Supplementary file 1: Sample of questions from the original and reversed versions of the MTBQ

### Sample of questions from the original MTBQ

We are interested in finding out about the effort you have to make to look after your health and how this impacts on your day-to-day life.

## Please tell us how much difficulty you have with the following:

(Please tick the box that most applies to you)

		Not Difficult	A little Difficult	Quite Difficult	Very Difficult	Extremely Difficult	Does not apply
1.	Taking lots of medications		$\Box_1$			4	
2.	Remembering how and when to take medication		$\Box_1$	<b></b> 2	□3	4	Πo
3.	Paying for prescriptions, over the counter medication or equipment					4	0
4.	Collecting prescription medication				$\square_3$	4	Πo
5.	Monitoring your medical conditions (e.g. checking your blood pressure or blood sugar, monitoring your symptoms etc.)			<b>D</b> 2	□3	<b></b> 4	
6.	Arranging appointments with health professionals		$\Box_1$		□3	4	Πo
7.	Seeing lots of different health professionals		$\Box_1$			4	

Permission must be sought to use the 'Multimorbidity Treatment Burden Questionnaire' (MTBQ)<sup>4</sup> via the website: <u>https://www.bristol.ac.uk/primaryhealthcare/resources/mtbq/</u>

### Sample of questions from the reversed scale MTBQ

We are interested in finding out about the effort you have to make to look after your health and how this impacts on your day-to-day life.

### Please tell us how much difficulty you have with the following:

(Please tick the box that most applies to you)

		Extremely Difficult	Very Difficult	Quite Difficult	A little Difficult	Not Difficult	Does not apply
1.	Taking lots of medications	4	□3		$\square_1$	Πo	Πo
2.	Remembering how and when to take medication	<b></b> 4	□3		$\Box_1$	□₀	
3.	Paying for prescriptions, over the counter medication or equipment	4	□3	<b>□</b> 2		0	Πo
4.	Collecting prescription medication	4	□₃			Πo	Πo
5.	Monitoring your medical conditions (e.g. checking your blood pressure or blood sugar, monitoring your symptoms etc.)	4	□3	<b></b> 2		□o	
6.	Arranging appointments with health professionals	4	□3		$\Box_1$	Πo	
7.	Seeing lots of different health professionals	4	□3		$\Box_1$		

Permission must be sought to use the 'Multimorbidity Treatment Burden Questionnaire' (MTBQ)<sup>4</sup> via the website: <u>https://www.bristol.ac.uk/primaryhealthcare/resources/mtbg/</u>

#### Supplementary file 2: COSMIN study design checklist

Genera	l recommendations for the design of a study on measurem	nent properties					
		Very good	Adequate	Doubtful	Inadequate	NA	
Resear	ch aim						
1.	Provide a clear research aim, including (1) the name and	Research aim					
	version of the PROM, (2) the target population, and (3)	clearly					
	the measurement properties of interest.	described					
PROM							
2.	Provide a clear description of the construct to be	Construct					
	measured.	clearly					
		described					
3.	Provide a clear description of the development process	Development					
	of the PROM, including a description of the target	process clearly					
	population for which the PROM was developed.	described					
4.	The origin of the construct should be clear: provide a	Origin of the					
	theory, conceptual framework (i.e. reflective or formative	construct clear					
	model) or disease model used or clear rationale to define						
	the construct to be measured.						
5.	Provide a clear description of the structure of the PROM	Structure and					
	(i.e. the number of items and subscales included in the	scoring					
	PROM, instructions given and response options) and its	algorithm					
	scoring algorithm.	clearly					
		described					
6.	Provide a clear description of existing evidence on the	Existing					
	quality of the PROM.	evidence on the					
		quality of the					
		PROM clearly					
		described					

7.	Provide a clear description of the context of use*	Context of use clearly described
Target	population	
8.	Provide a clear description of in- and exclusion criteria to select patients, e.g. in terms of disease condition and characteristics like age, gender, language or country, and setting (e.g. general population, primary care or hospital/rehabilitation care)	In- and exclusion criteria for patients clearly described
9.	Provide a clear description of the method used to select the patients for the study (e.g. convenience, consecutive, or random)	Method for patient selection clearly described
10.	Describe whether the selected sample is representing the target population in which the PROM will be used in terms of age, gender, important disease characteristics (e.g. severity, status, duration)	Study sample representing the target population clearly described

\* The context of use refers to the intended application of the PROM (e.g. for research or clinical practice), to a specific setting for which the PROM was developed (e.g. for use in a hospital or at home) or to a specific administration mode (e.g. paper or computer-administered). If the PROM was developed for use across multiple contexts, this should be described.

Measu	rement error and reliability					
		Very good	Adequate	Doubtful	Inadequate	NA
Design	requirements					
1.	Use at least two measurements.	At least two measurements				
2.	Ensure that the administrations will be independent.	Independent measurements				
3.	Ensure that the patients will be stable in the interim period on the construct to be measured.		Assumable that patients will be stable			
4.	Use an appropriate time interval between the two measurements, which is long enough to prevent recall, and short enough to ensure that patients remain stable.	Time interval appropriate				
5.	Ensure that the test conditions will be similar for the measurements (e.g. type of administration, environment, instructions).	Test conditions similar (evidence provided)				
6.	Perform the analysis in a sample with an appropriate number of patients (taking into account expected number of missing values)	≥100 patients				
Statisti	ical methods for measurement error					
7.	For continuous scores: calculate an intraclass correlation coefficient (ICC)	ICC will be calculated, and model or formula of the ICC is clearly described*				
8.	For dichotomous/nominal/ordinal scores: calculate kappa					Not applicable

9	. For ordinal scores: calculate a weighted kappa		Not applicable
1	<ol> <li>Provide a clear description of how missing items will be handled</li> </ol>	The way missing items will be handled is clearly described.	

\*\* The model (i.e. one-way random effect model or two-way random or mixed effect model), type (i.e. for single or multiple measurement) and definition (i.e. for consistency or absolute agreement) of the ICC that will be calculated is appropriately chosen and described (see 11); \*\* ICC formula does not correspond to the research question

Hypotl A. Con	hesis testing for construct validity nparison with other outcome measurement instruments (	convergent validity	)				
	P	Very good	, Adequate	Doubtful	Inadequate	NA	
Design	requirements						
1.	Formulate hypotheses about expected relationships between the PROM under study and other outcome measurement instrument(s).	Hypotheses formulated including the expected direction and magnitude of the correlations stated.					
2.	Provide a clear description of the construct(s) measured by the comparator instrument(s).	Construct(s) measured by the comparator instrument(s) is/are clearly described.					
3.	Use comparator instrument(s) with sufficient measurement properties.	Sufficient measurement properties of the comparator instrument(s) in a population similar to the study population.					
4.	Perform the analysis in a sample with an appropriate number of patients (taking into account expected number of missing values)	≥100 patients					

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5.	Use an appropriate time schedule for assessments of	PROM and
	the PROM of interest and comparison instruments.	comparison
		instrument(s)
		will be
		administered at
		the same time.
Statisti	cal methods	
6.	Use statistical methods that are appropriate for the	Statistical
	hypotheses to be tested	methods will be
		appropriate.
7.	Provide a clear description of how missing items will be	The way missing
	handled	items will be
		handled is
		clearly
		described.
https://v	www.cosmin.nl/wp-content/uploads/COSMIN-study-desigr	ning-checklist final.pdf

нурот	nesis testing for construct validity					
B. Com	iparison between subgroups (discriminative or known-gro	oups validity)				
		Very good	Adequate	Doubtful	Inadequate	NA
Design	requirements	Hypotheses				
1.	Formulate hypotheses regarding mean differences	formulated				
	between subgroups.	including the				
		expected				
		directions and				
		magnitude of				
		the mean				
		differences				
		stated.				
2.	Provide an adequate description of important	Adequate				
	characteristics of the subgroups, such as disease or	description of				
	demographic characteristics.	the important				
		characteristics				
		of the				
		subgroups.				
3.	Perform the analysis in a sample with an appropriate number of patients (taking into account expected number of missing values)	≥100 patients				
Statist	ical methods					
4.	Use statistical methods that are appropriate for the	Statistical				
	hypotheses to be tested.	methods will be				
		appropriate.				
5.	Provide a clear description of how missing items will be	The way missing				
	handled	items will be				
		handled is				
		clearly				
		described				

Supplementary file 3: Comparison of participant characteristics between baseline participants, participants who completed the baseline original version versus the reversed version of the MTBQ and participants who completed the follow-up survey.

	Baselir	ne	Baselir	ne	Baseli	ine	Follov	v-up	Follov	an-v
	survey	(n=244)	origina	I MTBO	rever	sed	origin	al	rever	sed
	····,	(	(n=112	2)	scale		MTBQ		scale MTBQ	
				МТВС	MTBQ		(n=105)		(n=120)	
					(n=13	2)	•		•	•
	n	%	n	%	n. n	%	n	%	n	%
Age (years; mean, SD)	69.9	13.1	71.9	11.6	68.1	14.0	71.3	11.5	68.3	13.7
18-50 years	18	7.4	4	3.6	14	10.6	4	3.8	12	10.0
51-60 years	37	15.2	15	13.4	22	16.7	15	14.3	19	15.8
61-70 years	55	22.5	25	22.3	30	22.7	25	23.8	29	24.2
71-80 years	82	33.6	42	37.5	40	30.3	40	38.1	37	30.8
81-90 years	47	19.3	22	19.6	25	18.9	18	17.1	22	18.3
91+ years	4	1.6	3	2.7	1	0.8	2	2.9	1	0.8
Missing	1	0.4	1	0.9	0	0.0	0	0.0	0	0.0
Gender										
Male	130	53.3	61	54.5	69	52.3	56	53.3	62	51.7
Female	113	46.3	50	44.6	63	47.7	48	45.7	58	48.3
Missing	1	0.4	1	0.9	0	0.0	1	1.0	0	0.0
Ethnicity										
White	229	93.9	106	94.6	123	93.2	100	95.2	113	94.2
Asian	5	2.0	2	1.8	3	2.3	1	1.0	2	1.7
Black/African/Caribbean	4	1.6	2	1.8	2	1.5	2	1.9	1	0.8
Mixed	4	1.6	1	0.9	3	2.3	1	1.0	3	2.5
Other	1	0.4	1	0.9	0	0.0	1	1.0	0	0.0
Missing	1	0.4	0	0.0	1	0.8	0	0.0	1	0.8
Number of long-term										
conditions										
3	136	55.7	58	51.8	78	59.1	55	52.4	69	57.5
4	73	29.9	35	31.3	38	28.8	32	30.5	35	29.2
≥5	35	14.3	19	17.0	16	12.1	18	17.1	16	13.3
Long-term conditions*										
Cardiovascular disease	210	86.1	98	87.5	112	84.8	92	87.6	104	86.7
Stroke or transient	72	29.5	39	34.8	33	25.0	37	35.2	30	25.0
ischaemic attack										
Diabetes	141	57.8	60	53.6	81	61.4	56	53.3	76	63.3
Chronic kidney disease	68	27.9	30	26.8	38	28.8	29	27.6	35	29.2
Chronic obstructive	119	48.8	51	45.5	68	51.5	48	45.7	63	52.5
pulmonary disease or										
asthma										
Epilepsy	20	8.2	12	10.7	8	6.1	11	10.5	7	5.8
Atrial fibrillation	79	32.4	41	36.6	38	28.8	40	38.1	33	27.5
Severe mental health	13	5.3	3	2.7	10	7.6	2	1.9	10	8.3
problems										
Depression	107	43.9	51	45.5	56	42.4	49	46.7	51	42.5
Learning disability	4	1.6	0	0.0	4	3.0	0	0.0	3	2.5
Rheumatoid arthritis	17	7.0	12	10.7	5	3.8	9	8.6	5	4.2
Heart failure	31	12.7	16	14.3	15	11.4	14	13.3	12	10.0

\*Long-term conditions from electronic GP records. Please note, similar long-term conditions are grouped together (e.g. COPD/asthma, stroke/TIA)

\*\* Based on Townsend scores<sup>18</sup>

Supplementary file 3 (continued): Comparison of participant characteristics between participants who completed the baseline original version, baseline reversed scale version, follow-up original version and follow-up reversed scale version

	Baseli survey (n=24	ne / 4)	Basel origin MTB( (n=11	Baseline original MTBQ (n=112)		Baseline reversed scale MTBQ (n=122)		v-up al 2 5)	Follow-up reversed scale MTBQ (n=120)	
	n	%	n	%	n	%	n	%	n	%
Age left full-time										
education (years)										
≤14	22	9.0	9	8.0	13	9.8	7	6.7	13	10.8
15 or 16	155	63.5	77	68.8	78	59.1	74	70.5	71	59.2
17 or 18	33	13.5	14	12.5	19	14.4	13	12.4	16	13.3
≥19	31	12.7	11	9.8	20	15.2	10	9.5	18	15.0
Missing	3	1.2	1	0.9	2	1.5	1	1.0	2	1.7
Employment status										
Fully retired from work	144	59.0	69	61.6	75	56.8	65	61.9	69	57.5
Employed	36	14.8	13	11.6	23	17.4	13	12.4	22	18.3
Other	64	26.2	30	26.8	34	25.8	27	25.7	29	24.2
Deprivation score**										
Quintile 1 (least deprived)	49	20.1	26	23.2	23	17.4	24	22.9	22	18.3
Quintile 2	49	20.1	22	19.6	27	20.5	19	18.1	23	19.2
Quintile 2	74	30.3	33	29.5	41	31.1	32	30.5	35	29.2
Quintile 4	47	19.3	21	18.8	26	19.7	20	19.0	25	20.8
Quintile 5 (most deprived)	25	10.2	10	8.9	15	11.4	10	9.5	15	12.5

# Supplementary file 4: Responses to the original and reversed versions of the MTBQ (baseline questionnaire)

Ple	ase tell us how much difficulty you have with the following:	Origir (n	nal MTBQ = 112)	Rever MTE	sed scale 3Q (n = .32)
		n	%	n	%
1.	Taking lots of medications				
	Does not apply	4	3.6	7	5.3
	Not difficult	57	50.9	72	54.9
	A little difficult	35	31.3	30	22.7
	Quite difficult	9	8.0	12	9.1
	Very difficult	5	4.5	8	6.1
	Extremely difficult	2	1.8	2	1.5
	Missing	0	0.0	1	0.8
2.	Remembering how and when to take medications				
	Does not apply	2	1.8	3	2.3
	Not difficult	57	50.9	79	60.8
	A little difficult	34	30.4	28	21.2
	Quite difficult	9	8.0	12	9.1
	Very difficult	6	5.4	5	3.8
	Extremely difficult	3	2.7	3	2.3
	Missing	1	0.9	2	1.5
З.	Paying for prescriptions, over the counter medication or				
	equipment				
	Does not apply	85	75.9	106	80.9
	Not difficult	15	13.4	18	13.7
	A little difficult	4	3.6	1	0.8
	Quite difficult	4	3.6	3	2.3
	Very difficult	1	0.9	2	1.5
	Extremely difficult	1	0.9	1	0.8
	Missing	2	1.8	1	0.8
4.	Collecting prescription medication				
	Does not apply	21	18.8	16	12.5
	Not difficult	36	32.1	56	43.8
	A little difficult	21	18.8	32	24.2
	Quite difficult	22	19.6	12	9.1
	Very difficult	9	8.0	5	3.8
	Extremely difficult	3	2.7	7	5.3
	Missing	0	0.0	4	3.0
5.	Monitoring your medical conditions (e.g. checking your blood				
	pressure or blood sugar, monitoring your symptoms, etc)				
	Does not apply	21	18.8	32	24.4
	Not difficult	53	47.3	63	48.1
	A little difficult	16	14.3	19	14.4
	Quite difficult	14	12.5	13	9.8
	Very difficult	3	2.7	1	0.8
	Extremely difficult	5	4.5	3	2.3
	Missing	0	0.0	1	0.8
6.	Arranging appointments with health professionals	_		-	
	Does not apply	6	5.4	5	3.9
	Not difficult	38	33.9	51	39.2
	A little difficult	32	28.6	41	31.1
1	Quite difficult	21	18.8	22	16.7
	Very difficult	8	7.1	4	3.0
	Extremely difficult	7	6.3	7	5.3
	Missing	0	0.0	2	1.5

# Supplementary file 4: Responses to the original and reversed versions of the MTBQ (baseline questionnaire)

		Original MTBQ		Reversed scale		
		(n =	: 112)	M	TBO	
		<b>(</b>	,	(n :	= 132)	
Ple	ase tell us how much difficulty you have with the following:	n	%	n (	<i> </i>	
7.	Seeing lots of different health professionals		,,,		,,,	
	Does not apply	13	11.6	16	12.2	
	Not difficult	37	33.0	62	47.3	
		26	22.0	24	18.2	
	Ouite difficult	20	18.8	24	15.2	
	Very difficult	10	20.0 2 Q	5	3 8	
	Extremely difficult	5	15	1	3.0	
	Missing	0	0.0	1	0.8	
8	Attending annointments with health professionals (e.g.	0	0.0	1	0.0	
0.	getting time off work arranging transport etc)					
	Doos not apply	22	20.7	26	27 5	
	Not difficult	20	25.7	50	27.5	
	A little difficult	14	12 5	22	16.7	
	A little difficult	14	12.5	16	10.7	
	Vory difficult	15	5.4	10	2.0	
	Extromoly difficult	6	5.4 E /	4	0.0	
	Advising	1	5.4	1	0.0	
0	Wissing	T	0.9	T	0.8	
9.	Deer not apply	EO	E 2 7	66	E0 9	
	Not difficult	20 14	52.7 12.7	24	50.0 10 г	
		14	12.7	24	10.5	
	A little difficult	10	8.9	14	10.0	
	Quite difficult	11	9.8	12	9.1	
	very difficult	8	7.1	8	0.1	
	Extremely difficult	9	8.0	6	4.5	
10	Wissing	Z	1.8	2	1.5	
10.	Getting neip from community services (e.g. physiotherapy,					
	aistrict nurses etc)	<b>C1</b>		60	FD 1	
	Does not apply	01	55.5	69	53.1	
		21	19.1	20	20.0	
		11	9.8	13	9.8	
	Quite difficult	8	/.1	14	10.6	
	Very difficult	2	0.3	2	1.5	
	Extremely difficult	2	1.8	6	4.5	
	Wissing	Z	1.8	2	1.5	
11.	Obtaining clear and up-to-date information about your					
	condition	-	4 5	C	4.0	
	Does not apply	5	4.5	6	4.6	
		52	46.9	68	52.3	
		23	20.5	30	22.1	
	Quite aifficult	19	1/.0	23	1/.4	
	very difficult	8	/.1	2	1.5	
	Extremely difficult	4	3.6	1	0.8	
	wissing	1	0.9	2	1.5	
l I						

# Supplementary file 4 (continued): Responses to the original and reversed versions of the MTBQ (baseline questionnaire)

	Original MTBQ		Reversed	
	(n =	112)	MTBQ	
			(n =	132)
Please tell us how much difficulty you have with the following:	n	%	n	%
12. Making recommended lifestyle changes (e.g. diet and exercise)				
Does not apply	9	8.0	12	9.2
Not difficult	34	30.4	48	36.9
A little difficult	26	23.2	32	24.2
Quite difficult	23	20.5	22	16.7
Very difficult	10	8.9	10	7.6
Extremely difficult	9	8.0	6	4.5
Missing	1	0.9	2	1.5
13. Having to rely on help from family and friends				
Does not apply	24	21.4	40	30.3
Not difficult	38	33.9	41	31.1
A little difficult	15	13.4	24	18.2
Ouite difficult	20	17.9	11	8.3
Very difficult	8	71	8	6.1
Extremely difficult	7	63	8	6.1
Missing	,	0.5	0	0.1
Number of missing responses per participant 0 1 ≥2	103 8 1	92.0 7.1 0.9	122 6 4	92.4 4.5 3.1
Global MTBQ score (10-question version, excluding optional questions 2, 9 and 10)				
Median, IQR	17	7.1	1	2.5
	(7.5,	35.0)	(5.0,	27.5)
Score of 0 (n, (%)	11 (	9.8)	18 (	13.7)
Chi-squared test for score of zero		p-value	= 0.348	
Global MTBQ score (13-question version)				
Median (IQR)	15	5.4	1	1.5
	(5.8 <i>,</i>	32.7)	(3.8,	26.9)
Score of 0 (n, (%))	11 (	(9.8)	17 (	13.0)
Chi-squared test for score of zero		p-value = 0.443		

Note: Questions 2, 9 and 10 were excluded from the main analysis of the original MTBQ paper due to a high proportion of 'does not apply' responses. They are shown in italics. As they may be relevant to other populations, they can be considered as optional.

Supplementary file 5: Histogram of the global MTBQ score and global TBQ score, for the original and reversed versions of the MTBQ questionnaire

Distribution of global MTBQ scores for participants who received the original and reversed versions of the MTBQ



# Distribution of global Treatment Burden Questionnaire (TBQ) scores for participants who received the original and reversed versions of the MTBQ







#### Supplementary file 7a: Comparison of floor effect and missing data between similar questions from the MTBQ and TBQ

MTE	3Q question (n = 112)	Floor	Missing	TBQ question with a similar latent	Floor effect	Missing
		effect*	data	construct (n = 112)		data
	Global MTBQ score	9.8%	8.0%	Global TBQ score	11.6%	14.3%
1.	Taking lots of medications	54.5%	0.0%	1b. The number of times you should take your medication daily?	52.6%	5.4%
2.	Remembering how and when to take medication	52.7%	0.9%	1c. The efforts you make not to forget to take your medications (for example: managing your treatment when you are away from home, preparing and using pillboxes)	54.5%	3.6%
3.	Paying for prescriptions, over the counter medication or equipment	89.3%	1.8%	3b. The financial burden associated with your healthcare (for example: out of pocket expenses or expenses not covered by insurance)?	64.3%	0.9%
5.	Monitoring your medical conditions (eg. checking your blood pressure or blood sugar, monitoring your symptoms etc)	66.1%	0.0%	2b. Self-monitoring (for example, taking your blood pressure or checking your blood sugar): frequency, time spent and associated nuisances or inconveniences	70.5%	0.9%
6.	Arranging appointments with health professionals	39.3%	0.0%	2e. Arranging medical appointments (doctors' visits, lab tests and other exams) and reorganizing your schedule around these appointments	50.9%	0.0%

Supplementary file 7a (continued): Comparison of floor effect and missing data between similar questions from the MTBQ and TBQ

MT	BQ question (n = 112)	Floor effect	Missing data	TBQ question with a similar late construct (n = 112)	nt Floor effect	Missing data
8.	Attending appointments with health professionals (e.g. getting time off work, arranging transport etc)	64.3%	0.9%	2e Arranging medical appointr (doctors' visits, lab tests an exams) and reorganizing yo schedule around these appointments	nents 50.9% d other ur	0.0%
12.	Making recommended lifestyle changes (eg. diet and exercise)	38.4%	0.9%	3c. The burden related to dieta changes (for example: avoid certain foods or alcohol, ha quit smoking)?	ry 50.9% Jing ving to	0.0%
				<ol> <li>The burden related to doct recommendations to practi physical activity (for examp walking, jogging, swimming</li> </ol>	ors' 35.7% ce le: )?	0.9%
13.	Having to rely on help from family and friends	55.4%	0.0%	3e. How does your healthcare in your relationships with oth example, needing assistance everyday life, being ashame take your medication)?	mpact 59.8% ers (for e in ed to	0.0%

\*The floor effect is the proportion of participants who responded 'does not apply' or 'not difficult'

We received permission to use the Treatment Burden Questionnaire (TBQ) for this study.<sup>10 11</sup> Please do not use the questions from the TBQ without permission. Contact information and permission to use the TBQ: Mapi Research Trust, Lyon, France – Internet: <u>https://eprovide.mapi-trust.org.</u> TBQ © Ravaud et al, 2012. All Rights Reserved.

### Supplementary file 7b: Floor effect and missing data for MTBQ questions with no comparator question from the TBQ

		Floor effect	Missing data
4.	Collecting prescription medication	50.9%	0.0%
7.	Seeing lots of different health professionals	44.6%	0.0%
10.	Getting help from community services (eg. physiotherapy, district nurses etc)	73.2%	1.8%
11.	Obtaining clear and up-to-date information about your condition	50.9%	0.9%

\*The floor effect is the proportion of participants who responded 'does not apply' or 'not difficult'

#### Supplementary file 7c: Floor effect and missing data for TBQ questions with no comparator question from the MTBQ (n=112)

		Floor effect	Missing data
1a.	The taste, shape or size of your tablets and/or the annoyances caused by your injections (for example, pain, bleeding, bruising or scars)?	54.5%	5.4%
1d.	The necessary precautions when taking your medication (for example: taking them at specific times of the day or meals, not being able to do certain things after taking medications such as driving or lying down)	63.4%	2.7%
2a.	Lab tests and other exams (for example: blood tests or radiology): frequency, time spent and associated nuisances or inconveniences	59.8%	1.8%
2c.	Doctor visits and other appointments: frequency and time spent for these visits and difficulties finding healthcare providers	56.3%	0.9%
2d.	The difficulties you could have in your relationships with healthcare providers (for example: feeling not listened to enough or not taken seriously)	61.6%	0.0%
За.	The administrative burden related to healthcare (for example: all you have to do for hospitalizations, reimbursements and/or obtaining social services)?	73.2%	1.8%
4.	'The need for medical healthcare on a regular basis reminds me of my health problems'	42.9%	0.9%

\*The floor effect is the proportion of participants who responded 'does not apply' or 'not difficult'

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#### Supplementary file 7d: Comparison of missing responses per participant between the MTBQ and TBQ (n=112)

Multimorbidity Treatme	nt Burden Questionnaire (MTBQ)	Treatment Burden Ques	Treatment Burden Questionnaire (TBQ)			
Number of missing responses per participant (n, (%))		Number of missing responses per participant (n, (%))				
0	103 (92.0)	0	96 (85.7%)			
1	8 (7.1)	1	10 (8.9%)			
≥2	1 (0.9)	≥2	6 (5.4%)			

Characteristic	N	None	Low	Medium	High
		(MTBQ = 0)	(MTBQ=1-10)	(MTBQ=11-25)	(MTBQ>25)
Participants	243	29	70	69	75
Age group (n, (%))					
18-50 years	18	0 (0.0%)	3 (16.7%)	7 (38.9%)	8 (44.4%)
51-60 years	37	3 (8.1%)	8 (21.6%)	6 (16.2%)	20 (54.1%)
61-70 years	55	3 (5.5%)	10 (18.2%)	20 (36.4%)	22 (40.0%)
71-80 years	82	14 (17.1%)	31 (37.8%)	22 (26.8%)	15 (18.3%)
81-90 years	46	8 (17.4%)	18 (39.1%)	11 (23.9%)	9 (19.6%)
>90 years	4	1 (25.0%)	0 (0.0%)	2 (50.0%)	1 (25.0%)
Missing	1	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)
Gender (n, (%))					
Male	130	14 (10.8%)	42 (32.3%)	33 (25.4%)	41 (31.5%)
Female	112	15 (13.4%)	28 (25.0%)	35 (31.3%)	34 (30.4%)
Missing	1	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)
Ethnicity (n, (%))					
White	229	27 (11.8%)	67 (29.3%)	63 (27.5%)	72 (31.4%)
Asian	4	0 (0.0%)	1 (25.0%)	2 (50.0%)	1 (25.0%)
Black	4	1 (25.0%)	1 (25.0%)	0 (0.0%)	2 (50.0%)
Mixed	4	0 (0.0%)	1 (25.0%)	3 (75.0%)	0 (0.0%)
Other	1	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)
Missing	1	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Number of long-term conditions (n, (%))					
3	136	19 (14.0%)	35 (25.7%)	39 (28.7%)	43 (31.6%)
4	73	3 (4.1%)	26 (35.6%)	21 (28.8%)	23 (31.5%)
≥5	34	7 (20.6%)	9 (26.5%)	9 (26.5%)	9 (26.5%)

Supplementary file 8: Characteristics by category of treatment burden (original version of 10-question MTBQ, n=243)

				-	
Characteristic	N	None	Low	Medium	High
		(MTBQ=0)	(MTBQ=1-10)	(MTBQ=11-25)	(MTBQ>25)
Long-term conditions*(n, (%))					
Cardiovascular disease	209	26 (12.4%)	65 (31.1%)	59 (28.2%)	59 (28.2%)
Stroke or transient ischaemic attack	71	6 (8.5%)	25 (35.2%)	20 (28.2%)	20 (28.2%)
Diabetes	141	20 (14.2%)	39 (27.7%)	35 (24.8%)	47 (33.3%)
Chronic kidney disease	68	9 (13.2%)	26 (38.2%)	17 (25.0%)	16 (23.5%)
Chronic obstructive pulmonary disease or					
asthma	118	15 (12.7%)	34 (28.8%)	30 (25.4%)	39 (33.1%)
Epilepsy	20	1 (5.0%)	4 (20.0%)	4 (20.0%)	11 (55.0%)
Atrial fibrillation	78	15 (19.2%)	28 (35.9%)	19 (24.4%)	16 (20.5%)
Severe mental health problems	13	3 (23.1%)	2 (15.4%)	4 (30.8%)	4 (30.8%)
Depression	106	3 (2.8%)	22 (20.8%)	37 (34.9%)	44 (41.5%)
Learning disability	4	1 (25.0%)	0 (0.0%)	3 (75.0%)	0 (0.0%)
Rheumatoid arthritis	17	1 (5.9%)	2 (11.8%)	10 (58.8%)	4 (23.5%)
Heart failure	31	5 (16.1%)	12 (38.7%)	7 (22.6%)	7 (22.6%)
Age left full-time education (years; n, (%))					
≤14	21	2 (9.5%)	9 (42.9%)	6 (28.6%)	4 (19.0%)
15 or 16	155	22 (14.2%)	46 (29.7%)	41 (26.5%)	46 (29.7%)
17 or 18	33	3 (9.1%)	4 (12.1%)	13 (39.4%)	13 (39.4%)
≥19	31	2 (6.5%)	9 (29.0%)	8 (25.8%)	12 (38.7%)
Missing	3	0 (0.0%)	2 (66.7%)	1 (33.3%)	0 (0.0%)

Supplementary file 8 (continued): Characteristics by category of treatment burden (original version of 10-question MTBQ, n=243)

\*Long-term conditions from electronic GP records. Please note, similar long-term conditions are grouped together (e.g. COPD/asthma, stroke/TIA) \*\* Based on Townsend deprivation index scores<sup>18</sup>

Supplementary file 8 (continued): Characteristics by category of treatment burden (original version of 10-question MTBQ, n=243)

Characteristic	Ν	None (MTBQ=0)	Low (MTBQ=1-10)	Medium (MTBQ=11-25)	High (MTBQ>25)
Employment status (n, (%))					
Fully retired from work	143	22 (15.4%)	52 (36.4%)	40 (28.0%)	29 (20.3%)
Employed	36	1 (2.8%)	8 (22.2%)	13 (36.1%)	14 (38.9%)
Other	64	6 (9.4%)	10 (15.6%)	16 (25.0%)	32 (50.0%)
Missing	0	0	0	0	0
Deprivation score (n, (%))					
Quintile 1 (least deprived)	49	9 (18.4%)	11 (22.4%)	18 (36.7%)	11 (22.4%)
Quintile 2	49	6 (12.2%)	21 (42.9%)	12 (24.5%)	10 (20.4%)
Quintile 3	74	9 (12.2%)	15 (20.3%)	22 (29.7%)	28 (37.8%)
Quintile 4	46	2 (4.3%)	16 (34.8%)	11 (23.9%)	17 (37.0%)
Quintile 5 (most deprived)	25	3 (12.0%)	7 (28.0%)	6 (24.0%)	9 (36.0%)