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Telerehabilitation for mild traumatic brain injury patients: patients' preferences in Aotearoa New Zealand

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ABSTRACT

Introduction. Telerehabilitation offers the potential to improve access to specialty rehabilitation for people with mild traumatic brain injury (mTBI) and reduce health disparities for those living in geographically rural/remote areas. The success of telerehabilitation depends on the extent to which the service meets the patient's needs and their ability to access the services remotely. **Aim.** This study aims to help Healthcare practitioners and government agencies develop effective and patient-centred telerehabilitation services for mTBI patients. **Methods.** Participants were mTBI survivors or close acquaintances of a mTBI patient. The survey involved asking participants to choose between hypothetical rehabilitation scenarios with varying attributes, including the session duration (long or short), location (clinic-based vs telerehabilitation), therapist involvement, inclusion of online resources, associated cost and community COVID-19 threats. **Results.** The results suggest that there was a preference for rehabilitation rather than no rehabilitation, with an overall preference for long telerehabilitation sessions. The results differed somewhat between the groups, with people living with a mTBI being more positive towards clinic-based sessions and less impacted by the threat of COVID-19. The results are consistent with the proposition that individuals prefer telerehabilitation appointments. Although preferences differed between groups, the preference for telerehabilitation persisted, driven by time and cost considerations associated with in-person visits. **Discussion.** The findings suggest that mTBI patients value rehabilitation services, and that Healthcare practitioners and government agencies should consider offering long telerehabilitation sessions. Further research is warranted to assess the efficacy and feasibility of implementing telerehabilitation programs in clinical settings for mTBI patients.

Keywords: Cost, COVID-19, discrete choice experiment, Health economics, mild traumatic brain injury (mTBI), patient preferences, telehealth, telerehabilitation.

Introduction

Traumatic brain injury carries a high global incidence of approximately 69 million cases per year, of which >80% are classified as mild.[1] In Aotearoa New Zealand (NZ), a population-based study estimated 790 people per 100,000 suffered a mild traumatic brain injury (mTBI) annually across all age groups with significantly higher rates in Māori (indigenous people) compared to non-Māori.[2] Nearly 50% of people with mTBI experience four or more persistent post-concussion symptoms at 12 months including cognitive, visual, and vestibular dysfunction[3] with impacts on quality of life, community, and societal participation evident over subsequent years.[4–6]

Current research and clinical guidelines suggest adults with ongoing symptoms 2 weeks after mTBI require follow-up assessment and intervention to mitigate long-term sequelae.[7,8] Telerehabilitation, or the delivery of rehabilitation interventions remotely, has typically not been offered in NZ until the onset of the COVID-19 pandemic.[9,10] Telerehabilitation offers the potential to improve access to speciality rehabilitation for people with mTBI, reduce health disparities for those living in geographically rural/remote areas, overcome cultural and language barriers,[11–13] and provide an

WHAT GAP THIS FILLS

What is already known: Although telerehabilitation offers the potential to improve access to rehabilitation for people with mild traumatic brain injury (mTBI) and reduce health disparities, the services must be tailored to meet the specific needs of this population.

What this study adds: This study provides information about the aspects of rehabilitation that are most valued by patients and how telerehabilitation services can be designed to best meet the specific needs of this population in Aotearoa New Zealand. Considering the travel time, cost and familiarity with their therapist, the results suggest that long telerehabilitation sessions would be the most valued option.

equivalent or more clinically effective alternative to traditional in-person care.[14] Telerehabilitation can be comparable to traditional approaches for improving physical function outcomes,[15] facilitate engagement with services by providing ongoing support, and provide a mechanism for patients to remain connected to the service.[13,16]

The success of telerehabilitation for patients with mTBI will ultimately depend on the extent to which the service meets the patient's needs and the patients' ability to access the services remotely. The aim of this study was to identify mTBI patients' preferences for rehabilitation services, including telerehabilitation, using a discrete choice experiment (DCE). DCEs are a methodology for identifying the preferences of patients for services, including telerehabilitation, and the strength of those preferences. Previous studies have used DCEs to examine patient preferences for rehabilitation/telehealth services across different types of care and and health conditions including aged care,[17–19] lower extremity fractures,[20] cardiac conditions,[21] primary care,[22] diabetes,[23,24] chronic conditions,[25] skin cancer,[26,27] mental health,[28,29] and general out-patient services.[30–34] A primary advantage of DCEs over other methods of preference elicitation methods (such as hedonic pricing or other revealed preference approaches) is that it can provide insights into the likely success of methods of services delivery that are not currently widely available and allow the clinician to identify the package of services that are most likely to meet the patient's needs. As such, DCEs can facilitate patient-centred approaches to developing rehabilitation services for patients with mTBI.

Using attributes identified during an earlier stage of the research as being most important to mTBI patients during rehabilitation, a survey was conducted with people who have either suffered a mTBI or were closely associated with a patient living with a mTBI. Although the primary aim was to identify the strength of the preferences of patients for rehabilitation in general, a secondary aim was to conduct marginal analysis to examine patient preferences for different types of rehabilitation, including telerehabilitation. In addition, because the survey was conducted after the onset of the COVID-19 pandemic, the study also reports on patient's preferences during periods where there is a threat of contracting a contagious illness.

Method

Study design

The study involved a cross-sectional survey of participants in New Zealand. The study was part of a larger project that explored patients' and providers attitudes toward telerehabilitation for patients with mTBI. The DCE design and analysis experiment followed the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) checklist on patient-preference methods.[35] Data are available from the authors by request.

Identification of attributes to be used in the DCE

As part of the wider study, 12 clinicians with expertise and operational experience delivering mTBI rehabilitation from a broad range of perspectives (ie professional backgrounds, experience of telerehabilitation, gender, culture, and geographical location) and five mTBI patients who were undergoing/had received rehabilitation within the past 12 months following a clinical diagnosis of mTBI participated in a series of semi-structured focus groups/interviews regarding the design of rehabilitation services for patients living with a mTBI. The participants were identified through a rehabilitation company, with contact details of interested patients forwarded to the research team. A purposive sampling framework was developed to ensure a broad range of experiences were represented with respect to age, gender, ethnicity, time since mTBI and geographical location. The research team used their clinical experience along with interview themes and literature findings to develop the dimensions for each attribute (see Table 1).

Sample method

DCE participants were recruited though the NZ TBI Network (https://tbin.aut.ac.nz/about-us). The network consisted of patients living with a mTBI and their friends and family members. All members of the network were contacted and asked if they would be interested in participating in the study. Those who responded positively were screened to ensure that they either had experienced a mTBI/concussion or were a family or friend of a person living with a mTBI. Participants were offered the opportunity to take the survey online or via a paper survey (provided along with a self-addressed, stamped envelope). Thus, the survey used a convenience sampling technique involving individuals who self-identified as either having a mTBI or being a friend or family member of a person living with a mTBI. All

participants consented to be part of the study and the study received ethical approval from the New Zealand Ministry of Health's Health and Disability Ethics Committee (NZ 21/CEN/237).

Table 1. Treatment attributes and levels used to construct the rehabilitation scenarios.

Attribute	Levels
Type of programme	Quick clinic-based rehabilitation (30 min/week for 3 weeks)
	Long clinic-based rehabilitation (1 h/week for 8 weeks)
	Quick telerehabilitation (30 min/week for 3 weeks)
	Longer telerehabilitation (1 h/week for 8 weeks)
Who conducts the session	You know and like the therapist the clinic assigns to work with you
	You do not like the therapist the clinic assigns to work with you
	The clinic assigns a different therapist each week
Availability of online resources	No online resources available
	Online resources available
	Online resources available with support
Cost	NZ$0 (totally reimbursed)
	NZ$5 per session
	NZ$10 per session
	NZ$35 per session
	NZ$50 per session
	NZ$75 per session
COVID-19 risk in the community	None (no risk of getting COVID-19 from attending an in-person session)
	Trace amounts of COVID-19 in your community
	Some community spread of COVID-19
	Significant community spread of COVID-19

Questionnaire design

The fractional factorial design (created using the Bayesian design approach in SAS JMP[35]) with the greatest efficiency involved eight versions of a 16-choice set and was found to be the most efficient design with 97% based on the geometric mean of the eigenvalues, 67% for the maximum standard error for prediction over the candidate set and 94% based on the algebraic mean of the eigenvalues.[36] The survey began with a detailed explanation of all the attributes and their respective levels, an example that involved the choice between two cars, and then 16 choices between two rehabilitation programs and one opt-out option. An example of the choice that participants were asked to complete is shown in Fig. 1. For each choice, the participants were asked to select their preferred program. After completing the 16 choice sets, participants were asked a series of questions, including demographic information and their preferences for rehabilitation services and estimated cost/time for each type of service.

Model estimation

The DCE choices were analysed using conditional logit modelling (CLM).[37] The model was estimated in two ways: using each individual attribute (Categories Model) and using a linearised cost variable (Linear Model). The results were analysed for the entire sample and subsequently by whether the participant had a mTBI or was a friend or family member of someone who had a mTBI. The results from the DCE estimation provides an indication of the impact (positive or negative, as indicated by the sign of the coefficient (***B***) for each attribute) and the impact or importance of the attribute (the value of the coefficient). In addition, because participants were given the option of choosing no rehabilitation ('Don't like either programme' option shown in Fig. 1), the analysis also provides an indication of whether the participant would prefer to not engage in rehabilitation (the 'No Rehab' option reported below).

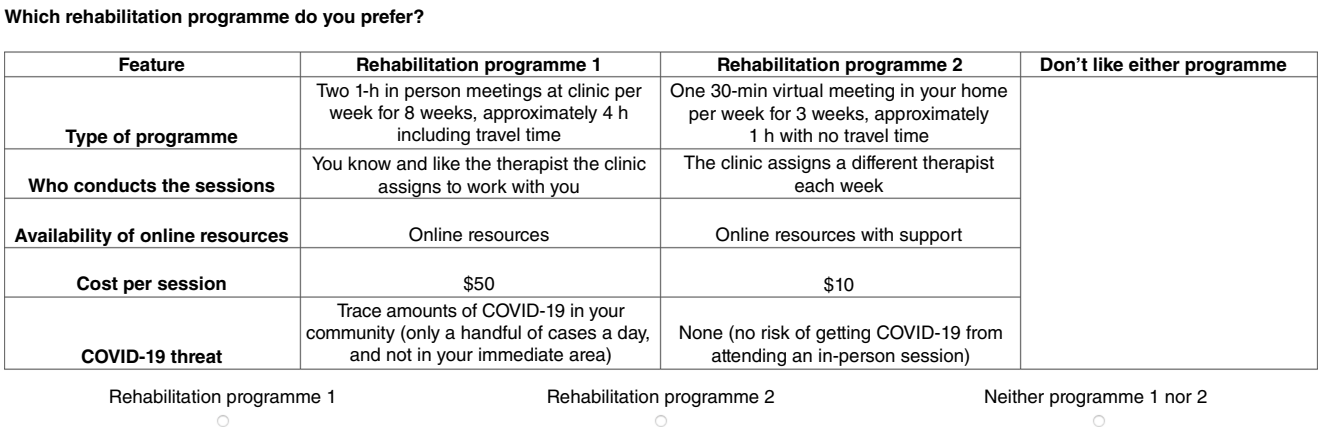

Fig. 1. Example of a choice set.

Marginal probabilities

Marginal analysis was conducted in two ways. First, the willingness to pay (WTP) for each attribute was calculated by dividing the coefficient (***B***) each of the attributes by the coefficient for the linearised cost (Linear Model). The WTP estimates the relative importance of each of the attribute in monetary terms. This was done for the entire sample and separately for two groups: patients living with a mTBI (Had a mTBI) and their friends and family members (Friends and Family). The second type of marginal analysis explored several policy scenarios, including: (a) having online resources available; (b) the threat of the spread of COVID-19 in the community; and (c) how changes in external conditions – namely increased risk of contracting COVID-19 – influenced the choice between online and clinic-based sessions. In addition, the analysis examines two policy options that could be used to increase the choice of rehabilitation after a mTBI; (a) lowering the cost of the telerehabilitation sessions but subsidising internet connectivity; and (b) reimbursing for wages lost as a result of attending (either virtually or at a clinic) the rehabilitation session. Each analysis reports the probabilities of each of the five options – quick (30 min) telerehabilitation, long (60 min) telerehabilitation, quick clinic visit, long clinic visit, or no visit under four scenarios relative to a 'base case' that was formed using the participants reported perceptions of the cost and time associated with each mode of delivery. The travel time and session cost information were combined with an estimate of the income that would be lost to form a total estimated cost of each mode of rehabilitation.

Ethics

The research meets ethical guidelines and was approved by the National Ethics Committee.

Results

Respondent demographics

The study sample included 68 participants with an average age of 41 years (see Table 2). Overall, 44% of the sample ($n = 30$) reported having a mTBI. The average time since their first mTBI was 5 years, and the average number of mTBIs was 2.6 events. A majority (83%) of the respondents had undergone rehabilitation following their mTBI. There was a high degree of connectivity for the participants (all reported having some access to the internet).

Discrete choice results: entire sample

The results from the conditional logit analysis are shown in Table 3. The first model (labelled Categories Model in Table 3) provides the coefficient results for each attribute included in the experiment (the reference variable for each attribute are indicated). As predicted, all cost results had negative slopes with increasing degrees of magnitude. The second model (Linear Model) reports the results with cost linearised for the entire sample. The results suggest that there was a general preference for therapy compared to not having therapy, as suggested by the significant negative coefficient for the No Rehab (the Neither option) in the analysis. The results also suggest that, all else being equal, participants preferred long clinic appointments and long telerehabilitation

Table 2. Demographic information of the study sample.

		All	Had a mTBI	Family or Friend
Age (years)		45.2	46.0	44.5
Female (%)		82.1	73.3	89.2
Ethnicity (%)	White	70.6	83.3	60.5
	Other	29.4	16.7	39.5
Education (%)	High school or some technical school	25.0	36.7	15.8
	University graduate	75.0	63.3	84.2
Location (%)	Auckland	55.9	40.0	68.4
	Urban	13.2	20.0	7.9
	Rural	30.9	40.0	23.7
Access to devices (%)	Smartphone	94.1	96.7	92.1
	Tablet	26.5	20.0	31.6
	Laptop	77.9	73.3	81.6
	Computer	36.8	20.0	50.0
	Smart watch	29.4	30.0	28.9
Internet connection (%)	Wireless 3G/4G/5G	60.3	63.3	57.9
	ADSL/VDSL[C]	8.8	10.0	7.9
	Broadband	25.0	33.3	18.4
	Fibre	51.5	50.0	52.6
	Don't know	0.0	0.0	0.0
	Other	1.5	0.0	2.7
Health	Self-rated health[A]	2.38	2.77	2.08
	EQ. 5D[B]	0.49	0.53	0.46
	Average no. of mTBIs		2.6	
	Average length of time since last mTBI		5.6 years	
	Rehab for mTBI		83.3%	
No. of participants		68	30	38

[A]Self-rated health is on a 1–5 scale with 1 = Excellent health.
[B]EQ. 5D score is the index score for the health utility rated on a scale where a value of 1 represents full health and a value of 0 represents death.
[C]ADSL = Asymmetric Digital Subscriber Line) and VDSL = Very-high-bit-rate Digital Subscriber Line.

Table 3. Conditional Logit results.

Variables	Categories model	Linear cost		Had a mTBI		Family or Friend	
	B (SE)[A]	*B* (SE)	WTP[B]	*B* (SE)	WTP	*B* (SE)	WTP
Short clinic-based rehabilitation	**Reference**	**Reference**		**Reference**		**Reference**	
Long clinic-based rehabilitation	0.56*	0.53*	NZ$22.83	0.97**	NZ$43.86	0.22	NZ$9.13
	(0.32)	(0.32)		(0.48)		(0.43)	
Quick telerehabilitation	-0.29	-0.32	-NZ$14.04	0.15	NZ$6.64	0.66	-NZ$27.42
	(0.33)	(0.33)		(0.50)		(0.45)	
Long telerehabilitation	0.64**	0.64**	NZ$27.61	0.92*	NZ$41.86	0.49	NZ$20.25
	(0.32)	(0.31)		(0.49)		(0.42	
No rehabilitation	-1.42***	-1.32***	-NZ$57.22	-1.25***	-NZ$56.64	-1.39***	-NZ$58.04
	(0.26)	(0.24)		(0.36)		(0.33)	
You know and like the therapist	**Reference**	**Reference**		**Reference**		**Reference**	
You don't like the therapist	-2.35***	-2.34***	-NZ$101.52	-2.34***	-NZ$106.45	-2.44***	-NZ$101.54
	(0.14)	(0.14)		(0.21)		(0.19)	
You see a new therapist each week	-1.10***	-1.08***	-NZ$47.04	-1.39***	-NZ$63.14	-0.93***	-NZ$38.63
	(0.14)	(0.14)		(0.22)		(0.18)	
No online resources	**Reference**	**Reference**		**Reference**		**Reference**	
Online resources	0.10	0.09	NZ$4.04	-0.27	-NZ$12.05	0.35**	NZ$14.50
	(0.13)	(0.13)		(0.19)		(0.17)	
Online resources with support	0.20	0.19	NZ$8.13	-0.19	-NZ$8.59	0.46**	NZ$19.29
	(0.16)	(0.16)		(0.24)		(0.22)	
No risk of COVID-19	**Reference**	**Reference**		**Reference**		**Reference**	
Trace amounts	-0.28	-0.29	-NZ$12.74	0.17	NZ$7.55	-0.64	-NZ$26.58
	(0.32)	(0.32)		(0.47)		(0.44)	
COVID-19 some community spread	0.45	0.39	NZ$17.09	0.71	NZ$32.32	0.23	NZ$9.63
	(0.31)	(0.31)		(0.48)		(0.41)	
Significant community spread	-1.00***	-1.01***	-NZ$44.09	-0.02	-NZ$0.68	-1.80***	-NZ$75.13
	(0.36)	(0.36)		(0.51)		(0.52)	
Significant community spread*Long clinic rehabiltation based	-0.13	-0.10	-NZ$4.39	-1.01	-NZ$45.68	0.61	NZ$25.42
	(0.55)	(0.54)		(0.78)		(0.78)	
Significant community spread*Quick online rehabiltation	0.96*	0.98**	NZ$42.78	-0.33	-NZ$14.91	2.03***	NZ$84.38
	(0.51)	(0.50)		(0.74)		(0.70)	
Significant community spread*Long telerehabilitation	0.26	0.26		-1.09		1.44*	
	(0.54)	(0.53)	-NZ$22.96	(0.79)	-NZ$35.77	(0.75)	-NZ$31.08
Linear cost		-0.02***	-$1.00	-0.02***	NZ-$1.00	-0.02***	-NZ$1.00
		(0.002)		(0.00)		(0.003)	
Cost NZ$0	**Reference**						
cost NZ$5	-0.26						
	(0.18)						
cost NZ$10	-0.45**						

(*Continued on next page*)

Table 3. (*Continued*)

Variables	Categories model	Linear cost		Had a mTBI		Family or Friend	
	B (SE)[A]	*B* (SE)	WTP[B]	*B* (SE)	WTP	*B* (SE)	WTP
	(0.18)						
cost NZ$35	-0.92***						
	(0.19)						
cost NZ$50	-1.12***						
	(0.18)						
cost NZ$75	-1.82***						
	(0.21)						
Number of observations	3264	3264		1440		1824	

*$P < 0.1$; **$P < 0.05$; ***$P < 0.01$.
[A]Standard errors in parentheses.
[B]Willingness to pay.

appointments to a quick clinic appointment. There was a strong preference for having a therapist that you know and like (as evidenced by the willingness to pay $107.55). Overall, there was little demand for online resources, either with or without clinician support. There was also a significant preference for not having significant COVID-19 spread and for a long telerehabilitation appointment if there was significant spread in the community.

Discrete choice results: mTBI and family or friend

Results from the conditional logit analysis are shown for the two groups – those who reported having a mTBI and those whose friends or family had a mTBI (Table 3). Both groups favoured rehabilitation over no rehabilitation and preferred a therapist that they liked over a new therapist each week. Those who had a mTBI showed a preference for a long clinic or long telerehabilitation session over both the short clinic and the short telerehabilitation sessions whereas the family or friends group showed no preference for a short versus long rehabilitation session.

Marginal analysis

Table 4 shows the participants' estimated costs of the travel that would be required to attend a long or short clinic visit, the perceived cost of a clinic visit and an online session, and the preference for therapist and resource materials. The travel time and session cost information were combined with an estimate of the income that would be lost to form a total estimated cost for each mode of rehabilitation, ranging from $77.32 for a long session in a clinic to $28.44 for a short telerehabilitation session. The results from the linear DCEs reported in Table 3 and the preferences and estimated costs shown in Table 4 were used as the base cost for the marginal analysis.

The marginal analysis shown in Table 5 shows the marginal probabilities for a choice between the five options – no visit, short clinic visit, long clinic visit, short telerehabilitation visit, and long telerehabilitation visit – for the policy scenarios described above. The first rows show the comparison between all five options, while the last two rows show the probabilities for a long clinic vs. rehabilitation visit with and without the inclusion of the lost wages (work costs). The results suggest that for the base case analysis, the probability of participants choosing a long telerehabilitation visit was 42% and a short telerehabilitation visit was 23%, meaning a combined probability of 65% of the respondents choosing a telerehabilitation visit compared with a probability of 33% choosing a clinic visit and 2% choosing to have no rehabilitation. The probability of choosing a telerehabilitation clinic visit increased when there was significant COVID-19 spread (78%) and if internet costs were subsidised (78%). In contrast, if respondents were compensated for the time required for the visit (either clinic based or telerehabilitation), the probability of choosing a clinic visit increased from 33% (base case) to 41% (no work cost), whereas the probability of a telerehabilitation visit decreased from 65% (base case) to 58% (no work cost). Those with a mTBI were relatively unaffected about the risk of contracting COVID-19.

Discussion

The purpose of this study was to examine the preference for telerehabilitation for people who suffer a mTBI. As such, it will aid healthcare practitioners and government agencies seeking to develop effective and patient-centred telerehabilitation services for mTBI patients. The participants had familiarity with a mTBI, either having suffered a mTBI in the past (mTBI group) or knowing someone (a friend or family member) who had a mTBI. The results suggest that,

Table 4. Survey results.

		All	Had a mTBI	Family or Friend
Time required for a long clinic session		89.8 min	91.4 min	88.4 min
Time required for a long telerehabilitation session		58.0 min	53.5 min	61.1 min
Time required for a short clinic session		59.8 min	61.4 min	58.4 min
Time required for a short telerehabilitation session		28.0 min	23.5 min	31.1 min
Cost of attending a clinic session		NZ$29.69	NZ$32.38	NZ$27.63
Cost of an online session		NZ$13.61	NZ$12.79	NZ$14.23
Option for face-to-face session (%)	Know and like therapist	98.5	100	97.4
	Do not like therapist	0.00	0	0
	New therapist each week	1.5	0	2.6
Option of online resources (%)	No online resources	1.5	3.3	0
	Online resources with no option to contact therapists	4.5	6.7	2.7
	Online resources with option to contact therapists	94.0	90	97.3
Average weekly salary		NZ$1273	NZ$1273	NZ$1273
Average hourly wage		NZ$31.83	NZ$31.83	NZ$31.83
Total cost of a long clinic session		NZ$77.32	NZ$80.86	NZ$74.52
Total cost of a long telerehabilitation session		NZ$44.35	NZ$41.15	NZ$46.64
Total cost of a short clinic session		NZ$61.40	NZ$64.94	NZ$58.60
Total cost of a short telerehabilitation session		NZ$28.44	NZ$25.23	NZ$30.73
n		68	30	38

overall, there was a preference for rehabilitation rather than no rehabilitation, with an overall preference for long telerehabilitation sessions. The results differed somewhat between the groups, with those who had suffered a mTBI being more positive towards clinic-based sessions and less impacted by the threat of being infected with COVID-19, but overall, the results are consistent with the proposition that individuals prefer telerehabilitation appointments. Results are partially due to the amount of time (and thus lost income, either actual or in time and effort) associated with a clinic visit. Even when individuals were compensated for the time required for the clinic visit, the preference for telerehabilitation appointments persisted. Although there was a preference for telerehabilitation appointments with therapists, there was little indication that the provision of online resources had significant value.

Previous studies have found that patients prefer telerehabilitation when they lived a long distant from the medical facilities[20,30] and value the flexibility of virtual consultations (perhaps because they want to minimise disruptions to their daily life;[27]). Unlike the results reported here, previous studies have found that patients prefer face-to-face sessions for hands-on treatment.[38] Increasing patient age and costs decrease digital health solution referrals,[34] and patients were reported as preferring consultations with their personal physician and shorter appointment wait times.[22] Patients accept less frequent video consultations with some face-to-face sessions and favour lower costs and less disruption to daily life.[25,33] They value telemedicine visits but prefer consultations in their community.[21] In blended care for psychotherapy, patients prioritise personal contact, effectiveness, and low cost, indifferent to content delivery modes.[29]

The current study adds to the literature by reporting the preferences of people who had a TBI or knew someone who had. Thus, the preferences reported here for rehabilitation over no rehabilitation, for long veruss short visits, and for telerehabilitation versuss clinic visits, can be seen as reflecting the preferences of people who are familiar with the challenges of having a mTBI and the choices faced when accessing rehabilitation. In addition, results presented here also indicate the impact of the risk of contracting COVID-19 on preferences for telerehabilitation versus clinic rehabilitation.

Inclusion of people who have suffered a mTBI or those who know someone who has suffered a mTBI was also a strength of the study as it ensures results will be relevant to other mTBI sufferers. The inclusion of family members/caregivers provides evidence in the areas where there are

Table 5. Marginal analysis of the policy scenarios.

		Long clinic (%)	Short clinic (%)	Long telerehabilitation (%)	Short telerehabilitation (%)	No rehabilitation (%)
All	Base case	17.7	15.1	42.2	23.3	1.6
	High COVID-19	10.7	10.1	36.4	41.7	1.1
	Free internet	11.6	9.9	56.0	21.5	1.1
	No work cost	25.9	15.3	41.9	16.1	0.8
	Clinic or telerehabilitation	29.6		70.4		
	Clinic or telerehabilitation/ no work cost	38.2		61.8		
Had a mTBI	Base case	20.6	11.1	40.7	26.6	0.9
	High COVID-19	14.4	21.2	26.1	36.5	1.8
	Free internet	13.8	7.4	53.5	24.7	0.6
	No work cost	29.5	11.2	40.2	18.5	0.5
	Clinic or telerehabilitation	33.6		66.4		
	Clinic or telerehabilitation/ no work cost	42.3		57.7		
Friend or family	Base case	15.3	18.0	44.1	20.6	2.0
	High COVID-19	7.2	4.6	47.6	40.0	0.5
	Free internet	9.8	11.5	58.8	18.7	1.3
	No work cost	22.8	18.4	43.9	14.0	0.9
	Clinic or telerehabilitation	25.8		74.2		
	Clinic or telerehabilitation/ no work cost	34.2		65.8		

differences in preferences, such as a greater sensitivity to the possible spread of COVID-19 for family members; however, overall, the preferences were roughly similar. Also, the overall number of respondents was relatively small ($n = 68$) for a DCE analysis due to difficulty in recruiting from this population. Although there were significant results from the DCE analysis, even with these relatively small numbers, which lends support to the claim that findings are robust, it also raises the possibility the results would change if a larger, more diverse sample was used. But one consequence of the relatively small sample size is that it was not possible to examine preferences by socioeconomic status or by ethnicity. Thus, the results should be seen as providing a general view of preferences for rehabilitation services, but additional research is needed to ensure that services are appropriate for people with potentially different preferences, especially Māori and Pacific people in New Zealand. A larger, more representative study would be needed to ensure that the preferences presented here are representative of the entire New Zealand population.

Another limitation of the study is the hypothetical nature of the methodology. DCEs are an expressed (rather than revealed) preference elicitation method, meaning that there is a chance that the participants would make different choices and express different preferences if faced with real-life rehabilitation decisions. In this case, however, the relatively small number of people living with a mTBI and the limited range of rehabilitation options on offer makes it difficult to study the revealed preferences. DCEs provide evidence on the likely impact of policy options that would be difficult to examine using actual choices, but the hypothetical nature of the choices is a limitation of this type of methodology.

The results have implications for developing rehabilitation plans for people living with a mTBI. First, the strong preference for rehabilitation and for long sessions, especially by those who are living with a TBI, highlights that this should be offered as part of their episode of care. Importantly, the results suggest a strong preference for online sessions over clinic sessions with therapists. Preference for telerehabilitation sessions would be expected during future health pandemics or national emergencies, and could be further encouraged by offering to subsidise internet access. The provision of online resources was not a strong preference for people, whether or not this was alongside therapist contact, either in person or online. This leads to interesting questions around the role of online resources in mTBI rehabilitation.

Understanding how online resources can be best utilised to support mTBI rehabilitation would be of significant clinical value.

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