The role of self-efficacy, well-being capability and diabetes care assessment for emotional and diabetes management challenges during the COVID-19 pandemic: Findings from a follow-up study

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A B S T R A C T

This study aimed to investigate the potential protective role of baseline resources and capabilities for experiencing challenges to emotional well-being and perceived access to and quality of diabetes care during the COVID-19 pandemic in a Danish type 2 diabetes population (N = 1608). We investigated how differences in self-efficacy, well-being capability, socioeconomic status, health status, and perceptions of diabetes care measured before the COVID-19 pandemic were related to experiences of well-being and diabetes management challenges during the pandemic. The study is based on a survey conducted shortly before the pandemic (autumn 2019) and a follow-up survey during the pandemic (autumn 2020), which included questions about impacts of the pandemic. We used this longitudinal data to quantitatively investigate in regression analyses how self-reported baseline indicators of chronic care access and quality (PACIC), self-efficacy (GSE), health (EQ VAS), and well-being capability (ICE-CAP-A), and registry-based socioeconomic indicators were associated with the probability of reporting negative impacts on emotional wellbeing and diabetes management. Results showed that respondents with higher baseline general self-efficacy and higher well-being capability scores, who more often considered care well-organised and were in better health before the pandemic, were less likely to report pandemic-related negative impacts on emotional well-being. Considering diabetes care well organised before the pandemic was associated with a lower probability of adverse impacts on diabetes care. The results thus broadly confirmed that several indicators of higher levels of baseline resources and capabilities were associated with a lower probability of reporting negative impacts of the pandemic. However, some variation in predictors was observed for general well-being outcomes, compared to diabetes-care specific challenges, and findings on socioeconomic status as indicated by education were mixed.

1. Introduction

The coronavirus (COVID-19) pandemic and the fight to control its spread introduced far-reaching impacts and constraints on the daily lives of people worldwide. This has resulted in concerns about the implication for well-being of the pandemic (Holmes et al., 2020; Pfefferbaum and North, 2020; Robinson et al., 2022) and has motivated interest in identifying individual resilience factors (Johnston et al., 2021). Additional concern has been raised over the adverse interaction of the pandemic with people's existing health-related disadvantage, such as chronic conditions, poorer psychosocial circumstances, and socioeconomic disadvantage (Bambra et al., 2020, Wachtler et al., 2020).

From the onset of the pandemic, people with type 2 diabetes (T2D) were identified in Denmark and elsewhere as being at higher risk for COVID-19-related hospitalisation and death (Grabowski et al., 2020; Mesas et al., 2020; Reilev et al., 2020). Recommended T2D care includes daily medication, healthy diet, and physical activity (Davies et al., 2018), and while the majority of disease management takes the form of daily self-care outside the clinical setting (Fisher and Glasgow, 2007), it is recommended to have regular ongoing healthcare visits to monitor health status and to prevent, delay or treat complications (Davies et al., 2018). The exceptional circumstances during the COVID-19 pandemic may have influenced daily self-care routines as well as opportunities to access healthcare. Combined with the identified higher health risks of

COVID-19 for persons with diabetes this has resulted in concerns about psychosocial and diabetes management challenges for people living with T2D during the pandemic (Carr et al., 2021; Joensen et al., 2020; Sacre et al., 2021; Scott et al., 2020). Studies from the early phase of the pandemic showed that people with diabetes reported high rates of worry about COVID-19 and about being negatively affected by COVID-19 (Joensen et al., 2020; Sacre et al., 2021) and that some found it unsettling to be described as a risk group (Grabowski et al., 2020). Additionally, reduced contact with healthcare for people with T2D has been documented in Denmark and internationally (Carr et al., 2021; Danish Regions, 2021).

In March 2020, the Danish government introduced mitigation measures to halt the spread of COVID-19 that imposed substantial restrictions and changes in day-to-day life (Saunes et al., 2021). The initial phase of the pandemic in spring 2020 was characterised by widespread societal lockdown and isolation in Denmark. During late spring, summer, and early fall, gradual reopening occurred but extensive restrictions on activities outside the household were maintained, e.g., required mask wearing, activity limits, and physical distancing. Rising infection rates during the fall led to renewed restrictions in the winter of 2020–2021 (Vistisen et al., 2021; Vrangbæk et al., 2021). In the last days of 2020, COVID-19 vaccination was initiated in Denmark (Tænketanken Europa, 2021).

The effects of the pandemic and associated behavioural restrictions have been characterised as limiting peoples' capabilities: their abilities and freedom "to do or be" and act according to their usual values and aims for life (Anand et al., 2020; Simon et al., 2021, p. 2). The capabilities framework is a broad multidimensional approach aiming to assess individuals' opportunities to "pursue the lives they have reason to value" (Ruger, 2004, p. 1076; Sen, 1999). Due to its broad view on quality of life and emphasis on freedom and possibility, the capability framework has been suggested as a relevant perspective to identify and understand impacts of the wide-ranging constraints and risks the COVID-19 pandemic introduced (Anand et al., 2020; Meili et al., 2021). There are at present several survey-based operationalisations of capabilities available including measures focusing on assessing wellbeing capability (Coast et al., 2015; Helter et al., 2020). Simon et al. (2021) investigated capability in a survey conducted early in the pandemic and found that belonging to a risk group as defined by age 65+ and/or having a pre-existing health condition (including diabetes) was associated with reduced well-being capability as measured by the OxCAP-MH instrument. However, the study only included one measurement during the pandemic and hence cannot illuminate on the potential role of existing capabilities.

Other studies have emphasised the potential role of various types of resources as potential protectors against adverse wellbeing impacts of the pandemic. In a general population survey, Johnston et al. (2021) investigated the role of financial and non-financial resources in psychological resilience, finding that belief in one's abilities to cope with challenges (i.e., general sense of self-efficacy) was an important protective factor for psychological distress in the early phase of the pandemic crisis (Johnston et al., 2021). In general, knowledge on people's pre-existing characteristics and resources may be critical in understanding differential impacts of the pandemic both in terms of wellbeing and healthcare related outcomes. To the best of our knowledge, it is as yet unknown how pre-existing characteristics of well-being capability, self-efficacy and healthcare contact are associated with well-being and healthcare outcomes among people with T2D during the COVID-19 pandemic. This study combines a survey investigating aspects of health and healthcare resources, well-being and capabilities among a random sample of people with T2D in Denmark conducted shortly before the pandemic began (autumn 2019) with a follow-up survey during the pandemic (autumn 2020) that included additional questions about pandemic-related worries and problems. The longitudinal design enabled a unique perspective on the association of baseline resources and characteristics with general and diabetes-specific challenges related

to the COVID-19 pandemic. This study aimed to investigate the potential protective role of baseline resources and capabilities for experiencing challenges to emotional well-being and perceived access to and quality of diabetes care during the COVID-19 pandemic in a Danish population with T2D. Specifically, we investigated how differences in self-efficacy, well-being capability, socioeconomic status, health and healthcare resources measured before the COVID-19 pandemic were associated with experiences of well-being and diabetes care during the pandemic.

This study adds to the literature on psychosocial and healthcare impacts of the pandemic among people with T2D by investigating negative impacts experienced in a later stage of the pandemic, when people had had some time to adapt to changing circumstances, continued to have prolonged exposure to mandated restrictions and altered life conditions, and still awaited vaccination roll-out. The results are expected to be relevant to understanding and addressing the effects of the prolonged pandemic on well-being and diabetes-care related challenges of people with T2D. However, the results may also provide more general insights into the importance of the investigated characteristics for resilience to substantial systemic challenges.

2. Material and methods

2.1. Setting

Denmark is characterised by publicly funded comprehensive universal healthcare coverage (Olejaz et al., 2012). T2D healthcare is organised in disease management programmes integrated into regional agreements on care provided by general practitioners, specialists in private practice, municipalities, and hospitals (Frølich et al., 2015; Vrangbæk, 2021). T2D is estimated in Denmark to have a median age at diagnosis of around 63 years and is currently more common in men than women (Carstensen et al., 2020). T2D can lead to a range of complications and a Danish study has shown that around one-third may have complications already at the time of diagnosis (Gedebjerg et al., 2018).

2.2. Data collection

In October 2019, a survey was conducted among a random sample of people with T2D in Denmark investigating aspects of health, healthcare, well-being and capabilities with the primary aim of studying healthcare access, use and quality for persons with T2D and associations between healthcare characteristics and personal capabilities (Tapager et al., 2022b). Due to the emergence of the pandemic, the follow-up survey that was planned to take place a year later was adjusted to include additional questions about worries and problems related to the pandemic crisis thus enabling the present analyses.

The population consisted of random samples of people fulfilling registry-based criteria for diabetes treatment onset in 2016–2017 and of the general population with similar demographic characteristics. This study included respondents with self-reported T2D from either sample. Invitations for the second survey were sent exclusively to first-round survey respondents who had consented to be invited to a follow-up survey (86%). Invitations were sent to an official online mailbox ("eBoks") with a link to the online survey. The vast majority of the Danish population has this official secure mailbox, which has become a feasible tool for recruiting research survey participants (Ebert et al., 2018). Written reminders were sent to non-respondents, and non- or partial respondents were also given the option of responding by telephone. Invited respondents received written information about the study, including information on confidentiality, use of registry data and the voluntary nature of participation. Survey sampling and data collection were carried out by Statistics Denmark's survey division (DST Survey). Survey data were merged with registry data and accessed and analysed through the Statistics Denmark research platform, providing secured access to pseudonymised registry and survey data. Baseline survey data collection is described in further detail elsewhere (Tapager

et al., 2022b).

2.2.1. Ethics and data approvals

The study was carried out in accordance with Danish data protection legislation, registered and approved in the University of Copenhagen's record of research projects containing personal data (J.nr: 514–0032/18-3000), and approved by the Research Ethics Committee for Science and Health at University of Copenhagen (J.nr: 504–0054/19-5000).

2.3. Analytical strategy and survey measures

Our analyses investigated associations between baseline indicators of resources measured before the pandemic and self-reported impacts measured seven to eight months into the pandemic. Our analyses are based on validated instruments previously translated and used in Denmark as well as selected Danish instruments regarding pandemic outcomes adapted for this study (see below). Relevant permissions for use were obtained where applicable. The survey measures are presented below and a supplementary full list of the applied survey instruments including key references to development, translation and validation studies as well as links to access and registration for use is available in online supplementary material (OSM Table 1).

2.3.1. Outcome measures: perceived impacts of the pandemic

The impact of the pandemic was explored with self-reported outcome measures from the follow-up survey and studied perceived impact on general well-being and diabetes management. We aimed to capture outcomes relating to both broader well-being diabetes-related care specifically as both these domains have been emphasised in the literature as areas of concern during the COVID-19 pandemic.

2.3.2. General well-being

Impact on general well-being was measured with two questions

Table 1
Study sample characteristics.

(N = 1608)	Percentage %	N
Female	39.0	627
Age <55	19.1	307
Age 55-64	33.8	543
Age 65-69	19.5	313
Age 70+	27.7	445
Cohabiting	65.0	1046
Immigrant	6.8	109
Health		
Diabetes duration ≤5 years	82.2	1322
Diabetes duration >5 years	17.8	286
At least one self-reported complication[a]	36.9	593
Education		
-short	25.8	415
-medium	48.3	777
-long	24.9	400
-missing	1.0	16
Occupation		
-Employed	37.7	606
-Self-employed	2.9	47
-Unemployed	10.9	175
-Retired/early retirement	48.5	780
Region of Denmark		
-North	11.4	184
-Mid	21.5	345
-Southern	24.9	400
-Capital	23.6	380
-Zealand	18.6	299
Municipality area type		
-Capital/near capital/big city	28.7	462
-Provincial/catchment area	44.0	708
-Rural	27.2	438

[a] One or more self-reported comorbidities or complications (heart, eye, kidney, nerve or foot conditions).

adapted from the COVID-19 impact on quality of life dimensions instrument (Sacre et al., 2021, Danish version obtained from Steno Diabetes Center Copenhagen). Items asked how the pandemic crisis was currently impacting emotional well-being (outcome 1a) and feelings about the future (outcome 1b). The first item emphasised current emotional well-being and the second solicited concerns that were expected to relate to thoughts about future capabilities in life. Response options were 'very negative impact', 'slightly negative impact', 'no impact', 'slightly positive impact', and 'very positive impact'. Responses were dichotomized to a binary indicator of any level of negative impact versus no or positive impact.

2.3.3. Diabetes management

Impacts related to diabetes management were measured with questions about problems with diabetes care and self-management and diabetes-related healthcare contact during the pandemic. Respondents were presented with a list of possible problems related to diabetes treatment during the pandemic and asked to indicate for each whether they currently were or had been experiencing it (questions adapted from Joensen et al., 2020 to reflect the later stage in the pandemic, see OSM Table 1). General self-care challenges (outcome 2a) were defined as a binary indicator of selecting the response option, "… I am not able to manage how changes in my everyday life (e.g., work from home, less social interaction) may affect my health". Negative diabetes care impact (2b) was defined as a binary indicator of selecting one or both of the problems: "not being able to access my diabetes care provider(s) if I need to" or "… the quality of the provision of my diabetes care is decreased during the Corona crisis".

Contact with diabetes care during the pandemic was measured with a multi-response question on diabetes-related points of contact since the beginning of the pandemic (outcome 2c). Contacts could be of any nature (i.e., by telephone, in writing, online or in person) and with any type of healthcare professional between the onset of pandemic restrictions in March and survey response, roughly 7–8 months later in October–November 2020. The indicator was based on a response of no diabetes-related contact of any type with any healthcare professionals.

2.3.4. Baseline measures: indicators of personal characteristics and resources

We investigated three domains of resources as potentially protecting against adverse impacts from the pandemic: 1) wellbeing capability and general self-efficacy, 2) health and healthcare resources, including self-assessed health and chronic care assessment, and 3) socioeconomic resources.

Beliefs in wellbeing capability and abilities to cope with unknown challenges

We used two aspects of self-reported capability arising from different approaches to operationalising different aspects of capability. One is a composite measure of well-being capability (ICECAP-A) and the other is general sense of self-efficacy as a measure of beliefs in general ability to cope with challenges (GSE) – both elaborated below.

The ICEpop CAPability measure for adults (ICECAP-A) aims to conceptualise and measure well-being from a capabilities' perspective (Al-Janabi et al., 2012) and is a part of the "ICECAP"-family of instruments gaining popularity and recognition in economic assessment (Helter et al., 2020; Kinghorn, 2019). It was developed in the UK through a qualitative and exploratory process identifying key well-being aspects and framing them in a way that captures them in a potential sense; that is, assessing peoples' perceived abilities and freedom to achieve certain valued outcomes, rather than whether they have been actually achieved (Al-Janabi et al., 2012, 2013). The instrument comprises five domains: "stability" (ability to feel "settled and secure"), "attachment" (ability to have love and friendship), "autonomy" (ability to be independent), "achievement" (ability to "achieve and progress" in life), and "enjoyment" (Al-Janabi et al., 2012, p. 173). For each domain, respondents are asked to choose the most accurate level for their current

situation. Response options range from no ability (e.g., "I am unable to feel settled and secure in any areas of my life") to total ability (e.g., "I am able to feel settled and secure in all areas of my life") (Al-Janabi et al., 2012, p. 173; University of Birmingham, n.d.). In a study developing a societally acceptable sufficient threshold of ICECAP-A through public deliberation, reasoning was shown to include considerations that ensuring a sufficient level on the ICECAP-A would indicate resilience and confidence in own abilities (Kinghorn, 2019). It was hypothesised in this context to be a protective factor for mental wellbeing during the pandemic disruptions.

We used the Danish translation of ICECAP-A by Holst-Kristensen et al. (2020, 2019). An overall index score was calculated by combining responses to the five domains with preference-based weights derived from a UK population (Flynn et al., 2015); no Danish weights exist. The resulting ICECAP-A score can be interpreted on a continuum from 0 (no capability) to 1 (full capability) (Flynn et al., 2015).

The concept of self-efficacy has been associated with a psychological interpretation of capabilities and an indicator of individual agency, which is an important aspect of capabilities (Alkire, 2005; Ruger, 2010; Schwarzer and Fuchs, 1995; Tapager et al., 2022a). It has been conceptualised elsewhere as a non-cognitive skill and shown to be a determinant of resilience during COVID-19 (Johnston et al., 2021). General self-efficacy (GSE) has been operationalised in a survey scale by Ralf Schwarzer and colleagues (Schwarzer, 2014; Schwarzer and Jerusalem, 1995). GSE aims to capture a general sense of ability to deal effectively with challenges; that is, to measure "confidence in one's coping ability across a wide range of demanding or novel situations" (Luszczynska et al., 2005, p. 81). In this study, we used the Danish translation (Mikkelsen et al., 1999) in a validated brief version (the GSE-6) assessment tool for generalized sense of self-efficacy (Romppel et al., 2013). The items comprise statements of confidence in ability to, for instance, "stick to my aims" or to "deal efficiently with unexpected events", with response options in four categories from not at all true to exactly true (Romppel et al., 2013; Schwarzer and Jerusalem, 1995). Responses are scored by taking the mean of responses coded as equidistant from 1 = "not at all true" to 4 = "exactly true" (Schwarzer, 2014). For this study, the GSE score was rescaled to a 0 to 1 continuum, with 0 being the worst possible score on all items ("not at all true" for all beliefs) and 1 being the best possible score on all items ("exactly true"). This was done to align with the "no to full" interpretation of the ICECAP-A score.

2.3.5. Health and healthcare resources

We used the Patient Assessment of Chronic Illness Care (PACIC) to indicate baseline quality of care (Frølich et al., 2021; Glasgow et al., 2005; Maindal et al., 2012). The PACIC was developed to assess patient experiences of care and its accordance with person-centred care in the Chronic Care Model (Glasgow et al., 2005), on which Danish disease management programmes for diabetes are based (Frølich et al., 2015). The 20 PACIC items address different aspects of care and are subdivided into five subscales: "patient activation", "delivery system design/-decision support", "goal setting/tailoring", "problem-solving/contextual", and "follow-up/coordination" (Glasgow et al., 2005, p. 439). For this study, we found the problem-solving subscale particularly relevant because it asks about the extent to which contextual aspects of diabetes management are perceived to have been addressed by diabetes healthcare providers, including whether respondents have been helped to prepare for taking care of diabetes in daily life and in difficult times (Glasgow et al., 2005). This was thought to be relevant in terms of preparedness to handle diabetes during the COVID-19 disruptions to healthcare and life in general. The subscale was scored by averaging completed subscale items (The ACT Center, 2004), excluding respondents with ≥50% missing responses to the total PACIC scale (Frølich et al., 2021). We also included a single item (PACIC item 5) assessing how often respondents felt satisfied that their care well organised, which was thought to be relevant as an indicator of overall

level of confidence in baseline diabetes care before the pandemic.

To indicate baseline self-care challenges, we included a single item from the MTBQ instrument (Duncan et al., 2018) assessing perceived difficulty in self-monitoring medical conditions, such as monitoring blood sugar or symptoms. The response to this item was dichotomized to reflect a response of 'quite difficult', 'very difficult' or 'extremely difficult' versus 'a little difficult', 'not difficult' or 'does not apply'). Health was measured as self-assessed overall health scored by chosen integer number from 0 to 100 on the EuroQol visual analogue scale (EQ VAS), which is a ruler type visual instrument where the respondent is asked to indicate current health on a scale from 0 ('the worst health you can imagine') to 100 ('the best health you can imagine') (EuroQol Research Foundation, 2021, p.12). The EQ VAS does not describe a specific understanding of health and is thus thought to reflect a broader underlying understanding of health as perceived by the respondent (Feng et al., 2014). We found this broad and subjective indicator relevant in this context of understanding perceived COVID-19 related impacts to capture effects related to individually perceived overall better or worse health.

2.3.6. Socioeconomic resources and controls

Baseline data on education and income levels were obtained from registers. Education was grouped into three levels following Eurostat (2019): short (up to lower secondary), medium (upper secondary/non-tertiary), long (short-cycle tertiary to doctoral). We used log-transformed household equalised disposable income in 2019 to estimate baseline income level.

We further controlled for a number of baseline characteristics using registry data: sex, cohabitation status (yes/no), immigrant status (yes/no), age group (<55, 55–64, 65–69, 70+) to allow for non-linearity in age effects, employment status (employed, self-employed, unemployed, retired/pre-retirement), and area of residence (big city, provincial, or rural municipalities, (Statistics Denmark, 2018)). We also controlled for whether respondents self-reported being directly impacted by COVID-19 through their own infection or that of a close relative or friend.

Fig. 1 summarises the analytic framework and variables. In summary, the selected explanatory variables were chosen by selecting baseline characteristics that were hypothesised to serve as protective factors, with higher levels predicting a lower probability of experiencing adverse effects from the pandemic. Specifically, we hypothesised that higher well-being capability (ICECAP-A) and higher general sense of self-efficacy (GSE) as well as being in better health would be associated with lower probability of reporting negative impacts on emotional wellbeing and feelings about the future due to the pandemic. We hypothesised that higher levels of health and healthcare-related
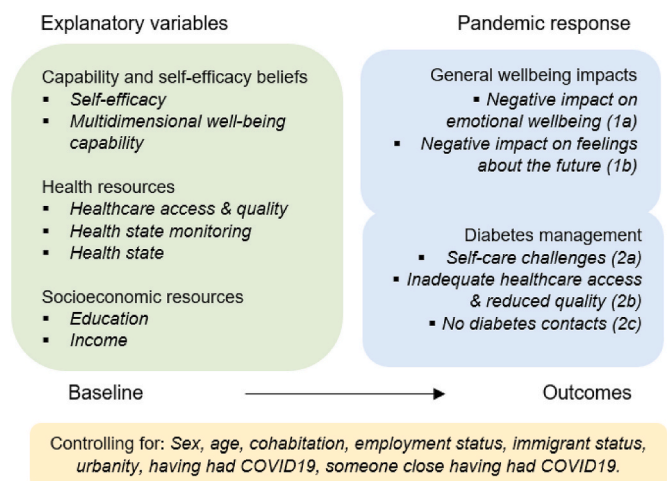

Fig. 1. Summary framework of analyses: baseline measures and outcomes.

resources in terms of: higher self-evaluated health state and not having difficulties with self-monitoring, higher confidence in care (PACIC, item 5) and contextualised care and preparedness (PACIC problem-solving/contextual subscale) would lower the probability of experiencing diabetes care related problems during the pandemic and possibly make general negative wellbeing impact less likely. Lower socioeconomic resources are often associated with worse T2D care quality and outcomes (Grintsova et al., 2014) and would therefore be expected to be so during the pandemic as well.

2.4. Statistical methods

All outcomes were operationalised as binary indicators denoting a negative impact. The probability of experiencing negative impacts by baseline characteristics was analysed in multivariate regressions following this model:

$$y_{it}^k = \alpha + \beta c_{i,t-1} + H_{i,t-1}\gamma + S_{i,t-1}\delta + Z_{it}\theta + \varepsilon_{it}$$

With y_{it}^k denoting the k outcomes reported at the time of pandemic survey (t). $c_{i,t-1}$ denoting capability or self-efficacy beliefs measured at baseline ($t-1$), $H_{i,t-1}$ denoting health-related variables self-reported at baseline, $S_{i,t-1}$ denoting socioeconomic variables obtained from register data from the year before the pandemic, and Z_{it} denoting control variables from time t, with the exception of employment status, which is proxied with $t-1$ data. Self-efficacy (GSE) and well-being capability (ICECAP-A) were included in separate regressions because these concepts have previously been shown to be highly correlated (Rohrbach et al., 2022; albeit a different self-efficacy measure). Both measures aim to address a sense of freedom or agency and hence we expect that persons reporting a high level of multidimensional wellbeing capability will also report higher levels of confidence in own abilities to tackle challenges and it may therefore be difficult to separate these effects if included together. Regressions were estimated by linear probability models with robust errors and with p < 0.05 considered statistically significant. This methodology is promoted for its simplicity in application and interpretation (Pischke, 2012; Wooldridge, 2010, p. 562) and has previously been applied in e.g. Johnston et al. (2021).

The measure of diabetes-related healthcare contact did not allow assessment of whether contact was needed and thus whether lack of contact was inherently problematic. Therefore, we also included a supplementary subgroup analysis among respondents with selected self-reported comorbidities or complications (heart, eye, kidney, nerve or foot conditions) because they were hypothesised as being in greater need of follow-up visits between annual check-ups. We compared all PACIC subscales and total scale scores for those with and without healthcare contact for this subgroup as a supplementary analysis of whether poorer baseline care quality was associated with less contact during the pandemic.

Data were analysed using SAS 9.4 software.

3. Results

A response rate of 55% to the first survey and 85% to the follow-up survey yielded 1608 respondents with self-reported T2D and full responses to both questionnaires. Table 1 shows respondent characteristics. By design (Tapager et al., 2022b), the majority of respondents were relatively newly diagnosed with T2D (self-reported diagnosis within the previous five years). More than a third reported at least one heart, eye, kidney, nerve or foot condition. Most respondents were either employed or retired, including loss of fitness-for-work early retirement (Table 1).

Fig. 2 depicts the occurrence of self-reported outcomes during the pandemic. Almost half of respondents reported that the pandemic had a current negative impact on their feelings about the future (49%) and emotional well-being (44%). One in ten reported that they were currently or had been experiencing problems of insufficient access to healthcare professionals or reduced quality of diabetes care. A slightly smaller proportion of respondents (9%) reported not being able to manage how everyday changes could affect their health. Nearly one in four respondents had had no diabetes-related contact with healthcare professionals since the first lockdown (Fig. 2).

Table 2 shows parameters estimated from regressions. Higher levels of self-efficacy and ICECAP-A capability well-being scores were both significantly associated with a lower probability of reporting negative impacts on emotional well-being and feelings about the future. However, self-efficacy and capability well-being were not significantly associated with diabetes management outcomes. The PACIC problem-solving and contextual influences subscale was not associated with any outcomes. However, a higher assessment on the single item describing how often respondents felt confident that their diabetes care was well organised was significantly associated with a reduced probability of reporting diabetes management problems. A higher level of confidence that care was well organized was also associated with a lower probability of having had no diabetes-related contact with healthcare providers since the first lockdown and was the only investigated characteristic, including all demographic controls, that was associated with
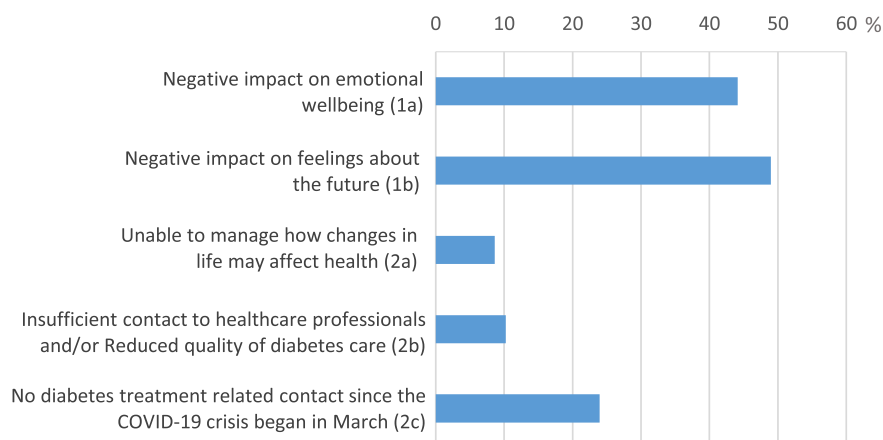
Note: We used the Danish term "coronakrisen" (COVID-19 crisis), commonly used in popular media to capture experiences embracing the entire exceptional societal state and not just COVID-19 disease risk.

Fig. 2. Self-reported COVID-19 outcomes, percentage of respondents.

Table 2
Parameter estimates for baseline characteristics in regressions of self-reported outcomes during the pandemic (p-values in parentheses)
i. With general self-efficacy as predictor
ii. With well-being capability (ICECAP-A) as predictor.

	(1a)	(1b)	(2a)	(2b)	(2c)
	Negative emotional impact	Negative impact on future	Self-care challenges	Healthcare challenges	No contact during pandemic
Self-efficacy score	−0.3563*	−0.2976*	−0.0551	−0.0555	−0.0013
	(<0.0001)	(<0.0001)	(0.1816)	(0.2047)	(0.9818)
PACIC: Satisfied care was well organized	−0.0324*	−0.0023	−0.0238*	−0.0264*	−0.0380*
	(0.0152)	(0.8731)	(0.0078)	(0.0050)	(0.0036)
PACIC: Problem solving/contextual	0.0117	−0.0213	0.0005	0.0080	−0.0094
	(0.2836)	(0.0559)	(0.9230)	(0.2082)	(0.3458)
Difficulty with monitoring health condition	−0.0059	0.0286	0.0554	0.0903*	−0.0304
	(0.8871)	(0.5179)	(0.0858)	(0.0091)	(0.4102)
Self-assessed health (0–100 EQ5D-VAS)	−0.0027*	−0.0013	−0.0007	−0.0011*	0.0008
	(0.0001)	(0.0668)	(0.0838)	(0.0132)	(0.2117)
Log income	0.0253	−0.0126	0.0265	−0.0129	0.0349
	(0.4811)	(0.7095)	(0.1382)	(0.5188)	(0.2028)
Short education	−0.1323*	−0.0907*	0.0065	0.0451*	0.0560
	(0.0002)	(0.0124)	(0.7459)	(0.0464)	(0.0708)
Medium education	−0.0951*	−0.0255	−0.0003	−0.0011	0.0426
	(0.0020)	(0.4142)	(0.9874)	(0.9487)	(0.1053)
Long education (base)					
Controls[a]					

	(1a)	(1b)	(2a)	(2b)	(2c)
	Negative emotional impact	Negative impact on future	Self-care challenges	Healthcare challenges	No contact during pandemic
ICECAP value	−0.5370*	−0.4691*	−0.1337	−0.0704	−0.0194
	(<0.0001)	(<0.0001)	(0.0567)	(0.2938)	(0.8377)
PACIC: Satisfied care was well organized	−0.0312*	−0.0011	−0.0232*	−0.0263*	−0.0379*
	(0.0199)	(0.9392)	(0.0090)	(0.0050)	(0.0037)
PACIC: Problem solving/contextual	0.0118	−0.0211	0.0009	0.0079	−0.0092
	(0.2821)	(0.0585)	(0.8727)	(0.2111)	(0.3529)
Difficulty with monitoring health condition	−0.0079	0.0264	0.0538	0.0904*	−0.0308
	(0.8491)	(0.5531)	(0.0925)	(0.009)	(0.4014)
Self-assessed health (0–100 EQ5D-VAS)	−0.0024*	−0.0010	−0.0005	−0.0011*	0.0008
	(0.0010)	(0.1860)	(0.2235)	(0.0175)	(0.2053)
Log income	0.0201	−0.0165	0.0270	−0.0140	0.0353
	(0.5834)	(0.6342)	(0.136)	(0.4803)	(0.1973)
Short education	−0.1270*	−0.0863*	0.0071	0.0460*	0.0559
	(0.0004)	(0.0184)	(0.7237)	(0.0424)	(0.0704)
Medium education	−0.0877*	−0.0192	0.0011	0.0000	0.0427
	(0.0045)	(0.5408)	(0.9479)	(0.9983)	(0.1037)
Long education (base)					
Controls[a]					

Note: N = 1574 (sample size restricted to those with complete information on education, GSE, ICECAP and PACIC).
*p-value < 0.05.
[a] All regressions include demographic controls: sex, age, labour market affiliation, cohabitation status, immigrant background, urbanity, having had COVID, someone close having had COVID. Estimates for controls are available in online supplementary material.

this outcome (Table 2).

Better self-assessed health was associated with a lower probability of negative impacts on emotional well-being and on problems with access or quality of diabetes care. A baseline response that self-monitoring medical conditions was quite, very or extremely difficult (MTBQ item) was associated with a higher probability of reporting problems with access or quality of diabetes care during the pandemic (Table 2).

Educational level was associated with both general emotional impact and diabetes healthcare access and quality problems. However, the relationships were in opposite directions. Short education was associated with increased probability of reporting diabetes care problems but a decreased probability of reporting negative impact on emotional well-being, compared with long education. Baseline income level was not associated with any outcomes (Table 2).

Table 3 shows that, among respondents with self-reported complications or comorbidities, those who reported having had no diabetes-related healthcare contact since the beginning of the pandemic generally had lower scores for baseline care across all PACIC domains, which were statistically significant for three of four subscales and the total

PACIC score.

4. Discussion

This study shows that, in general, higher levels of baseline self-efficacy, capability and health-related resources of people with T2D measured shortly before the COVID-19 pandemic were associated with lower probability of reporting negative experiences of pandemic-related challenges. However, there was some variation in predictors for general well-being outcomes, compared to diabetes-care specific challenges, and findings on socioeconomic status as indicated by education were mixed.

People with T2D frequently reported some negative impacts of the pandemic on their current emotional well-being and feelings about the future. However, negative impacts were reported slightly less frequently than in a study of an Australian T2D population in the early phase of the pandemic (Sacre et al., 2021), which may reflect some adaptation later in the pandemic among our respondents (if not caused by different study settings overall). Higher pre-pandemic levels of confidence in one's capabilities to manage adversity (GSE) abilities to achieve key

Table 3

Average baseline patient assessment of care scores [95% CI] prior to the pandemic according to diabetes care contact during the pandemic, among respondents with self-reported complications[a].

	No contact[c]	Some contact	
Overall PACIC[b]	2.6 [2.4; 2.7]	2.8 [2.7; 2.9]	*
Subscales:			
- 'Patient activation'	2.8 [2.6; 3.0]	3.1 [3.0; 3.2]	*
- 'Delivery system design/decision support'	3.4 [3.2; 3.6]	3.7 [3.6; 3.8]	*
- 'Goal Setting/tailoring'	2.5 [2.3; 2.7]	2.6 [2.5; 2.7]	
- 'Problem-solving/contextual'	2.4 [2.2; 2.7]	2.7 [2.6; 2.9]	*
- 'Follow-up/coordination'	2.1 [1.9; 2.2]	2.3 [2.2; 2.4]	
N (%)	129 (22)	464 (78)	

*t-test p-value<0.05.

[a] One or more self-reported comorbidities or complications (heart, eye, kidney, nerve or foot conditions).

[b] Higher score indicates higher quality in terms of higher levels of receiving patient-centred 'Chronic Care Model' practices and can range from 1 to 5 (Glasgow et al., 2005).

[c] Response category: "I have not been in contact with any healthcare professionals since the COVID-19 crisis began in March" to the question "Where have you been to check-up, treatment and/or in teaching or exercise programmes in relation to your diabetes? Please tick off places you have been in contact with (either by physical presence, in writing, by telephone or online)".

dimensions of well-being (ICECAP) were associated with a lower probability of reporting adverse impacts on well-being. The findings on GSE are consistent with a recent study showing its protective effect for psychological resilience in the early phase of the pandemic (Johnston et al., 2021). To the best of our knowledge, no other studies have yet combined ICECAP-A measured before the pandemic with pandemic-related challenges, emotional or otherwise. The results confirm a general intuition that advantage in the core well-being aspects of the ICECAP-A — the ability to thrive, have pleasure, autonomy, love and support and to progress in life — may offer resilience in the face of adversity (Kinghorn, 2019). Additionally, this application adds to the literature suggesting that capability wellbeing measures such as ICECAP-A are relevant to assess advantage in a broader sense than for instance strictly health-related quality of life (Al-Janabi et al., 2013; Coast et al., 2015; Rohrbach et al., 2022).

Conversely, these general capability-related indicators were not significantly associated with the diabetes management outcomes we studied. However, pre-pandemic perception that care was well organised was consistently associated with these outcomes, indicating that diabetes management outcomes are likely more externally contingent, e. g., on the type and quality of available healthcare services and support. Compared with people with diabetes who reported worries about reduced quality or insufficient access to diabetes care in a study early in the pandemic (Joensen et al., 2020), a smaller proportion in this study of people with T2D studied later in the pandemic had actually experienced these problems. However, the results that reporting difficulty with self-monitoring health conditions at baseline, short education, lower self-assessed health, and worse assessment of care at baseline were all associated with a higher probability of experiencing adverse changes in diabetes healthcare quality and access indicate that pandemic-related disruptions may have compounded existing healthcare-related disadvantages, as also suggested in a recent review (Pujolar et al., 2022).

General treatment guidelines for general practitioners state that all patients with type 2 diabetes should have regular consultations to support the achievement of treatment targets and prevent or delay the development of complications. The recommended frequency is an annual check-up with one or more shorter follow-up visits, depending on health and treatment status and goals (DSAM, 2019). Thereby, a majority of people with T2D could arguably be expected to have had some diabetes-related contact in the roughly 8 months between the initial lockdown in March 2020 and their survey responses in October or November 2020. However, COVID-19 may have affected the likelihood

of that contact. For instance, increased contact could be expected due to possible concerns about T2D as a risk factor for COVID-19 disease severity. Conversely, physical contact could be reduced due to COVID-19-related precautions and changes in healthcare system or patient practices. Sacre et al. (2021) found increased general practitioner contact but common cancellations of specialised care, and Carr et al. (2021) found a large decrease in health checks for people with diabetes in 2020 in the UK. Danish statistics suggest that the overall level of healthcare contacts normalised within a few months into the pandemic but highlight that persons with T2D maintained a lower average level of contacts in 2020 (Danish Regions, 2021).

We cannot ascertain from our data whether respondents reporting no diabetes-related healthcare contact would have had contact during this period in the absence of a pandemic or whether the absence of contact was necessarily problematic. In addition to possible pandemic-related changes, underlying differences in needs and preferences may exist. This mix of potential explanations may account for the absence of systematic associations between the explanatory variables we investigated and the absence of healthcare contact. Subgroup analyses among respondents with self-reported comorbidities or complications, who we assumed would have greater needs for regular care, suggested that those with healthcare contact during the pandemic generally had higher quality of chronic care at baseline, as measured by PACIC scores. The association between higher PACIC scores and more frequent care visits has been shown previously in cross-sectional studies (Frølich et al., 2021; Petersen et al., 2014). Regardless of the causal direction of the relationship, this study's longitudinal design indicates that the association between better assessment of care and more frequent care contact appears to persist over a longer time horizon and during profound societal disruption.

In a comprehensive welfare state, it may not be surprising that income is not related to the studied outcomes, and it is consistent with Johnston et al.'s findings on psychological resilience during the pandemic in the UK (Johnston et al., 2021). It may seem counterintuitive that short education was associated with a lower probability of self-reported negative impacts on general emotional state and future thoughts. However, this finding is consistent with those of a longitudinal general population survey in Denmark carried out at roughly the same time (Thygesen et al., 2021) and a large longitudinal study in the American general population (Wanberg et al., 2020), although the latter was unable to determine the mechanisms behind the inverse relationship between education and worsened wellbeing during the pandemic. Suggested possible explanations included people with more education having higher expectations for the availability of needed resources and greater fear about their potential loss, as well as sensitivity to changes in, for instance, work responsibilities (Wanberg et al., 2020).

4.1. Implications

Our findings add to existing evidence on the psychosocial burden and diabetes care challenges experienced by people with T2D during the COVID-19 pandemic (Carr et al., 2021; Joensen et al., 2020; Kim et al., 2022; Moradian et al., 2021; Sacre et al., 2021) which need to be addressed in the aftermath of the pandemic and in future crises. The demonstrated role of the baseline capabilities of general self-efficacy and well-being capability in emotional responses to the pandemic highlight their potential relevance in supporting psychological resilience. It also indicates that people with lower levels of self-efficacy and well-being capability may need more support during crises to mitigate adverse impacts on well-being. For diabetes care, the results emphasise the importance of care quality and of being attentive to and addressing the potential for crises to add to existing healthcare-related disadvantages.

4.2. Strengths and limitations

A study strength is the use of a large and unique database of people with T2D. We used validated survey instruments and high-quality registry data to supplement the increasing evidence base on the impacts of the COVID-19 crisis among people with T2D with insights from a later pandemic stage and longitudinal evidence on the role of pre-pandemic characteristics and resources on these impacts. By design, there is no reverse causation from the outcomes to the baseline measures. However, despite extensive adjustment of analyses there is still risk of confounding by unmeasured factors, and therefore we do not make causal claims about the associations we observed.

Although it is a study strength that we combined measurements before the pandemic with reported outcomes during the pandemic, a potential limitation is our use of self-reported impacts, rather than observed changes. The severity of self-reported emotional impacts is unknown and may not indicate sustained or severe mental health deterioration (Sacre et al., 2021). More research is needed to elucidate deterioration in clinical care, health and well-being over time and after the pandemic.

Previous analyses of baseline survey data suggest that respondents underrepresented socioeconomically disadvantaged populations, even though they did cover a range of sociodemographic groups (Tapager et al., 2022b). In addition, this study primarily included persons diagnosed within the last five years, and the findings may not apply to people with longer diabetes duration. In cross-country comparisons of pandemic outcomes, the first lockdown in Denmark was initiated early and with softer measures than reported in many other countries (Plümper and Neumayer, 2020) and a small sample of Danish diabetes nurses indicated smaller disruptions in diabetes care than elsewhere in Europe (Forde et al., 2021), which may have affected our findings. Thus, the generalisability of our findings to populations with different characteristics than the one studied here is unknown.

5. Conclusions

This study contributes new insights on patient-reported experiences of emotional and care-related challenges during the COVID-19 pandemic and their relationship to personal capability-related characteristics and perceptions of chronic care before the pandemic. Higher levels of self-efficacy and well-being capability may indicate resilience in emotional well-being but not the avoidance of diabetes health management challenges. Other indicators of higher baseline resources—diabetes care quality, health status and skills, and higher education—are associated with lower probability of challenges with diabetes healthcare access and quality. The pandemic crisis may thus add to existing disadvantages in personal well-being and chronic care resources. These insights may contribute to inform future investigations assessing protective factors for well-being and diabetes care during personal or societal crises and disruptions.

CRediT authorship contribution statement

Ina Tapager: Conceptualization, Methodology, Formal analysis, Data curation, Writing. **Lene Eide Joensen:** Conceptualization, Methodology, Writing, Supervision. **Karsten Vrangbæk:** Conceptualization, Writing, Supervision, Project administration, Funding acquisition.

Data availability

The authors do not have permission to share data.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2022.115276.

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