the IG.
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10 193 Outcomes

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12 194 The primary outcome may depend on how long the participants have had diabetes. Therefore,
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15 195 the study sample was divided into two subgroups. The primary outcome for participants with
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17 196 a duration of diabetes of < 5 years is remission after a period of 12 months after baseline defined
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19 197 as an HbA_{1c} level $< 6.5\%$ [38]. The hypothesis is that the remission rate 12 months after baseline
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21 198 will be 11% in the IG and 5% in the CG. The primary outcome for participants with a duration
22
23 199 of diabetes of ≥ 5 years is the HbA_{1c} level. It is hypothesised that the HbA_{1c} level will be
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25 200 reduced by 0.5% for the IG and 0.2% for the CG 12 months after baseline. The secondary
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27 201 outcomes are cardiovascular risk factors (blood pressure, HDL/LDL cholesterol, total
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29 202 cholesterol, and triglycerides), health-related quality of life, depressive symptoms, eating
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31 203 habits, exercise behaviour, antihyperglycaemic treatment, and blood pressure medication.
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37 205 **Data collection**

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39 206 After participants are recruited for the TeLIPro trial, they are given detailed information about
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41 207 the programme and provide informed consent. Participants register in the online portal and are
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43 208 asked for sociodemographic factors (sex, age, employment status, education) and the duration
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45 209 of their diabetes. Afterwards, the intervention begins. Participants are given devices and the IG
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47 210 is contacted by the personal health coach. In the online portal, all participants answer
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49 211 questionnaires about their health-related quality of life (Short-Form-Health Survey 12; SF-12),
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51 212 impairment due to depressive symptoms (German version of the Centre for Epidemiological
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53 213 Studies-Depression Scale; CES-D Scale), eating behaviour (German version of the Three-
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55 214 Factor Eating Questionnaire; FEV), and exercise behaviour (Global Physical Activity
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57 215 Questionnaire, GPAQ)[39-42] at baseline, 3 months, 6 months, 9 months, 1 year (completion
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4 216 of the intervention), 15 months (follow-up phase), and 18 months (follow-up phase) after
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6 217 baseline. If a questionnaire is not answered within two weeks, participants are reminded by a
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8 218 telephone call from the online portal service staff. A total of up to three telephone calls are
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10 219 attempted, followed by a reminder e-mail. On a quarterly basis, also the attending GP is asked
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12 220 for the participants' HbA_{1c} level, weight, BMI, fasting blood glucose, blood pressure,
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14 221 triglycerides, HDL/LDL cholesterol, antihyperglycaemic treatment, and blood pressure
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16 222 medication. Body weight is recorded weekly, and walked steps are recorded daily by the
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18 223 devices for both groups. For the IG, blood glucose is monitored daily.
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224 225 **Development of the DCE**

226 The first step in developing a DCE is to define the research problem under consideration (e.g.,
227 measuring patient preferences for tele-medical lifestyle programmes) and to adequately
228 transfer it into an experimental framework[43–44]. The task comprises the identification and
229 selection of attributes that reflect all characteristics relevant for a decision in the context of the
230 research problem. The attributes (e.g., cost or duration of treatment) of the research problem
231 are further specified by different levels (e.g., cost of \$50 or \$500 and 2, 3, or 4 hours). To
232 construct an experimental design, the levels of the attributes are systematically varied and
233 presented in a series of choice sets each with the same number of alternatives (typically two
234 alternatives). By standard economic theory, it is assumed that individuals will choose the
235 alternative that maximises their utility. The preference weights for attributes and levels (part-
236 worth preference weights) constitute the overall utility of an alternative. Thus, observed
237 choices provide information about the relative weights of preferences for attributes and levels
238 as well as about the overall utility of each alternative[45]. We are primarily interested in the
239 preferences of participants who already decided to participate in a tele-medical coaching
240 programme. Thus, we did not include an opt-out option because respondents have already
241 chosen to participate in TeLIPro. To identify and select attributes and levels, we followed the

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4 242 current literature on the development of DCEs and implemented the following steps: (i)
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6 243 compilation of evidence, (ii) consultation of experts, (iii) consultation of people with diabetes
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8 244 as relevant actors, (iv) pretest, and (v) pilot test[46–47].
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11 12 13 246 Compilation of evidence

14
15 247 First, we conducted a literature search to identify attributes used in DCEs to elicit preferences
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17 248 regarding lifestyle changes, coaching, and devices (see the online supplementary material).
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19 249 Based on the literature search, we summarised attributes regarding how comfortable the
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21 250 devices are to wear, the handling of the devices, the frequency of contact with the GP or the
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23 251 health coach, emotional support during the programme, responsibility for the physical activity
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25 252 schedule or diet schedule, and the time investment. We did not include monetary costs in our
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27 253 summary, because payments for the provision of health care in Germany are normally paid
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29 254 directly by the statutory health insurance, and therefore monetary costs are less relevant than
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31 255 the time investment for preferences regarding tele-medical lifestyle programmes.
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40 258 Second, we discussed the attributes with health care experts (see acknowledgments) to ensure
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42 259 that the health care perspective, telehealth, and the clinical perspective were incorporated in
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44 260 the DCE. This process leads to a preliminary list of attributes (i) considering any possible
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46 261 attribute thought to be relevant to tele-medical lifestyle programmes for people with T2DM,
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48 262 (ii) including attributes with a special relevance for TeLIPro in order to best adapt patient
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50 263 preferences to the intervention envisaged in the project, and (iii) including those who could be
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52 264 realistically described in the choice scenario and were potentially amenable to change. This
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54 265 resulted in a list of seven attributes with 2-5 levels: the functions and handling of the online
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56 266 portal, the contacts to coach compared to GP contacts, the transfer of knowledge about a
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58 267 healthier lifestyle, emotional support, exercise plan, nutrition plan, and the total time required
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4 268 for the programme. This list formed the basis for the DCE design. The alternative attributes:
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6 269 communication between coach and doctors, competence of the coach, total number of contacts
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8 270 to coach, duration of the programme, intensity of the exercise programme, and exercise in
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10 271 groups or individually were used in the pretest.
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15 273 Consultation of people with diabetes/Pretest

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17 274 Third, we conducted qualitative interviews in the form of a cognitive pretest with five
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19 275 individuals with diabetes (December 2018 and January 2019). Participants were recruited from
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21 276 the self-help group (n=2) at the German Diabetes Center in Duesseldorf, Germany, and a
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23 277 specialised diabetes care practice (n=3) in Leverkusen, Germany, by email or personal contact.
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25 278 They participated on a voluntary basis and gave written informed consent prior to being
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27 279 included in the study. The interviewers were two researchers from the Institute for Health
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29 30 Services Research and Health Economics. Interviews were conducted face-to-face at the
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31 31 German Diabetes Center, the diabetes care practice, and the participants' homes. All interviews
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33 32 were logged and audiotaped. The individual interviews were conducted in order to ensure that
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35 33 (i) the most important attributes were included in the DCE, (ii) none of the chosen attributes
36
37 34 was dominant, (iii) proper levels were appointed to each of the attributes, and (iv) the task and
38
39 35 the wording used in the questionnaire were comprehensible and feasible[44–45]. For the
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41 36 qualitative interviews, we developed a guideline based on cognitive pre-testing, including
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43 37 think-aloud methods, demand techniques (understanding individual words), paraphrasing
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45 38 (reproducing tasks), and sorting techniques (attributes were presented to participants on cards,
46
47 39 and participants sorted them by personal relevance). In the first part of the interview, we
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49 40 introduced respondents to TeLIPro, and the questionnaire was presented piece by piece. To
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51 41 obtain more insight into how respondents understood the choice task, they were asked to think
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53 42 aloud during the interview. In addition, respondents were told to identify attributes and levels
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55 43 they did not understand or found hard to grasp and to provide suggestions for improvement. In
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4 294 the second part, all seven attributes of the DCE were presented on separate paper cards.
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6 295 Respondents were asked whether they could think of any other attributes that were important
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8 296 but had not been included so far. If so, the interviewer wrote these new attributes on blank
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10 297 cards, and respondents were asked what they considered important about these attributes and
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12 298 what kinds of levels of the attribute they could think of. If no more new attributes were
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14 299 mentioned, the additional cards with the six alternative attributes were laid out and explained
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16 300 to the respondents by the interviewer. Next, respondents were asked if they would swap one or
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18 301 more of the six alternative attributes or – if new attributes were mentioned – if they would swap
19
20 302 the new attributes with one or more of the seven attributes in the programme. Two researchers
21
22 303 reviewed the interviews and adjusted the DCE after an internal discussion. The attribute
23
24 304 ‘emotional support’ was swapped with ‘group activities’, which was also modified to include
25
26 305 the non-exercise group activities. The attribute ‘frequency of contacts’ was changed to
27
28 306 ‘communication between coach and doctors’. It asks if the coach and doctors have contact with
29
30 307 each other instead of the patient to doctor and patient to coach ratios. The attribute named “the
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32 308 transfer of knowledge about a healthier lifestyle” was changed to “responsibility for getting
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34 309 acquainted with a healthier lifestyle” The level ‘4 hours per week’ was removed from the
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36 310 attribute ‘total time required’ because it was deemed unrealistic by respondents. The attributes
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38 311 ‘exercise plan’ and ‘nutrition plan’ were merged into ‘responsibility for setting goals to
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40 312 exercise and menu schedule’ because both attributes targeted the domain of autonomy, and the
41
42 313 majority of the respondents swapped out one of these attributes. The description of the task
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44 314 concerning the selection of the choice sets was also rephrased to be more precise. This
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46 315 reduction in the number of attributes to six and the number of levels to two to four ensured an
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48 316 efficient design while also allowing the number of choice sets to be limited to a practicable
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50 317 number to prevent a mental burden that was too high for the participants. It was ensured that
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52 318 one combination of levels reproduced the actual TeLIPro health programme.
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320 Pilot test

321 Fourth, we presented the revised DCE to the members of the self-help group ($n=10$) at one of
 322 their monthly meetings. On a pilot test, they answered a paper-pencil version of the DCE
 323 questionnaire and were asked at the end of the questionnaire if they had any suggestions for
 324 improvement. On the basis of these results, the attributes and levels as well as their descriptions
 325 in the questionnaire were not changed. The DCE instructions concerning the selection of the
 326 choice sets was again rephrased to clarify that the most preferred or least disliked programme
 327 of the two had to be chosen. The final six attributes with their corresponding levels are shown
 328 in Table 1.

329
 330 **Table 1:** Final attributes and corresponding levels included in the DCE

Attributes	Descriptions	Levels
The functions and handling of the online portal	During the coaching programme, you are provided with different devices to measure your weight, your blood glucose, and the steps you have walked. These devices automatically transfer your data to an online portal that you and your coach can access. The range of functions and the handling of the online portal can differ for different programmes. The more functions the online portal offers, the more complex the handling becomes.	Extensive functions and more complex handling Less extensive functions and easier handling
Communication between coach and doctors	Coaching programmes can differ on the basis of whether your coach and your doctors communicate about your treatment, the programme goals you have set, and your data in the online portal.	My coach and my doctors do not communicate My coach and my doctors do communicate
Responsibility for getting acquainted with a healthier lifestyle	Coaching programmes can provide you with information about various opportunities for lifestyle changes.	I receive information from my doctor I receive information from my coach

		I search for information myself
Group activities	Some coaching programmes contain activities in groups of 10-15 participants each. The activities include sports activities, cooking together, and also the exchanging of experiences by the group members in an online forum.	No group activities Group activities
Responsibility for setting goals to exercise and menu schedule	One part of the coaching programme is setting goals to exercise and eat well.	My coach sets my goals I set my goals independently My coach and I set my goals together
Total time required	Coaching programmes may differ in the amount of time you have to spend on the programme. This includes the time spent fulfilling your movement goals, talking to your coach, changing your diet, and using your devices correctly. The time required for potential group activities is not included.	12 hours per week 10 hours per week 8 hours per week 6 hours per week

331

332 DCE questionnaire design

333 The combination of the attributes in the different scenarios of the DCE and the compilation of
 334 the scenarios was based on the number and levels of the attributes as well as other content and
 335 statistical requirements. SAS macros (SAS version 9.4) were used to define the optimal number
 336 of choice sets[48]. Particular care was taken to ensure that combinations of levels were realistic.
 337 The number of total choice sets takes respondents' cognitive capacity into account. The
 338 efficient factorial fractional design ($D\text{-error}=0.12$) consisted of 12 unique choice tasks. To
 339 control for the reliability of the choices that were made, choice set 7 was repeated as choice set
 340 13, resulting in a total of 13 choice sets.

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342 Assessment of the DCE

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4 343 Initially, respondents are provided with an extensive explanation of the meanings of all
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6 344 attributes and levels as well as information on how to deal with a choice set, accompanied by
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8 345 an example. Afterwards, respondents are told that they need to choose between two lifestyle
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10 346 programmes in the following choice sets. They are told that 13 choice sets are best suited for
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12 347 determining what type of lifestyle programme is preferred. Respondents are told to always
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14 348 choose their personally best-suited or least-rejected lifestyle programme and that there are no
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16 349 right or wrong answers. They are also reminded that they can always opt for a programme with
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18 350 all the features listed. Every choice task is accompanied by the invitation: 'Please select the
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20 351 coaching programme that suits you best'. Then both programmes (Programmes A and B) are
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22 352 presented (see Figure 1) followed by the question: 'Which programme do you prefer? (Please
23
24 353 tick the appropriate box)'. Figure 1 presents an example of a choice task as included in the
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26 354 questionnaire. The DCE is measured before the start of the intervention and after 1 year when
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28 355 the intervention has been completed. Data collection for the DCE began in January 2019 and
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30 356 is anticipated to take place until December 2020.

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37 358 - *Please insert Figure 1 here* -
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41 42 360 **Data analysis**

43
44 361 To derive the preferences of people with T2DM regarding tele-medical lifestyle programmes
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46 362 (i.e. relative preference weights for attributes and levels), the obtained baseline DCE data will
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48 363 be analysed using a conditional logit model. Preference weights describe the relative strength
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50 364 of each attribute and level in comparison with all other attributes and levels, respectively.
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52 365 Furthermore, the preference weights will be expressed as time equivalents (willingness to
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54 366 invest time) by calculating the trade-off or marginal rates of substitution between attributes and
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56 367 the attribute that focuses on the time required by the programme. Because the IG and CG do
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58 368 not differ at baseline, the analysis is based on the full sample. To investigate differences in
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4 369 preferences before and after participation in the programme, the preference weights of
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6 370 unexperienced, naive programme participants and experienced participants will be compared
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8 371 descriptively and analysed using time equivalents. The analysis will be outlined separately for
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10 372 the IG and the CG as experiences during the intervention phase differ substantially.
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12 373 To investigate possible preference heterogeneity, we will conduct a latent class analysis (LCA)
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14 374 using the baseline data (full sample). The number of classes is determined by the Bayesian
15
16 375 information criterion as well as an examination of the interpretation of the latent classes. The
17
18 376 following covariates will be incorporated into the LCA: sociodemographic factors (sex, age,
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20 377 employment status, and education), disease-related characteristics (HbA_{1c} level, duration of
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22 378 diabetes, BMI), exercise behaviour, depressive symptoms, and health-related quality of life.
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24 379 Finally, we will investigate the causal effect of latent classes of preferences at the beginning of
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26 380 the study on programme success at the end of the study. This will be done by means of an LCA
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28 381 with a distal outcome, where programme success is regressed on latent preference classes. This
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30 382 approach will allow us to explore whether programme preferences differ with respect to distal
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32 383 outcomes such as programme success. This type of analysis may lead to additional information
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34 384 about heterogeneity in the (study) population.
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386 **Patient and Public involvement**

387 Patient involvement during the various stages of the development of the DCE (qualitative
388 interviews, pilot tests) ensured that the research question relied on the actual preferences of
389 people with T2DM participating in tele-medical lifestyle programmes.

390

391 **ETHICS AND DISSEMINATION**

392 The DCE study has been approved by the ethics committee of the medical faculty of the
393 Heinrich Heine University committee of the Heinrich-Heine University Duesseldorf,
394 registration number 2018-242-ProspDEuA, registered on December 6th, 2018. The TeLIPro

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4 395 trial is registered at the U. S. National Library of Medicine, registration number NCT03675919,
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6 396 registered on September 15th, 2018. Patient consent to participate was obtained. Data analysis
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8 397 will be done according to the principles of good scientific research on DCEs developed by the
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10 398 International Society for Pharmacoeconomics and Outcome Research (ISPOR). We aim to
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12 399 disseminate our results in peer-reviewed journals and at national and international conferences
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15 400 to interested patient groups and the public.
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415 **AUTHOR STATEMENT**

416 MV and AI contributed to the initial grant application. All authors contributed to the design of
417 the study and are involved in the implementation of the project. JS wrote the first draft of the
418 protocol. JS, JD, SG, VG, MV, MR, and AI contributed to the drafting and editing of the
419 protocol. All authors read and approved the final protocol.

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426 **CONFLICTS OF INTEREST**

427 The authors declare that they have no competing interests.

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6 429 **DATA STATEMENT**
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9 430 After the data are collected and the results are published, the data will be made available upon
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11 431 reasonable request.
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16 433 **SUPPLEMENTARY MATERIAL**
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19 434 Results of the literature review to identify attributes used in DCEs to elicit preferences
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21 435 regarding lifestyle changes, coaching, and devices.
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Figure 1: Example of a choice task used in the discrete choice experiment**First Choice**

Please select the coaching programme that suits you best.

	Programme A	Programme B
The functions and handling of the online portal	Extensive and complex	Less extensive and simple
Communication between coach and doctors	My coach and my doctors do not communicate	My coach and my doctors do communicate
Responsibility for getting acquainted with a healthier lifestyle	I receive information from my doctor	I receive information from my coach
Group activities	No group activities	Group activities
Responsibility for the goals of the exercise and menu schedule	My coach sets my goals	I set my goals independently
Total time required	10 hours per week	8 hours per week
Which programme do you prefer? (Please tick the appropriate box)	<input type="checkbox"/>	<input type="checkbox"/>

Supplementary File

Results of the literature review to identify attributes used in DCEs to elicit preferences regarding lifestyle changes, coaching, and devices.

DCE Topic	Attribute	Levels	Reference
Devices	Comfort of wearing	<ul style="list-style-type: none"> - Warm and squeezing - Breathing and not squeezing - Comfortable - Uncomfortable 	Bouman et al.,2016 [1] Bunge et al., 2010 [2]
Devices	Appearance	<ul style="list-style-type: none"> - Thick material and skin colored - Thin material and color of choice - Visible - Not visible 	Bouman et al.,2016 [1] Bunge et al., 2010 [2]
Devices	Help Needed	<ul style="list-style-type: none"> - Help needed - Independently - No help needed while emptying your bowels - You need less help than you did previously - You need as much help as you did previously - You need more help than you did previously 	Bouman et al.,2016 [1] Nafees et al.,2016 [3]
Devices	Duration of therapy	<ul style="list-style-type: none"> - 6 months - 15 months - 24 months 	Bouman et al.,2016 [1]
Devices	Device Hygiene	<ul style="list-style-type: none"> - Hand washed, dries slowly - Machine washed, dries quickly - Mouthpiece can be washed, but not replaced - Mouthpiece can be replaced, but not washed - Mouthpiece can be cleaned with a dry cloth, but not washed or replaced 	Bouman et al.,2016 [1] Hawken et al.,2017 [4]
Devices	Easy to Use	<ul style="list-style-type: none"> - 1 step - 2 to 3 steps - More than 4 steps - You will use an automatic pump (process requiring ~15 steps) - You will use a manual pump (process requiring ~30 steps) 	Hawken et al.,2017 [4] Nafees et al.,2016 [3]
Devices	Flexibility of device handling	<ul style="list-style-type: none"> - Inhaler can be held in any position throughout inhalation process - Inhaler must be held in certain position throughout inhalation process 	Hawken et al.,2017 [4]
Devices	Time to use per treatment	<ul style="list-style-type: none"> - 5 minutes - 10 minutes - 15 minutes - 25 minutes - 30 minutes - You will spend up to 30 minutes - You will spend up to 1 hour - You will spend up to 1.5 hours - You will spend up to 2 hours 	Mohamed et al.,2015 [5] Nafees et al.,2016 [3]

DCE Topic	Attribute	Levels	Reference
Devices (Coaching)	Frequency of use	<ul style="list-style-type: none"> - None - 2 pills 3 times a day (6 pills per day) - 3 pills 4 times a day (12 pills per day) - 2 times per day - 3 times per day - Once every two days on average - Once every day on average - Twice a day on average - Three times a day on average - Once per day - Once per week - Once per month - Once per 3 months - Once per 6 months - Once per year 	Marshall et al.,2017 [6] Mohamed et al.,2015 [5] Nafees et al.,2016 [3] Quaife et al.,2016 [7]
Coaching	Training of the IP (information provider)	<ul style="list-style-type: none"> - Counselor with specialized training in use of medications during pregnancy only - Family doctor with general health training 	Hancock-Howard et al.,2012 [8]
Coaching	Method of counseling and waiting time	<ul style="list-style-type: none"> - Make an appointment and meet with the IP in person in 3 days - Call a telephone service and receive the information within 30-minutes 	Hancock-Howard et al.,2012 [8]
Coaching	Knowing the IP	<ul style="list-style-type: none"> - You have met the IP before and they know your medical history - You have never met the IP 	Hancock-Howard et al.,2012 [8]
Coaching	Confidence in the skills of the IP	<ul style="list-style-type: none"> - You have confidence in the skills of the IP - You know nothing about the skills of the IP 	Hancock-Howard et al.,2012 [8]
Coaching	Helpfulness of information	<ul style="list-style-type: none"> - Enough information has been provided that you believe your question has been answered to your satisfaction - Some information has been provided to you, but your question has not been completely answered to your satisfaction 	Hancock-Howard et al.,2012 [8]
Coaching	Time away from home/office/usual activities including travel	<ul style="list-style-type: none"> - More than four hours - 3–4 h - 1–2 h 	Spinks et al.,2016 [9]
Coaching	Wait time to get result	<ul style="list-style-type: none"> - Up to three days - Up to one day - Less than four hours 	Spinks et al.,2016 [9]
Coaching	Who reviews the result	<ul style="list-style-type: none"> - GP - Telederm dermatologist 	Spinks et al.,2016 [9]
Coaching Diabetes	Feedback on physical activity performance	<ul style="list-style-type: none"> - Patient receives feedback on his or her individual performance - Patient's performance is compared with that of other patients 	Ramirez et al.,2016 [10]
Coaching Diabetes	Physical activity behavior-change education	<ul style="list-style-type: none"> - Patient's doctor recommends the educational content - Patient specifies the type of educational content he or she wants to receive 	Ramirez et al.,2016 [10]
Coaching Diabetes	Frequency of messaging	<ul style="list-style-type: none"> - Patient's doctor recommends how often patient should receive messages - Patient specifies how often he or she wants to receive messages 	Ramirez et al.,2016 [10]

DCE Topic	Attribute	Levels	Reference
Lifestyle Diabetes	Menu schedule	<ul style="list-style-type: none"> - <i>Flexible</i> you set your own goals and develop your own menu schedule to reach these goals without the assistance of a lifestyle coach - <i>General</i> your lifestyle coach informs you about health and unhealthy foods, using food information and examples of recipes - <i>Elaborate</i> your lifestyle coach develops a menu schedule that meets your needs and wishes - Flexible: primarily based on the participants' own initiatives and ideas - General: includes general information on a healthy diet and provides example recipes - Elaborate: a patient tailored schedule that is completely prepared by the lifestyle coach - Flexible (you composed this schedule) - General (with information about diet and examples of recipes) - Elaborate (this schedule is composed for you and tailored to your needs) 	<p>Salampessy et al.,2015 [11] Veldwijk et al.,2013 [12] Wanders et al.,2014 [13]</p>
Lifestyle Diabetes	Physical activity schedule	<ul style="list-style-type: none"> - Patient's doctor recommends physical activity goals - Patient selects his or her own personalized physical activity goals - <i>Flexible</i> you set your own goals and develop your own activity schedule to reach these goals without the assistance of a lifestyle coach - <i>General</i> your lifestyle coach informs you about what physical activities would be good for you, using information about physical activity and examples of exercises - <i>Elaborate</i> your lifestyle coach develops a physical activity schedule that meets your needs and wishes - Flexible: primarily based on the participants' own initiatives and ideas - General: includes general information on PA, and provides example exercises - Elaborate: a patient tailored schedule that is completely prepared by the lifestyle coach - Flexible (you composed this schedule) - General (with information about physical activity and examples of exercises) - Elaborate (this schedule is composed for you and tailored to your needs) 	<p>Ramirez et al.,2016 [10] Salampessy et al.,2015 [11] Veldwijk et al.,2013 [12] Wanders et al.,2014 [13]</p>

DCE Topic	Attribute	Levels	Reference
Coaching Lifestyle Diabetes	Consultation Structure / Social support	<ul style="list-style-type: none"> - Family members learn how to offer support - Patient meets other patients so they can support one another - <i>Individual</i> the consultations of the lifestyle program are individually - <i>Consultation 5</i> the consultations of the lifestyle program are in groups of 5 <i>other patients</i> - <i>Consultation 10</i> the consultations of the lifestyle program are in groups of 10 <i>other patients</i> - Individually - Groups with 5 other T2DM patients - Groups with 10 other T2DM patients - individual - in a group with 5 other people - in a group with 10 other people 	Ramirez et al.,2016 [10] Salampessy et al.,2015 [11] Veldwijk et al.,2013 [12] Wanders et al.,2014 [13]
Lifestyle Diabetes	Time spent on the program	<ul style="list-style-type: none"> - 2.5 hours per week - 4 hours per week 	Van Gils et al.,2011 [14]
Lifestyle Diabetes	Arrangement physical activity lessons	<ul style="list-style-type: none"> - Individually with men and women - With people of the same gender 	Van Gils et al.,2011 [14]
Lifestyle Diabetes	Group activity	<ul style="list-style-type: none"> - Only with people without diabetes - Only with other diabetes patients 	Van Gils et al.,2011 [14]
Lifestyle Diabetes	Sports activity	<ul style="list-style-type: none"> - Walking/cycling - Fitness (treadmill, rowing machine, bicycle) 	Van Gils et al.,2011 [14]
Lifestyle Diabetes	Counseling	<ul style="list-style-type: none"> - None - Physical therapist/sports teacher 	Van Gils et al.,2011 [14]

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Preferences of people with type 2 diabetes for tele-medical lifestyle programmes in Germany: Protocol of a discrete choice experiment

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Primary Subject Heading:	Research methods
Secondary Subject Heading:	Research methods, Diabetes and endocrinology, Health economics,

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Keywords:	Telemedicine < BIOTECHNOLOGY & BIOINFORMATICS, STATISTICS & RESEARCH METHODS, Protocols & guidelines < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health economics < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, General diabetes < DIABETES & ENDOCRINOLOGY, QUALITATIVE RESEARCH





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2 1 **Preferences of people with type 2 diabetes for tele-medical lifestyle programmes in**
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4 2 **Germany: Protocol of a discrete choice experiment**

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38 supplementary material: 1

24 **ABSTRACT**

25 **Introduction**

26 Tele-medical lifestyle programmes for people with type 2 diabetes mellitus (T2DM) provide
27 an opportunity to develop a healthier lifestyle and consequently to improve health outcomes.
28 When implementing new programmes into standard care, considering patients' preferences
29 may increase the success of the participants. This study aims to examine the preferences of
30 people with T2DM with respect to tele-medical lifestyle programmes, to analyse whether these
31 preferences predict programme success, and to explore the changes that may occur during a
32 tele-medical lifestyle intervention.

33 **Methods and analysis**

34 We outline the protocol of the development and assessment of a discrete choice experiment
35 (DCE) to examine patient preferences in a tele-medical lifestyle programme with regard to the
36 functions of the online portal, communication, responsibilities, group activities, and time
37 requirements. To develop the design of the DCE, we conducted pilot work involving health
38 care experts and in particular people with T2DM using cognitive pretesting. The final DCE is
39 being implemented within a randomised controlled trial (RCT) for investigating whether
40 participation in a tele-medical lifestyle intervention programme sustainably improves the
41 HbA_{1c} values in 850 members of a large German statutory health insurance with T2DM.
42 Preferences are being assessed before and after participants complete the programme. The DCE
43 data will be analysed using regression and latent class analyses (LCAs).

44 **Ethics and dissemination**

45 The DCE study has been approved by the ethics committee of the medical faculty of the
46 Heinrich Heine University Duesseldorf, registration number 2018-242-ProspDEuA, registered
47 on December 6th, 2018. The TeLIPro trial is registered at the U. S. National Library of
48 Medicine, registration number NCT03675919, registered on September 15th, 2018. We aim to

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4 49 disseminate our results in peer-reviewed journals, at national and international conferences,
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6 50 and among interested patient groups and the public.
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11 **Strengths and limitations of this study**

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13 53 • We are using a DCE to assess the preferences of people with T2DM participating in
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15 54 TeLIPro, a tele-medical lifestyle programme, before and after they complete the
16
17 55 programme.
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20 56 • Programme preferences may be used to further develop the TeLIPro Health
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22 57 Programme.
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24 58 • DCE data will enable us to retrieve relative preference weights from which we can learn
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26 59 which components of a tele-medical lifestyle programme are most important to the
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28 60 participants.
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31 61 • Since the DCE was developed on the basis of the TeLIPro trial, the transferability of
32
33 62 the DCE to other tele-medical lifestyle programmes will be limited.
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38 **Keywords**

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40 65 Patient preferences, discrete choice experiment, lifestyle changes, Type 2 diabetes mellitus,
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42 66 tele-medical coaching, lifestyle intervention, preference elicitation, preference assessment,
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44 67 lifestyle changing programme
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68 INTRODUCTION

69 The prevalence of diagnosed diabetes in the world is continuously increasing[1]. In 2019, more
70 than 9.5 million adults were diagnosed with diabetes in Germany, most of them with type 2
71 diabetes mellitus (T2DM)[2]. Besides antihyperglycemic treatment, an effective T2DM
72 therapy includes programmes aimed at lifestyle changes, including changes in dietary habits
73 and improvements in physical activity. Since these programmes have significantly reduced
74 T2DM participants' haemoglobin A_{1c} (HbA_{1c}) levels, they may help to reduce the progression
75 of the disease[3–7]. Thus, lifestyle programmes have been included in clinical guidelines and
76 international position statements for the treatment of people with T2DM[8–10].

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78 Digital health technologies and coaching approaches are playing increasingly important roles
79 in health care in diabetes[11–17]. Tele-medical health programmes offer up-to-date easy access
80 and most notably a location-independent way to support patients in managing their diabetes,
81 using technical aids such as apps, internet platforms, and mobile measurement devices and
82 often including a personal health coach[11–14]. A proof of concept study showed that
83 participation in a tele-medical health intervention programme that focused on eating behaviour,
84 but also included support from a personal health coach, led to significant reductions in HbA_{1c},
85 weight, blood pressure, and other cardiovascular risk factors in people with T2DM[12].

86
87 Little is known about the underlying decision-making process regarding the participation and
88 adherence of the target groups to tele-medical lifestyle programmes. One promising approach
89 to examine why some people participate and succeed in lifestyle-changing programmes and
90 others do not is to ask patients about their preferences for these programmes. As one integral
91 part of the multidimensional concept of patient-centeredness[18], preferences determine which
92 alternative is most favourably evaluated by patients (e.g., which type of lifestyle programme is
93 preferred).

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6 95 Preferences can be determined not only for entire programmes but also for different
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8 96 components that make up a programme (e.g., the duration or intensity of a programme). These
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10 97 components might be evaluated differently by participants. Multi-attribute methods, such as
11
12 98 the discrete choice experiment (DCE)[19–21], can help to identify preferred components,
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14 99 which are important for achieving better programme outcomes. To date, studies using a DCE
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17 100 to elicit preferences in people with diabetes have mostly examined preferences regarding
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19 101 treatment[22–26] and lifestyle changes[27–29]. Thus, there remains a need to clarify patients’
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21 102 preferences regarding the relative importance of components with respect to tele-medical
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23 103 lifestyle programmes and coaching approaches (e.g., involvement of the coach, internet
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25 104 platforms, mobile measurement instruments, or type of support). Knowledge of these
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27 105 preferences and the identification of groups of patients with similar preferences may be helpful
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29 106 for identifying new programme participants and for developing new or adapting existing health
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31 107 programmes by designing them in a more tailored and preference-oriented way.
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38 109 It is also important to ask whether preferences are associated with programme success. A match
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40 110 between the preference for and the content of a programme is likely to improve a participant’s
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42 111 adherence to and willingness to participate in a programme and thus the success of the
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44 112 programme in the form of better outcomes. Studies in which participants were matched to
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46 113 entire lifestyle programmes in accordance with their preferences found significant, albeit small,
47
48 114 positive effects on treatment outcomes[30–34]. To the best of our knowledge, associations
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50 115 between preferences for certain components of tele-medical lifestyle programmes and
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52 116 programme success have not been investigated in diabetes care using DCE methodology.
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54 117 Knowledge of which particular components contribute to the success of tele-medical lifestyle
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56 118 programmes may be helpful for modifying programmes accordingly.
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4 120 Another question that arises is whether participants' preferences change while they are
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6 121 participating in a tele-medical lifestyle programme. In principle, preferences are assumed to be
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8 122 stable[35–37]. However, as expressed preferences depend on individual information and
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10 123 experience, they may change as participants receive more information about the programme
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12 124 and its components during participation. Similar effects have been found for preferences with
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14 125 regard to cancer screening. Detailed information about recommended invasive follow-up
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16 126 testing for individuals at risk had negative effects on individuals' decision to participate in a
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18 127 non-invasive screening[38]. Knowledge of changes in preferences in individuals with diabetes
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20 128 participating in tele-medical lifestyle programmes would be helpful for adapting the
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22 129 components of a programme as it progresses.
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29 131 **Contribution to the field & Aims**

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31 132 With this study, we aim (i) to measure the preferences of people with T2DM regarding tele-
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33 133 medical lifestyle programmes and coaching approaches and to analyse the heterogeneity of
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35 134 these preferences, (ii) to investigate whether preferences predict programme success, and (iii)
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37 135 to compare participants' preferences before and after the intervention.
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43 137 **METHODS AND ANALYSIS**

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46 138 Patient preferences for tele-medical lifestyle programmes and coaching approaches are being
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48 139 elicited with a DCE in individuals who are participating in a randomised-controlled trial (RCT)
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50 140 for testing the effectiveness of the tele-medical lifestyle intervention programme TeLIPro[39].
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52 141 Participants of the RCT are also taking part in the DCE. The DCE uses the infrastructure of the
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54 142 RCT for data collection. However, the DCE does not influence the RCT, the selection of
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56 143 participants, or the randomised assignment of the participants. In the following, we first
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4 144 describe the TeLIPro Health Programme briefly. After this, we outline the development of the
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6 145 DCE and its assessment within the RCT.
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10 11 147 **The TeLIPro Health Programme**

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13 148 TeLIPro (TeLIPro Health Programme - Active with Diabetes) is a tele-medical lifestyle
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15 149 programme in Germany designed to help people with T2DM implement a healthy lifestyle
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17 150 through patient-centred and personal care[39]. Participants receive tele-medical devices, access
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19 151 to a secured tele-medical online portal, and tele-medical coaching from a personal health coach
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21 152 who supports and accompanies them for the duration of the programme. The programme is
22
23 153 intended to improve blood glucose levels and therefore to improve or maintain the health status
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25 154 and the quality of life of the participants in the long-term. Ultimately, this should reduce the
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27 155 risk for concomitant and secondary diseases. The integration of the technology also supports
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29 156 the scalability of the programme, enabling it to meet the individual preferences and needs of
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31 157 the participants.
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39 159 **Development of the DCE to measure patient preferences**

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41 160 To measure preferences, we are employing a DCE, a stated preference method, which is the
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43 161 predominant method for eliciting patient preferences in all fields of health care[40–44]. The
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45 162 DCE methodology – based on the Random Utility Theory – allows researchers to estimate and
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47 163 contrast the relative strengths of preferences across a range of particular attributes. The first
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49 164 step in developing a DCE is to define the research problem under consideration (e.g.,
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51 165 measuring patient preferences for tele-medical lifestyle programmes) and to adequately
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53 166 transfer it into an experimental framework[19–20]. The task comprises the identification and
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55 167 selection of attributes that reflect all characteristics relevant for a decision in the context of the
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57 168 research problem. The attributes (e.g., cost or duration of treatment) of the research problem
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59 169 are further specified by different levels (e.g., cost of \$50 or \$500 and 2, 3, or 4 hours). To
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4 170 construct an experimental design, the levels of the attributes are systematically varied and
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6 171 presented in a series of choice sets each with the same number of alternatives (typically two
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8 172 alternatives). By standard economic theory, it is assumed that individuals will choose the
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10 173 alternative that maximises their utility. The preference weights for attributes and levels (part-
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12 174 worth preference weights) constitute the overall utility of an alternative. Thus, observed
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14 175 choices provide information about the relative weights of preferences for attributes and levels
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16 176 as well as about the overall utility of each alternative[45]. We are primarily interested in the
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18 177 preferences of participants who already decided to participate in a tele-medical coaching
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20 178 programme. Thus, we did not include an opt-out option because respondents have already
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22 179 chosen to participate in TeLIPro. To identify and select attributes and levels, we followed the
23
24 180 current literature on the development of DCEs and implemented the following steps: (i)
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26 181 compilation of evidence, (ii) consultation of experts, (iii) consultation of people with diabetes
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28 182 as relevant actors, (iv) pretest, and (v) pilot test[46–47].
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36 184 Compilation of evidence

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38 185 First, we conducted a literature search to identify attributes used in DCEs to elicit preferences
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40 186 regarding lifestyle changes, coaching, and devices (see the online supplementary material).
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42 187 Based on the literature search, we summarised attributes regarding how comfortable the
43
44 188 devices are to wear, the handling of the devices, the frequency of contact with the GP or the
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46 189 health coach, emotional support during the programme, responsibility for the physical activity
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48 190 schedule or diet schedule, and the time investment. We did not include monetary costs in our
49
50 191 summary, because payments for the provision of health care in Germany are normally paid
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52 192 directly by the statutory health insurance, and therefore monetary costs are less relevant than
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54 193 the time investment for preferences regarding tele-medical lifestyle programmes.
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195 Consultation of experts

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4 196 Second, we discussed the attributes with health care experts (see acknowledgments) to ensure
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6 197 that the health care perspective, telehealth, and the clinical perspective were incorporated in
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8 198 the DCE. This process leads to a preliminary list of attributes (i) considering any possible
9
10 199 attribute thought to be relevant to tele-medical lifestyle programmes for people with T2DM,
11
12 200 (ii) including attributes with a special relevance for TeLIPro in order to best adapt patient
13
14 201 preferences to the intervention envisaged in the project, and (iii) including those who could be
15
16 202 realistically described in the choice scenario and were potentially amenable to change. This
17
18 203 resulted in a list of seven attributes with 2-5 levels: the functions and handling of the online
19
20 204 portal, the contacts to coach compared to GP contacts, the transfer of knowledge about a
21
22 205 healthier lifestyle, emotional support, exercise plan, nutrition plan, and the total time required
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24 206 for the programme. This list formed the basis for the DCE design. The alternative attributes:
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26 207 communication between coach and doctors, competence of the coach, total number of contacts
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28 208 to coach, duration of the programme, intensity of the exercise programme, and exercise in
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30 209 groups or individually were used in the pretest.
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38 211 Consultation of people with diabetes/Pretest

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40 212 Third, we conducted qualitative interviews in the form of a cognitive pretest with five
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42 213 individuals with diabetes (December 2018 and January 2019). Participants were recruited from
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44 214 the self-help group (n=2) at the German Diabetes Center in Duesseldorf, Germany, and a
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46 215 specialised diabetes care practice (n=3) in Leverkusen, Germany, by email or personal contact.
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48 216 They participated on a voluntary basis and gave written informed consent prior to being
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50 217 included in the study. The interviewers were two researchers from the Institute for Health
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52 218 Services Research and Health Economics. Interviews were conducted face-to-face at the
53
54 219 German Diabetes Center, the diabetes care practice, and the participants' homes. All interviews
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56 220 were logged and audiotaped. The individual interviews were conducted in order to ensure that
57
58 221 (i) the most important attributes were included in the DCE, (ii) none of the chosen attributes
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4 222 was dominant, (iii) proper levels were appointed to each of the attributes, and (iv) the task and
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6 223 the wording used in the questionnaire were comprehensible and feasible[19,45]. For the
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8 224 qualitative interviews, we developed a guideline based on cognitive pre-testing, including
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10 225 think-aloud methods, demand techniques (understanding individual words), paraphrasing
11
12 226 (reproducing tasks), and sorting techniques (attributes were presented to participants on cards,
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15 227 and participants sorted them by personal relevance). In the first part of the interview, we
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17 228 introduced respondents to TeLIPro, and the questionnaire was presented piece by piece. To
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19 229 obtain more insight into how respondents understood the choice task, they were asked to think
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21 230 aloud during the interview. In addition, respondents were told to identify attributes and levels
22
23 231 they did not understand or found hard to grasp and to provide suggestions for improvement. In
24
25 232 the second part, all seven attributes of the DCE were presented on separate paper cards.
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27 233 Respondents were asked whether they could think of any other attributes that were important
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29 234 but had not been included so far. If so, the interviewer wrote these new attributes on blank
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31 235 cards, and respondents were asked what they considered important about these attributes and
32
33 236 what kinds of levels of the attribute they could think of. If no more new attributes were
34
35 237 mentioned, the additional cards with the six alternative attributes were laid out and explained
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37 238 to the respondents by the interviewer. Next, respondents were asked if they would swap one or
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39 239 more of the six alternative attributes or – if new attributes were mentioned – if they would swap
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41 240 the new attributes with one or more of the seven attributes in the programme. Two researchers
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43 241 reviewed the interviews and adjusted the DCE after an internal discussion. The attribute
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45 242 ‘emotional support’ was swapped with ‘group activities’, which was also modified to include
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47 243 the non-exercise group activities. The attribute ‘frequency of contacts’ was changed to
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49 244 ‘communication between coach and doctors’. It asks if the coach and doctors have contact with
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51 245 each other instead of the patient to doctor and patient to coach ratios. The attribute named “the
52
53 246 transfer of knowledge about a healthier lifestyle” was changed to “responsibility for getting
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55 247 acquainted with a healthier lifestyle” The level ‘4 hours per week’ was removed from the
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248 attribute ‘total time required’ because it was deemed unrealistic by respondents. The attributes
 249 ‘exercise plan’ and ‘nutrition plan’ were merged into ‘responsibility for setting goals to
 250 exercise and menu schedule’ because both attributes targeted the domain of autonomy, and the
 251 majority of the respondents swapped out one of these attributes. The description of the task
 252 concerning the selection of the choice sets was also rephrased to be more precise. This
 253 reduction in the number of attributes to six and the number of levels to two to four ensured an
 254 efficient design while also allowing the number of choice sets to be limited to a practicable
 255 number to prevent a mental burden that was too high for the participants. It was ensured that
 256 one combination of levels reproduced the actual TeLIPro health programme.

258 Pilot test

259 Fourth, we presented the revised DCE to the members of the self-help group ($n=10$) at one of
 260 their monthly meetings. On a pilot test, they answered a paper-pencil version of the DCE
 261 questionnaire and were asked at the end of the questionnaire if they had any suggestions for
 262 improvement. On the basis of these results, the attributes and levels as well as their descriptions
 263 in the questionnaire were not changed. The DCE instructions concerning the selection of the
 264 choice sets was again rephrased to clarify that the most preferred or least disliked programme
 265 of the two had to be chosen. The final six attributes with their corresponding levels are shown
 266 in Table 1.

268 **Table 1:** Final attributes and corresponding levels included in the DCE

Attributes	Descriptions	Levels
The functions and handling of the online portal	During the coaching programme, you are provided with different devices to measure your weight, your blood glucose, and the steps you have walked. These devices automatically transfer your data to an online portal that you and your coach can access. The range of	Extensive functions and more complex handling Less extensive functions and easier handling

functions and the handling of the online portal can differ for different programmes. The more functions the online portal offers, the more complex the handling becomes.

Communication between coach and doctors	Coaching programmes can differ on the basis of whether your coach and your doctors communicate about your treatment, the programme goals you have set, and your data in the online portal.	My coach and my doctors do not communicate My coach and my doctors do communicate
Responsibility for getting acquainted with a healthier lifestyle	Coaching programmes can provide you with information about various opportunities for lifestyle changes.	I receive information from my doctor I receive information from my coach I search for information myself
Group activities	Some coaching programmes contain activities in groups of 10-15 participants each. The activities include sports activities, cooking together, and also the exchanging of experiences by the group members in an online forum.	No group activities Group activities
Responsibility for setting goals to exercise and menu schedule	One part of the coaching programme is setting goals to exercise and eat well.	My coach sets my goals I set my goals independently My coach and I set my goals together
Total time required	Coaching programmes may differ in the amount of time you have to spend on the programme. This includes the time spent fulfilling your movement goals, talking to your coach, changing your diet, and using your devices correctly. The time required for potential group activities is not included.	12 hours per week 10 hours per week 8 hours per week 6 hours per week

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270 DCE questionnaire design

271 The combination of the attributes in the different scenarios of the DCE and the compilation of

272 the scenarios was based on the number and levels of the attributes as well as other content

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4 273 and statistical requirements. SAS macros (SAS version 9.4) were used to define the optimal
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6 274 number of choice sets[48]. Particular care was taken to ensure that combinations of levels
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8 275 were realistic. The number of total choice sets takes respondents' cognitive capacity into
9
10 276 account. The efficient factorial fractional design (D -error=0.12) consisted of 12 unique
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12 277 choice tasks. To control for the reliability of the choices that were made, choice set 7 was
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15 278 repeated as choice set 13, resulting in a total of 13 choice sets.
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19 280 **Assessment of the DCE within the RCT**

21 281 The collecting of the DCE data is integrated into the collecting of the RCT data. Therefore,
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24 282 all RCT participants are asked to respond to the DCE. Next, we first describe the RCT, and
25
26 283 then we describe the assessment of the DCE.
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31 285 **The RCT: The TeLIPro trial**

33 286 The trial is aimed at assessing whether participating in the tele-medical lifestyle programme
34
35 287 TeLIPro can improve the HbA_{1c} levels of people with T2DM. According to the sample size
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37 288 calculation computed for the RCT, 850 participants were recruited from within the members
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40 289 of a German statutory health insurance (Allgemeine Ortskrankenkasse, Rhineland/Hamburg,
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42 290 AOK) via informational letters and reminder telephone calls. Inclusion criteria consist of a
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44 291 T2DM diagnosis, age between 18 and 67 years, HbA_{1c} \geq 6.5%, Body Mass Index (BMI) \geq 27
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46 292 kg/m², and a willingness to participate in the study. Participants are given detailed information
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48 293 about the programme and provide informed consent. Exclusion criteria consist of factors that
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50 294 would prevent successful participation in the programme, e.g., acute infections, addictions or
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52 295 dementia, as well as insufficient knowledge of the German language. Participants are being
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54 296 randomised (1:1) into an intervention group (IG) and control group (CG). Participants of the
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56 297 IG are given a scale, a step counter, access to a tele-medical online portal, a data hub for
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58 298 transmitting the measured values to the online portal, a glucose meter with test strips for the
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4 299 self-monitoring of blood glucose, and tele-medical telephone coaching from a personal health
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6 300 coach in addition to routine care. The number and duration of interactions between the health
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8 301 coach and the individuals in the IG are determined by the needs of the participants (on average
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10 302 14 interactions over the course of the intervention with a duration of 10–30 minutes each). The
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12 303 health coach encourages the participant, and they set goals together (i.e., behavioural changes
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14 304 concerning physical activity and eating). For the IG, the measures of blood glucose are
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16 305 recorded continuously, and pedometer data and weight (on a daily or weekly basis) are
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18 306 automatically transmitted to the online portal by the devices. The data can be viewed by both
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20 307 the participant and the coach. If a previously determined target value is exceeded or not
21
22 308 reached, an alert is triggered, and the coach may decide to intervene. In addition to the
23
24 309 monitoring function, the online portal provides information to support the change in lifestyle
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26 310 and enable participants to manage their illness autonomously, for example, text-based
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28 311 information on illness, nutrition, exercise, motivation, and health parameters. Furthermore,
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30 312 functions are available for communication and information exchange between the actors who
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32 313 are involved: participant and coach, as well as the attending general practitioner (GP) or
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34 314 relatives with the participant's consent. Therefore, it is easy to exchange information and adapt
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36 315 the therapy. The intervention will last 12 months. Participants of the CG are not accompanied
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38 316 by a coach. Except for this, they receive the same components of the programme as the IG.
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40 317 Participants register in the online portal and are asked for sociodemographic factors (sex, age,
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42 318 employment status, education) and the duration of their diabetes. Afterwards, the intervention
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44 319 begins. Participants are given devices and the IG is contacted by the personal health coach. In
45
46 320 the online portal, all participants answer questionnaires about their health-related quality of life
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48 321 (Short-Form-Health Survey 12; SF-12), impairment due to depressive symptoms (German
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50 322 version of the Centre for Epidemiological Studies-Depression Scale; CES-D Scale), eating
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52 323 behaviour (German version of the Three-Factor Eating Questionnaire; FEV), and exercise
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54 324 behaviour (Global Physical Activity Questionnaire, GPAQ)[49-52] at baseline, 3 months, 6

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3 325 months, 9 months, 1 year (completion of the intervention), 15 months (follow-up phase), and
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6 326 18 months (follow-up phase) after baseline. If a questionnaire is not answered within two
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8 327 weeks, participants are reminded by a telephone call from the online portal service staff. On a
9
10 328 quarterly basis, the participants' HbA_{1c} level, BMI, fasting blood glucose, blood pressure,
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12 329 triglycerides, HDL/LDL cholesterol, antihyperglycemic treatment, and blood pressure
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14 330 medication are assessed by asking the attending GP. Body weight is recorded weekly, and
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16 331 walked steps are recorded daily by the devices for both groups. For the IG, blood glucose is
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18 332 monitored daily. The primary outcome is the HbA_{1c} level. Secondary outcomes include
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20 333 cardiovascular risk factors, health-related quality of life, and medication. The analysis of the
21
22 334 effectiveness and health economic evaluation of the TeLIPro trial will be the topic of a later
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24 335 publication.

336 **Assessment of the DCE**

337 To address the DCE, respondents are provided with an extensive explanation of the meanings
338 of all attributes and levels as well as information on how to deal with a choice set, accompanied
339 by an example. Afterwards, respondents are told that they need to choose between two lifestyle
340 programmes in the following choice sets. They are told that 13 choice sets are best suited for
341 determining what type of lifestyle programme is preferred. Respondents are told to always
342 choose their personally best-suited or least-rejected lifestyle programme and that there are no
343 right or wrong answers. They are also reminded that they can always opt for a programme with
344 all the features listed. Every choice task is accompanied by the invitation: 'Please select the
345 coaching programme that suits you best'. Then both programmes (Programmes A and B) are
346 presented (see Figure 1) followed by the question: 'Which programme do you prefer? (Please
347 tick the appropriate box)'. Figure 1 presents an example of a choice task as included in the
348 questionnaire. The DCE is measured before the start of the intervention and after 1 year when
349 the intervention has been completed. Data collection for the DCE began in January 2019 and
350 is anticipated to take place until December 2020.

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6 352 - *Please insert Figure 1 here* -7
8 3539
10 354 **Data analysis for the DCE**11
12 355 To derive the preferences of people with T2DM regarding tele-medical lifestyle programmes13
14 356 (i.e. relative preference weights for attributes and levels), the obtained baseline DCE data will15
16 357 be analysed using a conditional logit model. Preference weights describe the relative strength17
18 358 of each attribute and level in comparison with all other attributes and levels, respectively.19
20 359 Furthermore, the preference weights will be expressed as time equivalents (willingness to21
22 360 invest time) by calculating the trade-off or marginal rates of substitution between attributes and23
24 361 the attribute that focuses on the time required by the programme. To investigate possible25
26 362 preference heterogeneity, we will conduct a latent class analysis (LCA). The number of classes27
28 363 is determined by the Bayesian information criterion as well as an examination of the29
30 364 interpretation of the latent classes. The following covariates will be incorporated into the LCA:31
32 365 sociodemographic factors (sex, age, employment status, and education), disease-related33
34 366 characteristics (HbA_{1c} level, duration of diabetes, BMI), exercise behaviour, depressive35
36 367 symptoms, and health-related quality of life. Because the IG and CG are not expected to differ37
38 368 at baseline due to randomisation, the analysis will be based on the full sample.39
40 369 We will investigate the effect of latent classes of preferences at the beginning of the study on41
42 370 programme success at the end of the study. This will be done by means of an LCA with a distal43
44 371 outcome, where programme success is regressed on latent preference classes. This approach45
46 372 will allow us to explore whether programme preferences differ with respect to distal outcomes47
48 373 such as programme success. This type of analysis may lead to additional information about49
50 374 heterogeneity in the (study) population.51
52 375 To investigate changes due to participation, preference weights before and after participation53
54 376 in the programme will be compared descriptively and analysed using time equivalents. The

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4 377 analysis will be outlined separately for the IG and the CG as their experiences during the
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6 378 intervention phase will differ substantially.

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10 380 **Sample size calculation for the DCE**

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12 381 As no initial estimates about parameter values in the target population are available, we applied
13
14 382 a rule of thumb to determine the sample size instead of a parametric approach. According to
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16 383 de Bekker-Grob et al. [53], one frequently used rule of thumb suggests $N > 500c/(t * a)$,
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18 384 where c is the largest number of levels among attributes, t is the number of choice tasks, and
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20 385 a is the number of alternatives per choice task. This was later refined by Orne [54] to
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22 386 $N > 1000c/(t * a)$, which resulted in a sample size of $N = 167$ for our design. The
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24 387 recruitment of 850 participants for the RCT will likely lead to a large enough sample that can
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26 388 be stratified for the IG and CG.

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30 390 **Patient and Public involvement**

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32 391 Patient involvement during the various stages of the development of the DCE (qualitative
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34 392 interviews, pilot tests) ensured that the research question relied on the actual preferences of
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36 393 people with T2DM participating in tele-medical lifestyle programmes.

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40 395 **ETHICS AND DISSEMINATION**

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42 396 The DCE study has been approved by the ethics committee of the medical faculty of the
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44 397 Heinrich Heine University committee of the Heinrich-Heine University Duesseldorf,
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46 398 registration number 2018-242-ProspDEuA, registered on December 6th, 2018. The TeLIPro
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48 399 trial is registered at the U. S. National Library of Medicine, registration number NCT03675919,
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50 400 registered on September 15th, 2018. Patient consent to participate was obtained for the RCT
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52 401 as well as for the DCE. Data analysis will be done according to the principles of good scientific
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54 402 research on DCEs developed by the International Society for Pharmacoeconomics and

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4 403 Outcome Research (ISPOR). We aim to disseminate our results in peer-reviewed journals and
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6 404 at national and international conferences to interested patient groups and the public.
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For peer review only

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417 **AUTHOR STATEMENT**

418 MV and AI contributed to the initial grant application. All authors contributed to the design of
419 the study and are involved in the implementation of the project. JS wrote the first draft of the
420 protocol. JS, JD, SG, VG, MV, MR, and AI contributed to the drafting and editing of the
421 protocol. All authors read and approved the final protocol.

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428 **CONFLICTS OF INTEREST**

429 The authors declare that they have no competing interests.

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6 431 **DATA STATEMENT**

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9 432 After the data are collected and the results are published, the data will be made available upon
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11 433 reasonable request.

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16 435 **SUPPLEMENTARY MATERIAL**

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19 436 Results of the literature review to identify attributes used in DCEs to elicit preferences
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21 437 regarding lifestyle changes, coaching, and devices.
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17 596 **Caption of Figures**

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19 597 **Figure 1:** Example of a choice task used in the discrete choice experiment.
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First Choice

Please select the coaching programme that suits you best.

	Programme A	Programme B
The functions and handling of the online portal	Extensive and complex	Less extensive and simple
Communication between coach and doctors	My coach and my doctors do not communicate	My coach and my doctors do communicate
Responsibility for getting acquainted with a healthier lifestyle	I receive information from my doctor	I receive information from my coach
Group activities	No group activities	Group activities
Responsibility for the goals of the exercise and menu schedule	My coach sets my goals	I set my goals independently
Total time required	10 hours per week	8 hours per week
Which programme do you prefer? (Please tick the appropriate box)	<input type="checkbox"/>	<input type="checkbox"/>

Supplementary File

Results of the literature review to identify attributes used in DCEs to elicit preferences regarding lifestyle changes, coaching, and devices.

DCE Topic	Attribute	Levels	Reference
Devices	Comfort of wearing	<ul style="list-style-type: none"> - Warm and squeezing - Breathing and not squeezing - Comfortable - Uncomfortable 	Bouman et al.,2016 [1] Bunge et al., 2010 [2]
Devices	Appearance	<ul style="list-style-type: none"> - Thick material and skin colored - Thin material and color of choice - Visible - Not visible 	Bouman et al.,2016 [1] Bunge et al., 2010 [2]
Devices	Help Needed	<ul style="list-style-type: none"> - Help needed - Independently - No help needed while emptying your bowels - You need less help than you did previously - You need as much help as you did previously - You need more help than you did previously 	Bouman et al.,2016 [1] Nafees et al.,2016 [3]
Devices	Duration of therapy	<ul style="list-style-type: none"> - 6 months - 15 months - 24 months 	Bouman et al.,2016 [1]
Devices	Device Hygiene	<ul style="list-style-type: none"> - Hand washed, dries slowly - Machine washed, dries quickly - Mouthpiece can be washed, but not replaced - Mouthpiece can be replaced, but not washed - Mouthpiece can be cleaned with a dry cloth, but not washed or replaced 	Bouman et al.,2016 [1] Hawken et al.,2017 [4]
Devices	Easy to Use	<ul style="list-style-type: none"> - 1 step - 2 to 3 steps - More than 4 steps - You will use an automatic pump (process requiring ~15 steps) - You will use a manual pump (process requiring ~30 steps) 	Hawken et al.,2017 [4] Nafees et al.,2016 [3]
Devices	Flexibility of device handling	<ul style="list-style-type: none"> - Inhaler can be held in any position throughout inhalation process - Inhaler must be held in certain position throughout inhalation process 	Hawken et al.,2017 [4]
Devices	Time to use per treatment	<ul style="list-style-type: none"> - 5 minutes - 10 minutes - 15 minutes - 25 minutes - 30 minutes - You will spend up to 30 minutes - You will spend up to 1 hour - You will spend up to 1.5 hours - You will spend up to 2 hours 	Mohamed et al.,2015 [5] Nafees et al.,2016 [3]

DCE Topic	Attribute	Levels	Reference
Devices (Coaching)	Frequency of use	<ul style="list-style-type: none"> - None - 2 pills 3 times a day (6 pills per day) - 3 pills 4 times a day (12 pills per day) - 2 times per day - 3 times per day - Once every two days on average - Once every day on average - Twice a day on average - Three times a day on average - Once per day - Once per week - Once per month - Once per 3 months - Once per 6 months - Once per year 	Marshall et al.,2017 [6] Mohamed et al.,2015 [5] Nafees et al.,2016 [3] Quaife et al.,2016 [7]
Coaching	Training of the IP (information provider)	<ul style="list-style-type: none"> - Counselor with specialized training in use of medications during pregnancy only - Family doctor with general health training 	Hancock-Howard et al.,2012 [8]
Coaching	Method of counseling and waiting time	<ul style="list-style-type: none"> - Make an appointment and meet with the IP in person in 3 days - Call a telephone service and receive the information within 30-minutes 	Hancock-Howard et al.,2012 [8]
Coaching	Knowing the IP	<ul style="list-style-type: none"> - You have met the IP before and they know your medical history - You have never met the IP 	Hancock-Howard et al.,2012 [8]
Coaching	Confidence in the skills of the IP	<ul style="list-style-type: none"> - You have confidence in the skills of the IP - You know nothing about the skills of the IP 	Hancock-Howard et al.,2012 [8]
Coaching	Helpfulness of information	<ul style="list-style-type: none"> - Enough information has been provided that you believe your question has been answered to your satisfaction - Some information has been provided to you, but your question has not been completely answered to your satisfaction 	Hancock-Howard et al.,2012 [8]
Coaching	Time away from home/office/usual activities including travel	<ul style="list-style-type: none"> - More than four hours - 3–4 h - 1–2 h 	Spinks et al.,2016 [9]
Coaching	Wait time to get result	<ul style="list-style-type: none"> - Up to three days - Up to one day - Less than four hours 	Spinks et al.,2016 [9]
Coaching	Who reviews the result	<ul style="list-style-type: none"> - GP - Telederm dermatologist 	Spinks et al.,2016 [9]
Coaching Diabetes	Feedback on physical activity performance	<ul style="list-style-type: none"> - Patient receives feedback on his or her individual performance - Patient's performance is compared with that of other patients 	Ramirez et al.,2016 [10]
Coaching Diabetes	Physical activity behavior-change education	<ul style="list-style-type: none"> - Patient's doctor recommends the educational content - Patient specifies the type of educational content he or she wants to receive 	Ramirez et al.,2016 [10]
Coaching Diabetes	Frequency of messaging	<ul style="list-style-type: none"> - Patient's doctor recommends how often patient should receive messages - Patient specifies how often he or she wants to receive messages 	Ramirez et al.,2016 [10]

DCE Topic	Attribute	Levels	Reference
Lifestyle Diabetes	Menu schedule	<ul style="list-style-type: none"> - <i>Flexible</i> you set your own goals and develop your own menu schedule to reach these goals without the assistance of a lifestyle coach - <i>General</i> your lifestyle coach informs you about health and unhealthy foods, using food information and examples of recipes - <i>Elaborate</i> your lifestyle coach develops a menu schedule that meets your needs and wishes - Flexible: primarily based on the participants' own initiatives and ideas - General: includes general information on a healthy diet and provides example recipes - Elaborate: a patient tailored schedule that is completely prepared by the lifestyle coach - Flexible (you composed this schedule) - General (with information about diet and examples of recipes) - Elaborate (this schedule is composed for you and tailored to your needs) 	<p>Salampeyy et al.,2015 [11] Veldwijk et al.,2013 [12] Wanders et al.,2014 [13]</p>
Lifestyle Diabetes	Physical activity schedule	<ul style="list-style-type: none"> - Patient's doctor recommends physical activity goals - Patient selects his or her own personalized physical activity goals - <i>Flexible</i> you set your own goals and develop your own activity schedule to reach these goals without the assistance of a lifestyle coach - <i>General</i> your lifestyle coach informs you about what physical activities would be good for you, using information about physical activity and examples of exercises - <i>Elaborate</i> your lifestyle coach develops a physical activity schedule that meets your needs and wishes - Flexible: primarily based on the participants' own initiatives and ideas - General: includes general information on PA, and provides example exercises - Elaborate: a patient tailored schedule that is completely prepared by the lifestyle coach - Flexible (you composed this schedule) - General (with information about physical activity and examples of exercises) - Elaborate (this schedule is composed for you and tailored to your needs) 	<p>Ramirez et al.,2016 [10] Salampeyy et al.,2015 [11] Veldwijk et al.,2013 [12] Wanders et al.,2014 [13]</p>

DCE Topic	Attribute	Levels	Reference
Coaching Lifestyle Diabetes	Consultation Structure / Social support	<ul style="list-style-type: none"> - Family members learn how to offer support - Patient meets other patients so they can support one another - <i>Individual</i> the consultations of the lifestyle program are individually - <i>Consultation 5</i> the consultations of the lifestyle program are in groups of 5 <i>other patients</i> - <i>Consultation 10</i> the consultations of the lifestyle program are in groups of 10 <i>other patients</i> - Individually - Groups with 5 other T2DM patients - Groups with 10 other T2DM patients - individual - in a group with 5 other people - in a group with 10 other people 	Ramirez et al.,2016 [10] Salampessy et al.,2015 [11] Veldwijk et al.,2013 [12] Wanders et al.,2014 [13]
Lifestyle Diabetes	Time spent on the program	<ul style="list-style-type: none"> - 2.5 hours per week - 4 hours per week 	Van Gils et al.,2011 [14]
Lifestyle Diabetes	Arrangement physical activity lessons	<ul style="list-style-type: none"> - Individually with men and women - With people of the same gender 	Van Gils et al.,2011 [14]
Lifestyle Diabetes	Group activity	<ul style="list-style-type: none"> - Only with people without diabetes - Only with other diabetes patients 	Van Gils et al.,2011 [14]
Lifestyle Diabetes	Sports activity	<ul style="list-style-type: none"> - Walking/cycling - Fitness (treadmill, rowing machine, bicycle) 	Van Gils et al.,2011 [14]
Lifestyle Diabetes	Counseling	<ul style="list-style-type: none"> - None - Physical therapist/sports teacher 	Van Gils et al.,2011 [14]

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