

# **Adaptation to treatment. Evidence from a RCT in Uganda**

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## **ABSTRACT**

We empirically investigate the process of adaptation in the context of a randomized control trial implemented in Uganda. Adaptation theories claim that people tend to adapt to their conditions and to adjust their aspirations accordingly, so that the changes in satisfaction are only transitory. We implement a randomized control trial in Kampala, Uganda, where a random sample of disabled people is provided with medical equipment for lower limbs disabilities (June 2012). This represents the treatment group, composed of 233 people. A control group of 115 people were assessed and interviewed to be treated one year later (June 2013). Both the treatment and control group are interviewed four, nine and twelve months after the intervention. The hypotheses we test are that the medical treatment should have a positive effect on the patients' medical conditions, raising their life satisfaction in the short run; in the medium-long run, if adaptation occurs, their life satisfaction should return to the pre-treatment level, or close. Our results show that life satisfaction is increasing with the treatment, but the effect is not lasting. Indeed, after ten months after the intervention, life satisfaction starts to decrease reaching the pre-treatment level in one year. This result is particularly evident for the patients whose mobility, as objectively measured through medical tests, has improved in one year, providing support to the adaptation hypothesis.

## **1. Introduction and related literature**

We study the phenomenon of adaptation in relation to a randomized-control trial implemented in Uganda consisting in the provision of orthotic equipment to adults affected by lower limb disabilities. Adaptation refers to the evidence that after major events that can increase or decrease subjective well-being, individuals tend to adapt to their conditions over time so that the change in their subjective well-being is only transitory, and their life satisfaction returns to the pre-change level, or close in the case of only partial adaptation (see e.g. Helson (1964), Frederick and Loewenstein (1999)). Empirical evidence exists showing that people can adapt for example to income, (Clark, Frijters et al. (2008), Di Tella, Haisken-De New et al. (2010)) and sometimes to disability (Albrecht and Devlieger (1999), Brickman, Coates et al. (1978)). However, there are events to which people cannot adapt even in the long-run, so that their life satisfaction is permanently changed, such as widowhood (see e.g. Lucas, Clark et al. (2003)), unemployment (see e.g. Lucas, Clark et al. (2004)) and severe disability (Lucas (2007), Oswald and Powdthavee (2008)).

We contribute to the literature on adaptation by studying the effect of a treatment on life satisfaction over time through a randomized-control trial. The phenomenon of adaptation has to date been studied mainly using cross-sectional data, or panel data but without information of the

baseline levels of subjective well-being. The provision of medical equipment to disabled individuals can be seen as an exogenous shock causing significant changes in the patients' quality of life and subjective well-being. Following the patients at four, ten and twelve months after the treatment, we can study the pattern of their life satisfaction and any potential adaptive process. The medical treatment, i.e. the provision of orthotic equipment to disabled individuals, is expected to improve the patients' quality of life through an improvement in their mobility, which will increase their independence and ability to perform physical and daily activities. The consequences of the treatment should go beyond the effect on health; indeed, more independence and mobility can positively affect other domains of life of the patients' treated, such as their work, family and social relations. Finally, an improvement in overall quality of life can increase the subjective well-being of the patients and their overall satisfaction. The aim of this work is to understand whether this improvement occurs and is sustained over time.

Also, we can link the study of adaptation to the analyses of reference levels, namely expectations and aspirations, evaluating if and how they have been affected by the treatment. The concept of adaptation is indeed linked to the change in aspirations. When adaptation occurs, people adjust their aspirations to their new conditions, which make them unsatisfied with what they have (see e.g. Frederick and Loewenstein (1999), Brickman and Campbell (1971)). Aspirations are a form of reference level: people evaluate their conditions not only in absolute terms but also relatively to a reference level, that can be external, such as social comparisons, or internal, such as own aspirations. A second form of internal reference level is expectations: people evaluate their conditions compared to what they expected to achieve, leading to disappointment if expectations are not fulfilled (see e.g. Bell (1985), Loomes and Sugden (1986), Gul (1991), Kőszegi and Rabin (2006)). The medical treatment provided to disabled individuals could change the patients' reference levels in two ways: it can initially raise their expectations, if the patients expect their overall quality of life to be improved by the treatment; and it can raise their aspirations in the long run, if the treatment is successful but the patients adapt to their new conditions over time.

Last, we contribute to the literature on adaptation providing new evidence from a developing country, and to the development economics literature of randomized-control trials adding new areas of interests. Despite the large number of interventions in developing countries in the form of RCTs, very little attention has been given to date to their effects on the participants' subjective well-being. Haushofer and Shapiro (2013) use a RCT in Kenya to explore the effect of unconditional cash transfers on psychological well-being, finding that a reduction of poverty has significant positive effects on the recipients' satisfaction and happiness, and it helps also to reduce their depression and level of stress after 1 or 2 years. Cattaneo, Galiani et al. (2009) investigate the effect of a programme developed by the Mexican Government aimed at improving the living standards of people living in low-income neighbourhoods through the replacement of dirt floors with cement floors. After 2-4 years from the intervention the results show positive effects of the treatment on the people's satisfaction with their quality of life and a reduction of their levels of depression and stress. Devoto, Duflo et al. (2011) study the effect of household water connection in urban Morocco on overall household welfare. The water connection generated important time gains to the households treated, increasing their leisure and social activities. This was translated in an increase in their life satisfaction and perceived quality of life six months after the treatment. No significant effects are found instead by the authors on the emotional well-being (i.e. positive and negative affects). Fafchamps and Kebede (2012) explores adaptation to disability using cross-sectional data from Ethiopia, finding that

individuals cannot adapt to disability, which significantly reduces life satisfaction irrespective of the time elapsed since the onset.

The rest of the paper is organized as follows: section 2 describes the Uganda Polio Project and the data. Section 3 contains the results of the impact evaluation related to medical data (section 3.1) and life satisfaction (section 3.2). Section 4 focuses on the changes in expectations and aspirations caused by the treatment. Section 5 explores the effect of the treatment on different measures of subjective well-being. Section 6 concludes.

## **2. The Uganda Polio Project**

The Uganda Polio Project aims to provide adult Ugandan people affected by polio or other lower limb disabilities with medical equipment for their impairment. The Uganda National Household Survey (2010) estimates that 16% of the Ugandan population aged over 5 is disabled. In general, disabled people are often the poorest and excluded from education and the job market. Their medical conditions are often made more critical due to both a limited health care system and access to that system, and to a limited supply of appropriate equipment for their disability. The Ugandan government has recognized the issue of disability and through legislation has committed itself to help this disadvantaged group of the population. However despite the increasing political empowerment given to disabled people and the work of local NGOs to give more attention to the needs of disabled people, very little practical help has been given to date. Furthermore, little research exists on the issue of disability in developing countries and the impact of programmes targeted at improving the quality of life of disabled individuals.

The project started in 2012, involving a team of economists from The School of Economics of the University of Nottingham and medical professionals (neurologists, rehabilitation doctors, orthotists and orthotic technicians) from the Queens Medical Centre, Nottingham (part of the National Health Trust). A large number of unused and second hand orthoses and assistive technology (e.g. orthotic shoes, crutches, callipers, etc.) were donated by hospitals, orthotic manufacturers and individuals and collected from around the UK and transported to Kampala. Due to the constraints imposed by the need for appropriate facilities to adapt equipment for individuals in Uganda, the project was based in the Orthopaedic Workshop, Old Mulago hospital, Kampala – the capital city of Uganda<sup>1</sup>. In order to guarantee the sustainability of the project, the medical professionals from the National Health Trust worked together with the local staff by providing lessons each morning and a shadowing programme for local orthotists.

As the final goal is to understand if and to what extent this kind of treatment can help to improve the life of disabled individuals in developing countries, the intervention was implemented in the form of a randomized control trial. Through the collaboration with local NGOs, namely the National Union of Disabled People in Uganda (NUDIPU) and the Uganda National Action on Physical Disability (UNAPD), Mulago Hospital, and Makerere University we identified potential candidates for the intervention. From February 2012 we began to collect patients' details from the two disabled

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<sup>1</sup> A large number of disabled people live in rural areas due to the poor living conditions and conflicts. Efforts will be made in the next phases of the project to extend the intervention to rural areas with the help of the local charities.

NGOs. With the help from researchers at the University of Makerere specialising in Health economics, we conducted a rolling sampling method to identify as many individuals as possible with lower limb disabilities in Kampala and surrounding areas. In June 2012 we randomly divided the sample in two groups and invited patients to Mulago hospital: 233 disabled adults were assessed, interviewed and treated (“treatment” group), and 115 were only assessed and interviewed, to be treated one year later, in June 2013 (“control” group). For ethical reasons, the control group was informed that they would be treated one year later. Given that it was not possible to geographically separate the treatment and control groups, the control group was invited one week later, after the treatment group was treated and the UK orthotists had left. The rehabilitation doctors remained in order to complete the medical assessment of the control group and collect information about the equipment needed to treat them a year ahead. The 348 patients who participated in this phase represent our core sample. After both the medical and economic teams left, an extra sample of 22 patients was interviewed by local orthotists from the Mulago Hospital, 13 of whom were also treated, giving an overall sample of 370 individuals<sup>2</sup>.

All the patients were interviewed through an extensive questionnaire which collected information about their disability and medical history, and socio-demographic characteristics. The questionnaire was conducted at the individual level. A medical assessment captured information about the patients’ physical health and mobility, through established measures of locomotive impairment such as the Timed Up and Go (TUG) and the Ten Meters Walk tests. The information collected in June 2012 through the questionnaire and the medical assessment before the treatment represents the baseline data. Two telephone follow-up interviews were conducted four and ten months after the intervention using a scaled-down questionnaire. One year later, in June 2013, the entire team returned to Kampala, Uganda, and all the patients who participated in the project were invited to Mulago hospital to be reassessed (treatment) or treated (control).

Tables A1 and A2 in the Appendix contain the univariate frequencies and summary statistics of selected variables. The sample is almost evenly divided between men and women, 59 percent are males. The average age is 40. Whilst the majority are married or cohabitate, there is a high proportion of never married (25 percent). The majority of the patients are in the labour market, with almost half of them reporting to be self-employed (46 percent), and roughly 10 percent report being unable to work because of their impairment. The participants appear overall to be well-educated, with most of them having completed secondary school; very few report to have no education at all (3.5 percent). In terms of religion affiliation, they are fairly evenly split between catholic, protestant, muslim and other. Most are disabled from polio (65 percent); other sources of disability include road traffic accidents, infections, strokes and other diseases. For the majority of the patients in the sample onset of the disability occurred in childhood, with an average length of disability of 30 years. In terms of economic conditions, the individuals in the sample appear very poor, with an average household income of about 170000 UGX per month (about \$68).

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<sup>2</sup> Of the 370 observations, we exclude 16 cases from the analyses because they had different medical characteristics compared to the rest of the sample. These are amputee or patients too disabled to be treated with an orthotic intervention. They were part of the original sample and they have been assessed, interviewed and invited to come back. In some cases they were provided with orthopedic shoes or physiotherapy, but due to their particular medical conditions we exclude them from the impact evaluation.

Table 1 compares a selection of variables with the national figures reported in the Uganda National Household Survey 2009/2010, including both national means and those for the urban population only. Average monthly income in our sample is much lower than the national mean, especially if compared to the urban population. However household income is calculated here from a categorical question<sup>3</sup>, explaining the discrepancy with the national mean. Nonetheless, half of the individuals in our sample considered themselves very poor, poor or to never have enough.

In terms of education, marital status, and job status the individuals in our sample compare quite well with the rest of the population. In particular, the level of education of the disabled people in the sample reflects that reported by the urban population suggesting less discrimination at the schooling level at least in the urban area of Uganda (see Table 1). There is a higher proportion of people divorced or separated, and a higher proportion of wage employed compared to the national mean (however the number of wage employed should be higher in the urban population than in the rest of the country, but data on the employment status for the urban population are not available from the National Statistics). Information on average life satisfaction comes from the World Database of Happiness. The disabled individuals in our sample on average report low levels of satisfaction with an average satisfaction of 3.4 on a 7 points scale. However, this is not much lower than the national population (3.9).

**Table 1 - Comparison of baseline data of the Uganda Polio Project (June 2012) with the national figures.**

	Uganda Polio Project	National Data	
	Tot. Sample	Urban pop.	National pop.
<b>Average HH monthly income (UGX)</b>	170246	660000	303700
<b>Marital status</b>			
married	52.5	57.8	65.9
divorced/separated	13.8	8.2	7.4
never married	25.1	29.1	18.9
widowed	8.5	4.9	7.8
<b>Education</b>			
no schooling	3.53	6.6	17.3
primary	37.35	30.5	51.4
secondary or higher	59.12	62.9	31.2
<b>Employment status</b>			
wage employed	38.5	-	23.6
self-employed	61.5	-	76.4
<b>Average Satisfaction with life</b>	3.4	-	3.9

*Source for national data: Uganda National Household Survey, 2009/10. Source for national life satisfaction: World Database of Happiness.*

<sup>3</sup> Income was calculated assigning to each individual the median value of the category chosen, and equivilizing it using the modified OECD equivalence scale (assigning a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child); a continuous variable of household income was included in the questionnaire, but due to a high number of missing values we are not able to use it; for the upper category of the categorical income variable (> 200,000 UGX per month), we assigned the average mean from the non-missing values of the continuous variable reported by those who chose the highest category in the categorical variable (mean was 282,622 UGX per month). Because of this procedure the upper bound of income distribution is likely to be underestimated.

Table A3 in the Appendix shows the test for the equality of the distribution between the treatment and control group. No differences were found on average between the two groups for all the main socio-economic characteristics and variables related to subjective well-being. The same holds for most of the medical data, though we find significant differences for the reach test<sup>4</sup>, frequency of falls per month and muscle strength.

## 2.1. Data and descriptive statistics

The first wave of the project (June 2012) involved 370 disabled individuals, 245 treated and 125 controls. One year later, in June 2013, all the patients were invited to come back to the Old Mulago Hospital, Kampala, to be reassessed (treatment) or treated (control). Two telephone interviews were also conducted in November 2012 and April 2013 using a shorter version of the questionnaire. Due to attrition, the final balanced sample for the first and last wave is composed of 252 observations, of whom 166 were treatment and 86 control cases; of these, 211 observations are also available in the two telephone follow-ups. Of the 252 patients available in the first and last wave, 16 were excluded from the analyses because they had different characteristics at the baseline<sup>5</sup>, leaving a total sample of 236 observations available in the first and last wave, and 197 in all the four waves, 137 treatment cases and 60 controls. As our main goal is to understand the change in subjective well-being over the four waves of the project, in the following analyses we use the 197 observations available in all periods as the main sample. However, many relevant variables such as the medical measures have been collected only in the first and last wave, so we also make use of the increased sample of 236 as comparison.

Table 2 shows that most of the attrition came about in the last wave. One explanation for this is that during our intervention in June 2013 there was a transport strike in Kampala which ran for a significant part of the trial period making it impossible for some people to come to the hospital.

**Table 2 - Attrition**

Freq.	Percent	Cum.	Pattern
211	57.03	57.03	1111
55	14.86	71.89	111.
40	10.81	82.7	1...
18	4.86	87.57	1..1
16	4.32	91.89	11..
14	3.78	95.68	1.11
9	2.43	98.11	11.1
7	1.89	100	1.1.
370	100	XXXX	

<sup>4</sup> Patients stand straight and stretch arms in front of themselves and a measurement is taken (in cm.); they are then asked to remain standing straight but stretch as far as they can and a measurement is taken (this measures the flexibility of the body, mainly hamstrings and lower back).

<sup>5</sup> See Note 2.

If the attrition is not random, i.e. it is due to specific characteristics of the patients which lead them to exit the project, the estimates will be inconsistent. Table 3 shows that for all the socio-economic characteristics, medical data and subjective well-being, there is no difference between the two groups at the baseline. In order to further test for the presence of attrition bias, we also used the procedure suggested by Wooldridge (2010), including a lead of the selection indicator,  $s_{i,t+1}$ , in the main regression. For observations  $i$  that are in the sample in every wave,  $s_{i,t+1}$  is always zero; for those who exit the sample,  $s_{i,t+1}$  takes value 1 in the wave just before the attrition. The selection indicator is insignificant, suggesting that the sample does not suffer from attrition bias. Also, the randomization still holds after the attrition (see Appendix, Table A4).

**Table 3 – Mean values at the baseline between patients who remained in the project in all the four waves and those who are not available for at least one of the three follow-up.**

	Not available in at least one follow-up (mean)	Available in all follow-ups (mean)	Ttest (p-value)
<b>Socio-economic characteristics</b>			
age	39	41	0.168
years of schooling	9.3	8.9	0.387
hh income	175752	167907	0.492
individual earnings	246146	228006	0.693
job status	2.0	2.0	0.403
marital status	2.9	2.9	0.843
<b>Medical data*</b>			
TUG	12.5	13.3	0.374
10M	12.4	12.9	0.557
REACH test	23.4	22.7	0.582
pain at rest	1.3	1.7	0.199
pain when active	4.5	4.2	0.500
frequency of falls per month	3.0	2.7	0.823
WHODAS II	23.8	24.2	0.651
WHODAS II_mobility	6.7	6.4	0.162
SF8	525.5	530.1	0.744
SF8_physical	133.0	134.5	0.748
length of disability	29.1	30.8	0.386
muscle strength	44.4	45.0	0.748
<b>Subjective well-being</b>			
life satisfaction	3.5	3.3	0.399
happy	3.8	3.8	0.638
angry	2.8	2.7	0.449
sad	2.5	2.5	0.855
worried	3.3	3.2	0.388
perceived quality of life	2.9	2.9	0.906
<b>Aspirations and expectations</b>			
income aspiration (sufficient)	4.6	4.6	0.851
expectations about life	4.0	3.9	0.144
expectations about health	3.7	3.8	0.206

*\*With the exception of length of disability, medical data are available for the core sample only (348 of the original 370 obs.).*



### 3. Impact evaluation

The treatment provided can be expected to affect several domains of the patients' life, such as their income, work, social and family relations, as well as subjective well-being. The main channel of this impact is however the effect of the equipment provided on the patients' health status and mobility, which should make the patients more independent and able to perform daily activities with less difficulty. Consequently, we first analyse the impact of the treatment on medical measures (section 3.1). We then proceed to evaluate the effect of the treatment on life satisfaction (section 3.2), our primary goal.

#### 3.1. Impact on medical measures

The survey contains two types of variables related to patients' health status: patients' reported outcomes (PROs), and objective measurements of their mobility (Timed Up and Go, Ten Meters Walk). Patients' reported outcomes refer to the patients' own evaluation of their medical conditions, and are extensively used in medical trials to evaluate the impact of a treatment together with the clinical measures. PROs, despite based on subjective evaluations of the patients, are considered important for the evaluation of a medical treatment because some conditions are not directly measured and are known only to the patients (e.g. level of pain, functional status). The correlation between PROs and objective measures in our dataset ranges between 0.30 and 0.40.

All the medical measures in June 2012 have been taken before the patients were fitted. For one of the patients' reported outcome, i.e. the self-assessed physical and emotional health (SF8), data are available for both the in person and telephone interviews. Data on the other medical variables was collected only in the first and last wave where interviews were conducted in person. The PROs and objective medical measures used in the project are explained below.

- *Patients' reported outcomes*

- WHODAS II<sup>6</sup>: indicator developed by World Health Organisation to assess the physical and emotional consequences of disability, composed of several categorical variables. There are a number of versions of the measure which differ in level of detail. In this study we used the 12-item version. The 12 items of WHODAS II asks patients to score the level of difficulty they have in performing a certain activity on a 5-pt scale, from 1 (No difficulty) to 5 (Extreme difficulty or cannot do it). The 12 items can be grouped in six domains: mobility, self-care, life activity, cognitive skills, participation and getting along. The total indicator ranges from 12 (minimum severity) to 60 (maximum severity). In the following analyses we consider both the impact on the total score and the domain specifically related to mobility, i.e. the difficulty in standing up for long periods and walk long distances<sup>7</sup>, which should be most affected by the treatment; the scores for the mobility component range from 2 to 10.

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<sup>6</sup> World Health Organization Disability Assessment Schedule, second version. See Appendix, Table A5, for details.

<sup>7</sup> The two questions of WHODAS II related to the mobility components are: *In the last 30 days, how much difficulty did you have in: i) standing for long periods such as 30 minutes?; and ii) walking a long distance such as a kilometer (or equivalent)?* (Questions 1 and 7, see Appendix, Table A5).

- SF-8<sup>8</sup>: health-related quality of life instrument developed by Quality Metric to assess the physical and mental components of health status, extensively used in medical research and validated in African countries, specifically Uganda (see e.g. Roberts, Browne et al. (2008)). The SF-8 is composed of eight categorical questions assessing the physical and emotional well-being of the patients in the last four weeks. The questions relate to eight domains: general health, physical functioning, role limitations due to physical health problems, bodily pain, vitality, social functioning, mental health, role limitations due to emotional problems. The total score ranges from 0 to 800 with higher scores indicating better health. As for the WHODAS II, in the following sections we analyse the questions of SF8 specifically related to physical health, i.e. the questions on physical functioning and the related role limitations<sup>9</sup>; the score for the physical domain ranges 0-200.
  - Pain: self-reported indication of the level of pain at rest and when active, from 0 to 10.
- *Objective measures*
- Timed up and go (TUG): time that a person takes to stand up from a chair, walk three meters, turn around, walk back to the chair, and sit down (measured in seconds).
  - Ten meters walk (10M): time to walk ten meters (in seconds).

Table 4 shows the mean (median) values of the medical measures at the baseline for the total sample (last row) and by subgroups of population. Females report overall worse medical conditions than males, especially in the physical tasks (TUG and 10M walk). Physical health is worsening in age according to both the self-assessed measures (SF8 and its physical domain) and the objective ones, while the level of severity of disability seems quite stable over the age groups. The patients disabled by polio appear overall better off than the other patients according to all the medical measures, and they have an average length of disability higher than the sample mean (36 years compared to 19). This could explain the difference in their perceived and objective medical conditions as the patients affected by polio had more time to adapt to their disability status.

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<sup>8</sup> 8-Item Short Form Health Survey. See Appendix, Table A6, for details.

<sup>9</sup> The two questions of SF8 related to physical health are: *During the past 4 weeks: i) how much did physical health problems limit your usual physical activities (such as walking or climbing stairs)?*; and *ii) how much difficulty did you have doing your daily work, both at home and away from home, because of your physical health?* (Questions 2 and 3, see Appendix, Table A6).

**Table 4 - Mean (Median) values of medical measures at baseline (June 2012).**

	Patients' reported outcomes (PROs)						Objective measures	
	Severity of disability <sup>a</sup>	Severity of disability <sup>a</sup> (mobility)	Physical and emotional health <sup>b</sup>	Physical health <sup>b</sup>	Pain at rest	Pain when active	TUG (seconds)	10M Walk (seconds)
<b>Gender</b>								
female	25 (24)	7 (7)	521 (530)	138 (140)	2 (0)	5 (5)	14.4 (10.9)	15.0 (11.9)
male	24 (23)	6 (6)	543 (560)	136 (140)	2 (0)	4 (4)	12.9 (10.8)	11.7 (10.5)
<b>Age</b>								
<=30	24 (24)	6 (6)	553 (560)	143 (160)	2 (0)	4 (4)	12.2 (10.1)	12.2 (10.6)
31-55	24 (24)	6 (6)	537 (540)	137 (140)	2 (0)	4 (4)	13.1 (11.2)	12.4 (10.9)
>55	24 (20)	6 (7)	510 (510)	130 (140)	2 (0)	4 (4)	17.6 (11.4)	16.9 (11.6)
<b>Polio</b>								
Polio	23 (28)	6 (7)	566 (460)	147 (120)	1 (2)	4 (5)	13.2 (11.0)	12.6 (10.6)
Others	28 (22)	7 (6)	463 (580)	115 (160)	3 (0)	5 (4)	14.5 (10.8)	14.0 (10.9)
<b>Tot. Sample</b>	<b>24 (24)</b>	<b>7 (6)</b>	<b>528 (540)</b>	<b>134 (140)</b>	<b>2 (0)</b>	<b>4 (4)</b>	<b>13.1 (11)</b>	<b>12.7 (10.9)</b>

a) Severity of disability is measured through the WHODAS II; its mobility component refers to questions 1 and 7 only. Total score ranges 12-60 and its mobility component 2-10; higher values indicate more severity.

b) Physical and emotional health is measured through the SF8 questionnaire; physical health refers to questions 2 and 3 only. Total score ranges 0-800 and its physical component 0-200; higher values indicate better health.

Table 5 contains the diff-in-diff estimates of the effect of the treatment on the medical variables and the mean for treatment and control group in the first and last waves. We implement the analyses for the total sample (Panel A) and for the subgroup of patients disabled by polio, who represent the 65 per cent of our sample (Panel B).

Due to time and facilities constraints in the June 2013 wave, data on objective measures for the control group were collected after the patients were treated. This makes the comparison between treatment and control group problematic as for the controls we do not have information on the pre-treatment objective mobility in the second year. We thus focus first on the self-assessment measures, which are not affected by this problem, and we proceed to discuss the results about the objective measures later on.

The diff-in-diff estimation shows a significant improvement in the mobility perceived by the patients as measured by WHODAS II (lower values indicate lower impairment) for the total sample; considering that the score for this indicator ranges from 2 to 10, a change of 0.78 corresponds to about a 9% difference in the score. Also, it corresponds to an effect size of about 0.34 (measured as mean change divided by the standard deviation at the baseline), which is considered a small to moderate effect<sup>10</sup>. The mean values of severity of disability of the two groups in the two periods show that the result of the diff-in-diff estimation is driven both by an improvement in the treatment

<sup>10</sup> One of the problems of medical trials is how to identify changes that are not only statistically significant but also clinically meaningful to the patients. One of the easiest method to classify the impact of a medical treatment is via the Cohen's effect size (ES), measured as the ratio of the mean change pre- and post-treatment over the pre-treatment standard deviation. According to this method, an effect size is classified as small if ES=0.2, moderate if ES=0.5 and large if ES=0.8 (see e.g. Guyatt et al. (1998)).

group and a worsening in the control. Evaluating the effect by subgroups of population, we find that the patients treated who perceive a significant improve in their mobility compared to the controls are males, middle-aged individuals and patients disabled by causes different from polio (see Appendix A8). Significant results for the polio patients appear only when we use the larger sample (i.e. the sample balanced in the first and last wave, see Appendix A7): in this case we find that also the polio patients treated report their mobility significantly improved compared to the control; we do also find a significant improvement in the perceived physical health but also in the level of pain at rest.

The other self-assessment measures do not give significant results for the overall sample. Analysing the effect by subgroups of population we do find a worsening within the youngest cohort (patients aged equal or less than 30) in their perceived severity of disability and pain at rest compared to the controls (see Appendix A8).

We now move to discuss the objective measures. The diff-in-diff estimation shows a significant improvement in the Timed Up and Go (TUG) for both the total sample and the subgroup of polio patients: overall, from June 2012 to June 2013, the treatment has reduced the time the patients take to perform the TUG task by more than 4 seconds compared to the controls, and by about 6 seconds for the polio patients. Considering that the average TUG at the baseline was 13.1 (see Appendix A1), this appears as a very good improvement. However, looking at the mean for treatment and control in the two waves, we see that the result is driven not by an improvement following the treatment, but by a worsening for the controls in terms of seconds taken to perform the task in the second year. A similar pattern appears for the 10 meters walk, but the diff-in-diff estimate is not significant. The worsening in the conditions for the control group is not due to a real deterioration in their physical health. The explanation for this finding is that, as mentioned above, the measure for the control group refers to the post-assessment, i.e. immediately after the control received the treatment. The post-assessment measures from the first wave (June 2012) show that just after being treated the patients perform worse than they did without the treatment; the explanation is that the individuals are not comfortable with the new equipment, taking time to learn how to move with it. Indeed, data for the treatment group in June 2012 reveal that the difference between the pre and post assessment in the TUG is about 4 seconds (from 13.1 seconds in the pre-assessment to 17.1 seconds in the post-assessment). Given that the treatment and control group have similar characteristics at the baseline, we can assume that the control group experienced the same problems as the treatment group in the post-assessment tests when treated in June 2013. Subtracting 4 seconds to the control's post-assessment data, we obtain an average of 15.4 seconds for the TUG; yet, this value is still higher than one year before, which can be due to a minor deterioration of the patients' medical conditions.

**Table 5 – Diff-in-diff estimations of the treatment on medical measures.**

	Treatment				Control				Diff-in-Diff	
	June 2012		June 2013		June 2012		June 2013		June '12 - June '13	
<b>Panel A) - Tot. Sample (N=183)</b>										
<b>Patients' reported outcomes</b>										
Severity of disability (WHODAS II)	24.53	(0.77)	23.77	(0.56)	23.56	(1.15)	24.20	(0.84)	-1.401	(1.41)
Severity of disability_mobility (WHODAS II, Q.1 and 7)	6.44	(0.22)	6.07	(0.18)	6.19	(0.34)	6.60	(0.25)	-0.781**	(0.39)
Physical and emotional health (SF8)	534.22	(12.19)	486.17	(10.94)	531.54	(16.26)	486.67	(14.78)	-3.178	(21.2)
Physical health (SF8, Q. 2 and 3)	133.50	(3.88)	127.52	(3.42)	143.85	(4.80)	128.00	(5.04)	9.865	( 7.37)
Pain at rest	1.55	(0.23)	2.60	(0.28)	1.79	(0.41)	2.32	(0.38)	0.517	(0.55)
Pain when active	4.12	(0.41)	4.39	(0.30)	4.24	(0.44)	4.52	(0.32)	-0.017	(0.64)
<b>Objective measures</b>										
Timed up and go (sec.)	13.48	(0.88)	14.99	(1.11)	13.774	(1.16)	19.44	(2.16)	-4.156**	(2.06)
10 Meters walk (sec.)	12.59	(0.85)	13.87	(0.79)	14.28	(1.06)	17.71	(1.41)	-2.155	(1.45)

Notes: Std. errors in brackets clustered at the individual level. \* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

	Treatment		Control		Diff-in-Diff					
	June 2012	June 2013	June 2012	June 2013	June '12 - June '13					
<b>Panel B) - Polio (N=126)</b>										
<b>Patients' reported outcomes</b>										
Severity of disability (WHODAS II)	22.73	(0.76)	22.54	(0.68)	22.61	(1.16)	23.00	(0.84)	-0.575	( 1.52)
Severity of disability_mobility (WHODAS II, Q.1 and 7)	6.17	(0.27)	5.87	(0.24)	6.16	(0.39)	6.36	(0.28)	-0.508	( 0.44)
Physical and emotional health (SF8)	579.46	(12.35)	516.71	(14.50)	544.55	(17.08)	503.83	(15.67)	-22.035	(23.4)
Physical health (SF8, Q. 2 and 3)	146.03	(4.30)	136.71	(4.36)	147.73	(5.02)	131.92	(5.44)	6.494	(7.97)
Pain at rest	0.97	(0.23)	2.31	(0.35)	1.41	(0.40)	1.74	(0.39)	1.005	(0.64)
Pain when active	3.62	(0.41)	3.82	(0.40)	3.86	(0.47)	4.15	(0.46)	-0.094	( 0.77)
<b>Objective measures</b>										
Timed up and go (sec.)	12.97	(0.71)	15.15	(1.22)	13.47	(1.18)	21.32	(2.62)	-5.664**	( 2.43)
10 Meters walk (sec.)	11.98	(0.66)	14.59	(1.09)	13.79	(0.98)	18.42	(1.68)	-2.033	( 1.34)

Notes: Std. errors in brackets clustered at the individual level. \* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Given that for the control group we do not have information about the pre-treatment values of the objective measures after one year, we cannot rely on the diff-in-diff estimations. Yet, we can explore the changes in the objective measures within the treatment group. Table 6 shows the mean and quartiles change from June 2012 to June 2013 in the time (seconds) taken by the patients to perform the Timed Up and Go and 10 meters walk tasks, distinguishing by gender, age and source of disability; the values refer to the treatment group only<sup>11</sup>. The table shows a clear gender gap, with males benefitting much more than females: after one year from the intervention, males have reduced the time to perform the TUG task of 1.2 seconds on average, while women have got worse. A similar pattern is found using the 10M walk test. The distribution of the impact is also different, with 25 per cent of males experiencing a large improvement in their mobility (a decrease of 4.2 seconds in TUG corresponds to an effect size bigger than 0.5<sup>12</sup>), and half of them still getting better; vice versa only less than half of the female sample had their mobility improved, and the effect is also smaller in magnitude compared to males.

The effect seems instead not to depend on age. Looking at the distribution of the changes we do not find differences in TUG and 10M walks between the age groups. A big difference appears instead for the polio vs. non-polio patients. The table reveals that on average the patients disabled from polio are getting worse one year after the treatment, with less than half of them experiencing an improvement, and small in size. The group of other patients seem instead to benefit from the treatment according to both two objective measures.

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<sup>11</sup> As already mentioned, in June 2013 for the control group we have only the post-treatment measures, which are biased by the fact that the patients have just been treated and are not used to the new equipment.

<sup>12</sup> See Note 10 for the explanation of the effect size.

**Table 6 – Mean and quartile changes from June 2012 and June 2013 in the objective medical measures of the patients’ treated.**

	Change in TUG (seconds)				Change in 10M Walk (seconds)			
	Mean	p25	p50	p75	Mean	p25	p50	p75
<b>Gender</b>								
female	3.5	-1.3	1.0	3.9	2.0	-0.6	2.3	5.8
male	-1.2	-4.2	-0.2	1.7	-0.2	-1.9	0.4	1.9
<b>Age</b>								
<=30	0.7	-2.7	0.6	2.4	1.2	-1.9	0.5	3.4
31-55	1.1	-3.0	0.5	2.8	1.7	-1.2	1.3	3.5
>55	0.4	-2.7	0.3	2.1	-4.0	-1.1	0.1	2.0
<b>Polio</b>								
Polio	1.5	-1.4	0.9	2.8	2.3	-0.6	1.3	3.4
Others	-0.1	-4.3	-0.9	1.9	-1.8	-3.5	0.4	3.7

*Notes: data refer only to the treatment group.*

In order to better understand the results for the medical measures, we try to correlate the objective measures with the results found for the patients’ reported outcomes. In order to do this we divide the patients treated in two groups: those who according to the TUG experienced an improvement in their mobility after one year from the intervention, and those who did not. We then compare the results for the PROs for the improved versus not-improved group. We define an improvement in mobility as a reduction in the time to perform the TUG task of at least 1.6 seconds (i.e. an average 12 percent improvement), which corresponds to an effect size of 0.2<sup>13</sup>. Using this threshold, one third of the sample treated belongs to the improved group.

<sup>13</sup> *Ibidem*



**Table 7 - Mean (median) changes in patients' reported outcomes distinguishing by those who experienced an improvement in Timed Up and Go from June 2012 to June 2013 vs. those who did not.**

Patients' reported outcomes	TUG improved of at least 1.6 seconds		TUG same or worse	
	Mean	(Median)	Mean	(Median)
Severity of disability <sup>a</sup>	-3.8*	(-2.0)	1.2	(1.0)
Severity of disability_mobility <sup>a</sup>	-1.3**	(-1.0)	0.1	(0.0)
Physical and emotional health <sup>b</sup>	-9.7	(0.0)	-74.4***	(-60.0)
Physical health <sup>b</sup>	5.9	(0.0)	-14.9**	(-10.0)
Pain at rest	1.3*	(1.0)	0.9**	(0.0)
Pain when active	0.2	(0.0)	0.1	(0.0)

*a) Severity of disability is measured through the WHODAS II; its mobility component refer to questions 1 and 7 only. Total score ranges 12-60 and its mobility component 2-10; higher values indicate more severity. b) Physical and emotional health is measured by the SF8 questionnaire; physical health relate to questions 2 and 3 only. Total score ranges 0-800 and its physical component 0-200; higher values indicate better health. Asterisks refer to significance levels of non-parametric tests on the mean (ttest) \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . Data refer to treatment group only.*

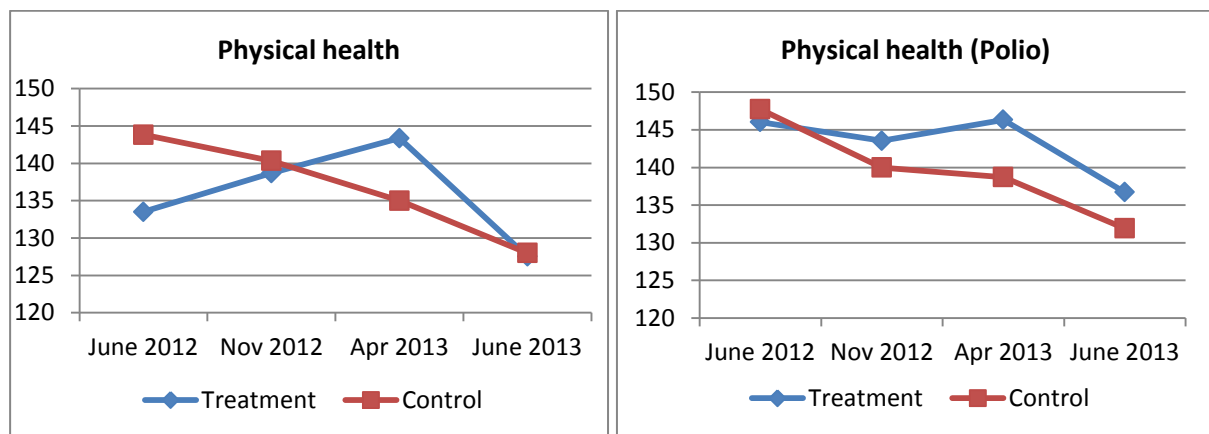
From Table 7 we can see a clear relation between the medical measures as assessed by the patients (PROs) and the objective one (TUG). Indeed, the patients treated whose TUG has improved in one year (of at least 1.6 seconds), perceive on average a significant improvement in their severity of disability, especially in their mobility component (a change of -1.3 in the mobility component corresponds to an effect size of 0.6, so between moderate and large according to Cohen's criteria<sup>14</sup>), while no effect is found for those whose TUG has not improved. According to physical and emotional health, we again find opposite results between the two groups, with now those who did not experience an improvement in TUG reporting a large worsening in their overall and physical health. No asymmetry is found instead for the level of pain, though the pain at rest has increased a bit more for the improved group.

Table 7 shows a significant and large decrease in the perceived health (SF8) for the patients whose mobility has not improved. The worsening is particularly large, and significant at 1 per cent level, in the case of the overall emotional and physical health. Compared to the measures of severity of disability (WHODAS II), the physical and emotional health measure (SF8) contains not only questions related to the physical health and functioning status, but also questions on the emotional health and limitations derived from this. The negative effect on the physical and emotional health that emerges for the patients whose mobility has not improved may be explained by the negative effect of disappointment. The treatment increased the expectations of all the patients treated when the project started in June 2012, but not for all of them expectations were fulfilled in terms of the medical impact. In the same time, the fact of being treated for their impairment could have recalled the patients their disability condition. The increased awareness of their disability together with the disappointment of not having their expectations fulfilled could explain the worsening in their perceived overall physical and emotional health.

Information on perceived physical and emotional health (SF8) have been collected in all the four waves of the projects, so we can examine the change in this measure over the year. We concentrate on the component related to physical health and how far this limits the patients' physical activities and daily work. The total measure of physical health ranges from 0 to 200, with

<sup>14</sup> *Ibidem*

higher values indicating better health. Figure 1 shows the change in physical health in the four waves of the project for treatment and control group, for the total sample and the subgroup of polio patients. For the total sample the starting point appear a bit different between treatment and control, despite not significantly. We observe an improvement in physical health for the treatment group until ten months after the intervention; in April 2013, the diff-in-diff estimation between the treatment and control group is significant at 1% level for the total sample. However, the effect disappears in June 2013, when the perceived physical health is even lower than the pre-treatment level for both the total and polio group. According to the self-assessment measure, the treatment seems thus to have an effect only for about 10 months. For the control group, we observe instead a continuous worsening in the physical health as perceived by the patients.

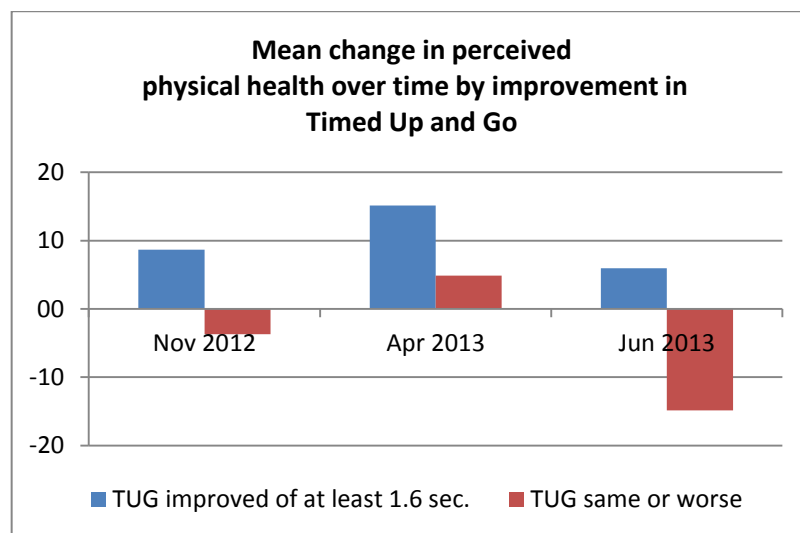


**Figure 1 – Physical health (sum of questions 2 and 3 of SF8) over time by treatment and control group.**

There can be two possible explanations for the finding that the perceived physical health among the patients treated is increasing for the first ten months and then decreasing to the baseline level in one year, or even lower. The first explanation can be that the treatment effect is not lasting, so the patients experience an improvement in their mobility for few months after receiving the equipment, but later on, without any new intervention, the effect of the treatment disappears. This can be due for example to deterioration in the equipment, in a change in the medical conditions of the patients that requires different or new intervention, or both. The second explanation can be due to a form of adaption similar to the one studied for subjective well-being. Information on physical health over time are indeed taken in the form of patients' reported outcome, so based on the subjective evaluation of the patients. It can happen that the perception the patients have of their medical condition is influenced by some reference levels and thus it changes over time not because of a change in their health but in their reference frame. Empirical evidence from the medical literature using PROs show that often an improvement in the clinical measures do not correspond to an improvement in the patients' own evaluations of their conditions. The reason for this is that the treatment causes a response shift, i.e. a change in the way the patient thinks about their health and functioning status; this can be a result of a change in the patients' internal standards ("recalibration"), in their values ("reprioritization") or in the way they conceptualize their quality of life ("reconceptualization") (see e.g. Schwartz, Andresen et al. (2007), Schwartz, Sajobi et al. (2013)). The mechanisms that can cause a response shift are coping, social comparison, reframe of expectations or goals. The phenomenon of response shift in the patients' reported outcomes

described in the medical literature has thus the same characteristics of the phenomenon of hedonic adaptation studied in psychology. Both of them involve a change in the cognitive stimuli, i.e. a change in a person's values or goals. Several studies have shown that response shift can lead to paradoxical findings, such as a global decrease in the patients evaluation of their quality of life after a treatment (even if clinically successful), leading to a potential underestimation of the treatment effect.

In order to better understand the findings related to the perceived physical health shown in Figure 1, we study the changes in perceived physical health distinguishing by the patients who experienced an improvement in their mobility after one year from the treatment versus those who did not. As before, we consider as a clinical improvement a reduction of at least 1.6 seconds in the time taken to perform the Timed Up and Go. Figure 2 shows the mean changes in the perceived physical health from the pre-treatment levels distinguishing by the patients whose mobility has improved (TUG reduced of at least 1.6 sec.) versus those whose mobility has remained the same or worsened. The data refer only to the treatment group.



**Figure 2 – Mean change in perceived physical health (SF8, questions 2 and 3) over time distinguishing by the patients who experienced an improvement in mobility as measured by the Timed Up and Go (TUG). Changes for both physical health and TUG are calculated compared to the pre-treatment levels (June 2012). Data refer to the treatment group only.**

Two conclusions can be inferred from Figure 2. First, there is a clear relationship between the increase in objective mobility as measured by TUG and the increase in perceived physical health. Among the patients treated, those who one year later experience a clinical improvement in their mobility (blue bars in Figure 2) report a much higher increase in their physical health over time compared to the patients who did not experience a similar improvement (red bars). This finding suggests that the PROs such as the perceived physical health correlate overall well with the objective measures. Second, the change in perceived physical health is not stable over time, and this is true for both groups. For the patients whose mobility has improved, the change in the perceived physical health reaches its maximum in April 2013; in June 2013 the difference with the pre-treatment level is instead very small. This pattern seems to be due to an adaptation process. The patients whose

mobility has not improved report instead a large decrease in their physical health compared to the pre-treatment level one year after the intervention.

To summarize, the impact evaluation of the medical measures shows a significant impact of the treatment in one year on the perceived mobility of the patients treated compared to the controls as measured by the mobility component of WHODAS II. However, observing the changes over time in the perceived physical health (SF8) we observe a significant improvement for the treatment group compared to the controls only in ten months after the intervention (April 2013). Distinguishing by the patients treated who in one year experienced an improvement in their mobility (as measured by the TUG), we observe two findings: first, the patients whose mobility increased report on average higher improvements in the subjective medical measures compared to those whose mobility did not improve; second, the perceived physical health of the patients whose mobility improved increases until April 2013 and disappears in one year.

The next section explores if these improvements in medical conditions correspond to the same changes in life satisfaction and study potential adaptive processes.

### 3.2. Impact on life satisfaction

Our main proxy for subjective well-being is life satisfaction on a 7-pt scale, which has been asked in all the waves of the project<sup>15</sup>. Figure 3 shows the baseline distribution of life satisfaction before the treatment, in June 2012. Overall, the patients report very low levels of satisfaction. The highest frequency of patients reports a life satisfaction almost close to the minimum, with an average level of life satisfaction of 3.4.



**Figure 3 – Life satisfaction at the beginning of the project (June 2012)**

Figure 4 shows the pattern of life satisfaction for the two groups over time, for the balanced sample (N=197) and for the subsample of polio patients (N=126). The treatment group has

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<sup>15</sup> Questions on satisfaction have been asked in the middle of the questionnaire in order to avoid as much as possible normative answers that can derive from the participation in the project (e.g. patients could report lower satisfaction in order to get better treatment).

experienced a significant<sup>16</sup> increase in life satisfaction in the first four months immediately following the intervention (19 percent increase for the total sample and 29 per cent for the polio group). However, from November 2012 to April 2013 life satisfaction of those treated starts to decrease slightly, despite being still higher than the original level. In June 2013, life satisfaction of those treated one year before has returned to almost the original level reported in June 2012, and is similar to the level reported by the control group.

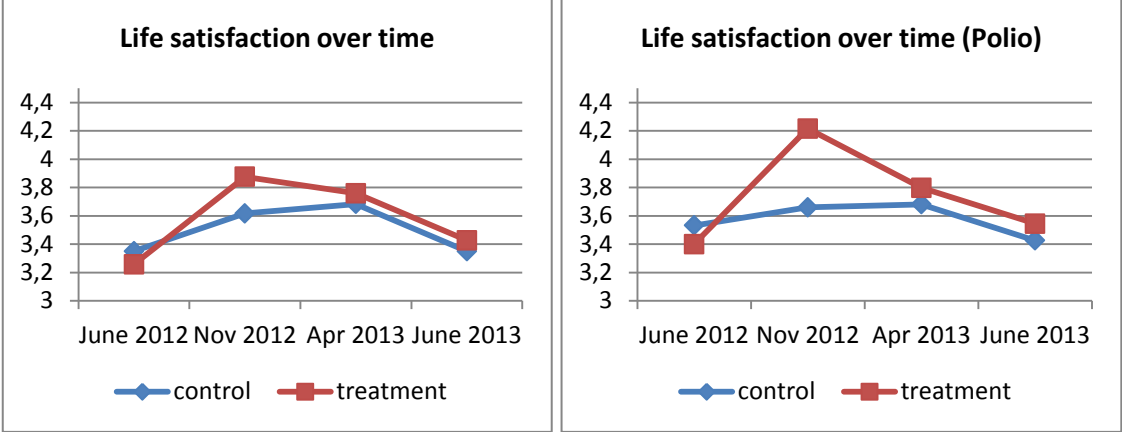


Figure 4 – Average life satisfaction of treatment and control group over time

Despite the increase in life satisfaction seen for the treatment group in the two waves after the treatment, the diff-in-diff estimations of the impact between the treatment and control groups do not give significant results for the overall sample. This is explained by the finding that life satisfaction also increased for the controls, in particular when we consider the overall sample. For the patients affected by polio, the difference between treatment and control is much more peaked, but only in the second wave. Table 8 shows the diff-in-diff estimations of life satisfaction between treatment and control for the total sample (Panel A) and the polio subsample (Panel B). For all the groups there is a positive impact of the treatment on life satisfaction four months after the intervention, but the size of the effect decreases over time – from the first follow-up (November 2012) to the last (June 2013), which reflects the pattern displayed in Figure 4. However only for polio group and for the first follow-up the coefficient is significant.

<sup>16</sup> Non-parametric tests of the equality of the distributions.

**Table 8 – Diff-in-Diff estimations of the impact of the treatment on life satisfaction in the three waves after the intervention.**

	Treatment		Control		Diff-in-Diff	
<b>Panel A) - Tot. Sample (N=197)</b>						
June 2012	3.257	(0.26)	3.350	(0.26)		
November 2012	3.876	(0.11)	3.617	(0.17)	0.352	(0.343)
April 2013	3.759	(0.12)	3.683	(0.16)	0.168	(0.354)
June 2013	3.426	(0.18)	3.350	(0.29)	0.169	(0.413)
<b>Panel B) - Polio (N=126)</b>						
June 2012	3.38	(0.23)	3.532	(0.28)		
November 2012	4.215	(0.14)	3.660	(0.21)	0.708*	(0.415)
April 2013	3.797	(0.16)	3.681	(0.19)	0.269	(0.421)
June 2013	3.544	(0.22)	3.426	(0.32)	0.271	(0.475)

Notes: Std. errors in brackets clustered at the individual level. \* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

An explanation for the finding that the results are overall not significant could be due to the fact that for ethical reasons the patients in the control group were informed they were going to be treated in the next year<sup>17</sup>. This fact could have raised their expectations and impacted their reported subjective well-being. Indeed, current expectations can have a positive effect on subjective well-being as anticipatory emotions (see e.g. Loewenstein (1987), Caplin and Leahy (2001)); the increase in life satisfaction also for the control group can reflect the effect of participating in the program and the expectations deriving from this. The fact that life satisfaction then decreases between April and June 2013 even for the control group may suggest a form of adaptation to expectations as well.

In order to estimate the effect of the treatment on life satisfaction we create a binary variable for life satisfaction from the original categorical variable<sup>18</sup>. We take the baseline median (3) as cut-off to generate the dummy variable for life satisfaction (LS):

$$LS_i = \begin{cases} 1 & \text{if Life Satisfaction} \geq 3 \\ 0 & \text{else} \end{cases}$$

The percentage of patients reporting a life satisfaction equals or higher than 3 is increasing over time until April 2013, especially for the treatment group, but it is decreasing from April to June 2013 (see Table 9).

<sup>17</sup> This was also necessary to have the continued support from both the Ministry of Health and local NGOs, and to ensure consistency with knowledge that this information would leak.

<sup>18</sup> Estimations using the 7-pt scale variable lead to insignificant results for the overall sample, as shown in the diff-in-diff estimations.

**Table 9 – Percentage of patients within treatment and control group reporting a life satisfaction higher or equal than 3.**

	<b>Treatment</b>	<b>Control</b>	<b>Tot.</b>
June 2012	49%	53%	50%
November 2012	85%	75%	82%
April 2013	84%	78%	82%
June 2013	56%	52%	55%

We estimate the following fixed-effects model:

$$LS_{it} = \alpha + \sum_{t=2}^4 \beta_t T_i W_t + \sum_{t=2}^4 \gamma_t W_t + f_i + \varepsilon_{it}$$

Where  $T_i$  is a dummy for the treatment group,  $W_t$  are four time dummies (June 2012, November 2012, April 2013 and June 2013, taking June 2012 as the omitted category) and  $f_i$  are individual fixed-effects. Table 10 contains the results for the total sample and the polio patients. We estimate the model with a linear model and a logistic model, both with individual fixed-effects.

**Table 10 – Effect of treatment on the probability of reporting a life satisfaction $\geq 3$ .**

	LINEAR Tot. sample b/se	LOGIT Tot. sample b/se	LINEAR Polio b/se	LOGIT Polio b/se
Treatment effect in Nov 2012	0.136 (0.0985)	0.717 (0.5308)	0.303*** (0.1127)	2.186*** (0.7108)
Treatment effect in Apr 2013	0.095 (0.0965)	0.450 (0.5399)	0.150 (0.1159)	0.865 (0.6385)
Treatment effect in Jun 2013	0.081 (0.1008)	0.347 (0.4616)	0.144 (0.1184)	0.665 (0.5607)
November12	0.217*** (0.0825)	1.110*** (0.4307)	0.128 (0.0942)	0.626 (0.4626)
April13	0.250*** (0.0809)	1.321*** (0.4445)	0.191** (0.0944)	0.980** (0.4813)
June13	-0.017 (0.0838)	-0.073 (0.3827)	-0.043 (0.0910)	-0.193 (0.4398)
constant	0.506*** (0.0288)		0.532*** (0.0352)	
Individual Fixed-effects	Yes	Yes	Yes	Yes
<i>N</i>	786	595	504	368
<i>R</i> <sup>2</sup>	0.14		0.15	
Log lik.	-334.06	-185.04	-201.78	-109.74

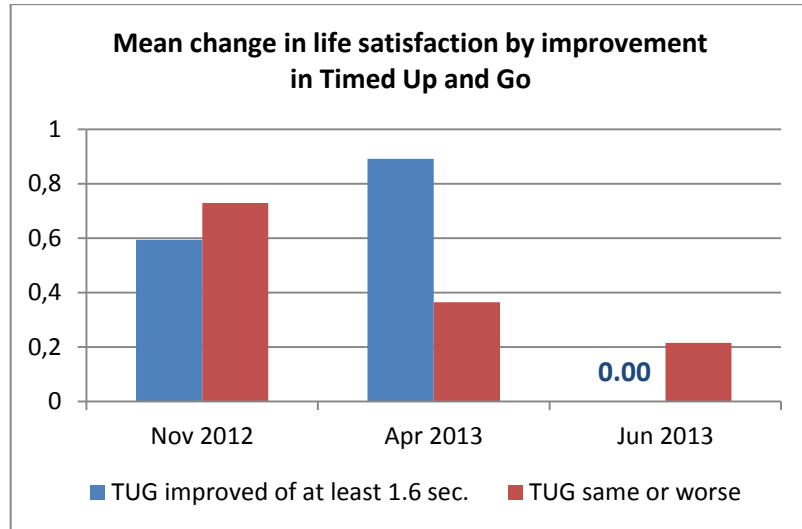
Notes: Dependent variable: Dummy for life satisfaction $\geq 3$ . Omitted category: June 2012. Standard errors in parenthesis.

\* $p < 0.10$  \*\* $p < 0.05$  \*\*\* $p < 0.01$ .

The effect of the treatment on life satisfaction is decreasing over time: it is positive in four months after the intervention (November 2012) and large in size, but approaches zero in June 2013, a full year on. However the increase in life satisfaction four months after the treatment is significant only for the polio group. This effect can have two different explanations: it can be due to the fact that the medical conditions of the polio patients improved, causing the initial increase in life satisfaction; later on, despite being better off, the patients adapted to their new health status and their life satisfaction returned to the pre-treatment level. Or it can be caused by the effect of expectations from the treatment, which then disappears in the next months. However, from the impact evaluation of the medical measures, we know that the polio patients did not experience on average an improvement in their objective conditions, though we find a significant increase in their perceived physical health and mobility when the larger sample is used (see Appendix, Table A7); also, from Figure 1 we observe that their perceived physical health is not improving in November 2012. The explanation for the significant increase in their life satisfaction in November 2012 seems thus more due to expectations than to an improvement in their medical conditions.

In order to better understand if the increase in life satisfaction is correlated with the change in medical condition or it is due only to expectations, we again divide the treatment group in those whose mobility has improved in one year (Timed Up and Go decreased of at least 1.6 seconds) and those who did not experience an improvement in their medical conditions. Figure 5 shows the mean changes in life satisfaction of the patients treated distinguishing by their improvement in mobility (TUG). Data refer to the treatment group only.





**Figure 5 - Mean change in life satisfaction over time distinguishing by the patients who experienced an improvement in mobility as measured by the Timed Up and Go (TUG=). Changes for both life satisfaction and TUG are calculated compared to the pre-treatment levels (June 2012). Data refer to the treatment group only.**

In the first follow-up the two groups experience a similar increase in life satisfaction, but in April 2013 the patients whose mobility improved from June 2012 to June 2013 report a much larger increase in life satisfaction compared to those whose mobility did not improved. However, after one year from the treatment life satisfaction of the improved group (blue bars in Figure 5) is on average the same as the pre-treatment level (the average change in June 2013 is equal to zero for the improved group). For these patients, we observe thus an increase in life satisfaction until the first ten months after the intervention, and a return to the baseline level in one year, despite the objective improvement in their mobility. We saw also from Table 7 that these patients not only experienced an improvement in their objective conditions, but also in their perception of the severity of disability. The fact that their life satisfaction returns to the baseline level seems thus be due to an adaptation process.

For the patients whose mobility has not improved (red bars in Figure 4.5) we observe instead a constant decrease in the effect of the treatment on life satisfaction. Yet, the change is positive and large especially in November 2012. For these patients, despite the treatment did not have an effect on their mobility, at least in one year, their life satisfaction is higher than the baseline level. A reason for this can be that either the treatment led to better medical conditions in the first months but the effect did not last, or it can be due to the expectations the patients had from the intervention, which then have not been fulfilled, or only partially, causing the decrease in life satisfaction.

We further empirically investigate the effect of the treatment on life satisfaction interacting the treatment dummy with a variable capturing if the patient has experienced an improvement in their mobility. We estimate the following model:

$$LS_{it} = \alpha + \sum_{t=2}^4 \beta_t T_i W_t + \sum_{t=2}^4 \delta_t T_i W_t X TUG\_improved_i + \sum_{t=2}^4 \gamma_t W_t + f_i + \varepsilon_{it}$$

As before, the dependent variable is a dummy equal to 1 if life satisfaction $\geq 3$ ; and *TUG\_improved* is a dummy equal to 1 if the patient has experienced an improvement in TUG of at least 1.6 seconds after one year. Table 11 contains the results. We estimate both a linear model and a logit model, both with fixed effects.

**Table 11 - Effect of treatment on the probability of reporting a life satisfaction $\geq 3$ , interacted with the dummy for improved mobility.**

	LINEAR Tot. sample b/se	LOGIT Tot. sample b/se
Treatment effect in Nov 2012	0.090 (0.1174)	0.406 (0.6538)
Treatment effect in Apr 2013	0.030 (0.1190)	-0.012 (0.6180)
Treatment effect in Jun 2013	0.060 (0.1210)	0.235 (0.5600)
Treatment effect in Nov '12 X TUG improved	0.108 (0.1285)	0.441 (0.7379)
Treatment effect in Apr '13 X TUG improved	0.297*** (0.1129)	2.176** (0.9138)
Treatment effect in Jun '13 X TUG improved	-0.054 (0.1361)	-0.202 (0.6165)
November12	0.234** (0.0923)	1.265** (0.5047)
April13	0.213** (0.0909)	1.130** (0.4953)
June13	0.021 (0.0937)	0.100 (0.4481)
constant	0.500*** (0.0322)	
Individual Fixed-effects	Yes	Yes
N	632	484
R <sup>2</sup>	0.15	
Log lik.	-269.16	-148.60

Notes: Dependent variable: Dummy for life satisfaction $\geq 3$ . Omitted category: June 2012. Standard errors in parenthesis. \* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.001$ .

The interaction term in the second follow-up is significant in all the models and big in size. The results show that the patients who experienced an improvement in their mobility report a significant higher probability of having their life satisfaction higher than the baseline median (3) compared to the control group. However, this result holds only in April 2013, and the effect disappears in a year.

Controlling for the improvement in mobility, we find that the treatment had a positive effect on life satisfaction after ten months from the intervention (April 2013). Comparing the patterns of life satisfaction and perceived physical health (Figures 2 and 5), we can see for the patients whose mobility has improved that the two graphs are similar: the maximum change from the pre-treatment level in both life satisfaction and perceived physical health is in April 2013, while the minimum in June 2013. The fact that in both cases the effect disappears in one year, despite the improvement in their objective conditions, seem thus to be explained by a phenomenon such as adaptation.

In the next section we explore the changes in the reference levels of the patients, namely expectations and aspirations, to reach a better understanding of the findings related to life satisfaction.

#### 4. Aspirations and expectations

Information on aspirations and expectations were collected in the first and last wave of the project. Their effect on subjective well-being is linked to the treatment in a different way. The effect of expectations is in fact independent from the treatment effect: the patients treated can experience an increase in their life satisfaction if they expect their life to improve, independently of the actual change in their medical conditions; this is due to the direct effect of expectations as anticipatory emotions. However, expectations can also lead to disappointment in the long-run if not fulfilled.

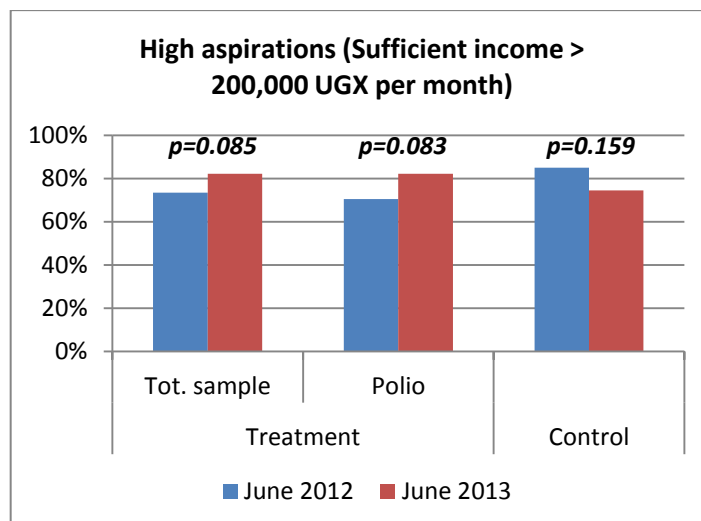
Aspirations and adaptation depend instead on the treatment effect. If the patients are getting better in their mobility and health, their life satisfaction will increase in the short-run. But in the medium/long-run, if adaptation occurs, and their aspirations shift, they will not be satisfied anymore with their new conditions, experiencing a decrease in their subjective well-being. Thus, adaptation requires a change in the patients' conditions to occur, while the effect of expectations is independent from this change.

Aspirations have been asked in relation to income. Following the previous empirical literature (see e.g. Stutzer (2004), Knight and Gunatilaka (2012), Barr and Clark (2010)) income aspirations have been measured as the level of income considered sufficient to live well. This is an ordinal variable taking five values of household income per month<sup>19</sup>. The range of possible answers goes from less than 50,000 UGX (about \$19) to more than 200,000 UGX (about \$76). Figure 6 shows the proportion of respondents choosing the highest category (sufficient income per month to live well higher than UGX 200,000) in June 2012 and 2013 distinguishing by treatment and control group, and polio patients. In June 2012 we see that most of the respondents both in the treatment and in the control group choose the highest category, with the proportion in the control group being higher than the treatment group (not significantly). After one year, we observe an increase in the aspirations for the overall treatment group and polio patients, which is what we expected: according to the theories of adaptation when people adapt to their new conditions they adjust their aspirations accordingly; in the case of an improvement in well-being, adaptation should lead to an increase in aspirations. The increase in aspirations for both the total sample and polio group is significant at 10% level<sup>20</sup>. A decrease in aspirations is found instead for the control group, despite not significantly.

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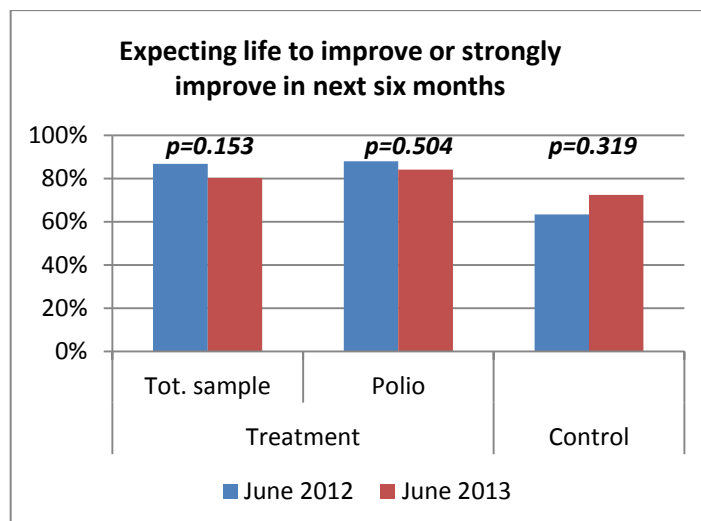
<sup>19</sup> Income ranges (UGX): 0-50,000; 50,000-100,000; 100,000-150,000; 150,000-200,000; >200,000.

<sup>20</sup> When we use the sample balanced only in the first and last wave (N=236), the increase in aspirations from June 2012 to June 2013 is even more significant (p=0.016 for the total treatment group and p=0.036 for the polio group).



**Figure 6 – Frequencies of patients choosing the highest category of income aspirations (income per month sufficient to live well) by treatment and control in June 2012 and June 2013. The treatment group has been further split considering only the polio subgroup.**

In terms of expectations, patients have been asked if they expect their life to change in the next six months through a categorical variable taking five values, from strongly get worse to strongly improve. In the first wave of the project (June 2012) expectations about life were significantly higher for the treatment group than for the controls (the difference in expectations between treatment and control group was significant at the 1% level). Figure 7 shows the frequencies of patients reporting to expect their life to improve or strongly improve in June 2012 and June 2013 by treatment and control group. The question has been asked to each patient as the very last step, just before they were leaving the clinic, in order to capture the effect of the intervention on their expectations. Intuitively, the patients treated should have higher expectations than the control group. Figure 7 shows that the percentage of respondents expecting their life to improve in June 2012 is much higher for the treatment group than for the control group, and this difference is statistically significant at 1% level. One year later, in June 2013, we observe an increase in the frequency of positive expectations for the control group only, which has just been treated. For the patients in the treatment group, who has only been reassessed, expectations are now lower than a year before. The changes in expectations over time are however not significant for any group.



**Figure 7 – Frequencies of patients reporting to expect their life to improve or strongly improve by treatment and control in June 2012 and June 2013. The treatment group has be further split considering only the polio subgroup.**

Also, analysing expectations within the treatment group, we find that the polio versus non-polio patients had different expectations at the beginning of the project, with the polio patients having significantly higher expectations than the non-polio ones<sup>21</sup>. This difference is due to a higher percentage of polio patients answering to expect their life to strongly improve compared to the rest of the treatment group, and a lower percentage expecting their life to get worse (see Table 12).

**Table 12 - Frequencies of expectations of polio vs. non-polio patients treated in June 2012.**

	Strongly get worse	Get worse	Remain about the same	Improve	Strongly improve
<b>Polio</b>	0.0	1.3	10.7	65.3	22.7
<b>Others</b>	3.6	3.6	7.3	74.6	10.9

To summarize, aspirations and expectations can have an impact on life satisfaction according to the theories of adaptation and anticipatory emotions. As the adaptation theories predict, aspirations have overall increased for all the patients treated, while no effect is found for the control. In terms of expectations, we find that the treatment generates significantly higher expectations for the treatment group compared to the control at the beginning of the project (June 2012). One year later, we observe a slight decrease in expectations for the treatment group and an increase for the control; despite these changes within group are not statistically significant, the difference between the two groups, which was significant at 1% level in June 2012, becomes insignificant in June 2013 ( $p=0.232$ ). Moreover, we do find that within the treatment group, the polio patients had significantly higher expectations than the non-polio ones at the beginning of the project. This could help to explain the significant increase in life satisfaction we found for this group in November 2012.

<sup>21</sup> The difference is significant at the 10% level according to non-parametric test (ttest).

## 5. Impact on other subjective well-being measures

This sections compares the effect of the treatment on different components of subjective well-being. We use two alternative measures of subjective well-being: positive and negative affects, and perceived quality of life. Information on these variables were collected only in the first and last wave of the project, so this section is not specifically addressed to evaluate potential adaptive processes over time, but rather to understand the impact of the treatment on different components of subjective well-being in one year.

We collected information about positive and negative affects asking the respondents how frequently they felt happy, sad, angry or worried in the last seven days<sup>22</sup>. The variables range from 1 to 5, where 1 corresponds to very rarely and 5 to very often and have been asked only in the first and last wave of the project. The treatment and control groups are not statistically different at the baseline in terms of these variables (see Table A3 in the Appendix). Table 13 displays the proportion of respondents reporting to feel happy, sad, angry or worried often or very often in the last seven days at the beginning of the project (June 2012). The first column shows the frequencies for the overall sample and the second for the group of polio patients. Positive and negative affects reveal different pattern of subjective well-being compared to what we find for life satisfaction. Indeed, most of the patients report they felt happy often or very often in the last seven days (61 per cent). The proportion is very low for feeling sad and angry, while more than 40 per cent report to have felt worried often or very often. For the group of patients affected by polio the frequencies are similar to the overall sample.

**Table 13 - Frequency of respondents reporting to feeling happy, sad, angry or worried often or very often in the last seven days in June 2012.**

	Tot. sample	Polio
happy	61.3	65.3
sad	19.3	17.7
angry	26.9	26.2
worried	42.9	39.0

A further measure of subjective well-being is the perceived quality of life. We asked the patients to rate their quality of life from 1 to 5 (where 1=very poor and 5=very good)<sup>23</sup>. Table 14 displays the frequencies for the total sample and the group of polio patients in June 2012. Less than 30 per cent of the patients consider their life to be good or very good, while about a third reports their life to be poor or very poor, all things considered.

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<sup>22</sup> Questions on positive and negative affects have been asked in a separate part of the questionnaire compared to the life satisfaction questions in order to avoid interactions between them.

<sup>23</sup> The question is: "All things considered, how would you rate your quality of life?"

**Table 14 – Frequency of quality of life in June 2012.**

	<b>Tot. sample</b>	<b>Polio</b>
very poor	7.1	7.8
poor	28.8	24.1
neither poor nor good	37.3	39.0
good	25.5	27.7
very good	1.4	1.4

We estimate the effect of the treatment on the difference measures of subjective well-being: positive and negative affects, and quality of life. We include also life satisfaction as comparison. The four variables related to affects have been averaged to create a global score of net affects (the scores of negative affects have been reversed so that higher values indicate better well-being). Table 15 contains the results of the fixed effect model for each subjective well-being measure (the dependent variable is indicated at the top of each column). We first estimate the effect for the total sample (Panel A), and then for polio only (Panel B).

Overall, we find that in one year the treatment has not produced any effect on satisfaction with life and affects. A part from life satisfaction, for which we can see the pattern over the year, for positive and negative affects we cannot say whether the insignificant effect is caused by adaptation, or because the treatment does not have any impact at all on the frequency of positive and negative affects. In contrast, we do find a positive significant effect on the perceived quality of life for both the total sample and the group of patients affected by polio. This suggests that the patients treated perceive an improvement in their quality of life that is supported by the finding of a perceived improvement in mobility and physical health described in section 3.1. The fact that we find a significant effect for quality of life but not for the other measures of subjective well-being could indicate that life satisfaction and affects are influenced also by psychological states, such as the phenomenon of adaptation or anticipatory feelings, while the perception of own quality of life involves a judgment based more on material outcomes.

**Table 15 – Effect of treatment on subjective well-being measures.**

	Life satisfaction b/se	Quality of Life b/se	Net affects b/se
<b>Panel A) - Tot. sample</b>			
Treatment effect in June 2013	0.170 (0.4006)	0.300* (0.1711)	-0.220 (0.1573)
June13	0.000 (0.3417)	-0.136 (0.1455)	0.214 (0.1376)
constant	3.285*** (0.0894)	2.884*** (0.0382)	3.349*** (0.0336)
Individual fixed-effects	Yes	Yes	Yes
<i>N</i>	392	390	372
<i>R</i> <sup>2</sup>	0.00	0.02	0.02
<b>Panel B) - Polio</b>			
Treatment effect in June 2013	0.271 (0.4648)	0.507*** (0.1785)	-0.270 (0.1645)
June13	-0.106 (0.3742)	-0.152 (0.1453)	0.264** (0.1310)
constant	3.437*** (0.1111)	2.924*** (0.0421)	3.356*** (0.0401)
Individual fixed-effects	Yes	Yes	Yes
<i>N</i>	252	251	239
<i>R</i> <sup>2</sup>	0.00	0.09	0.03

Notes: Dependent variable at the top of each column. Linear models with fixed effects. Omitted category: June 2012. Standard errors in parenthesis. \* $p < 0.10$  \*\* $p < 0.05$  \*\*\* $p < 0.01$ .

Interacting the treatment variable with the dummy for the improvement in the patients' objective mobility (improvement in Timed Up and Go of at least 1.6 seconds), the interaction term is not significant. However, we do find a significant decrease in the net affects for the patients treated whose mobility did not improved (See Appendix, Table A9). This result seems to be related to the negative effect we found for the perceived physical and emotional health for the patients treated whose mobility did not improve (Table 7). The fact that the patients' expectations were not fulfilled together with the increased awareness of their disability conditions generated from participating in the project could explain the negative effect on their emotional well-being.

## 6. Conclusions

We evaluated the effect of the provision of medical equipment to disabled people on their subjective well-being, using a randomized control trial in Kampala, Uganda. All the patients participating in the project were adults with lower limb disabilities, mostly due to polio, who in June 2012 were provided with orthotic technology for their disability. An extensive questionnaire and a medical assessment was conducted at the beginning of the project in order to collect baseline data on the patients before the treatment. Follow-up data were collected through two telephone interviews using a smaller version of the questionnaire (November 2012 and April 2013) and again in person in June 2013, when the control group was treated and the treatment group reassessed.



The impact evaluation of the medical data showed that the treatment had a positive effect on the patients' reported outcomes, significantly increasing the perception of their mobility in one year compared to the control group. Also, compared to the controls, we found that the treatment significantly improved the patients' perceived physical health ten months after the intervention. For this variable however the effect disappears in one year. In terms of the objective medical conditions, we cannot instead rely on the diff-in-diff estimations because information on the pre-treatment levels of the control group are not available in the second year. A descriptive analysis of the objective measures for the treatment group revealed that the groups of patients who experienced the largest improvement in their mobility as objectively measured (through the Timed Up and Go and 10 meters walk tests) are males and the non-polio patients.

We used the information on the objective mobility of the treatment group to get a better understanding of the findings related to the subjective medical measures. We found that the patients treated who experienced an improvement in their mobility (of at least 1.6 seconds) report also better perceptions of their physical health and severity of disability in one year. However, exploring the changes in the perceived physical health over time, we observe that the patients whose mobility improved in one year report their maximum increase in their perceived physical health in ten months after the treatment (April 2013), while in one year there is no difference compared to the pre-treatment level.

Exploring the effect of the treatment on life satisfaction two findings emerged: first, the treatment caused a significant increase in the probability of reporting a life satisfaction higher than the baseline median (3) for the polio patients in November 2012; second, controlling for the improvement in the objective mobility, the treatment had a positive significant effect for the patients whose mobility has improved, but only in April 2013.

The pattern of life satisfaction over the four waves appears very similar to the one found for the perceived physical health. For the patients treated whose mobility improved, we observe an increase in both the satisfaction and medical measure until April 2013, and a decrease in June 2013 close to the pre-treatment level. This similar result found for the two subjective variables, i.e. the self-reported physical health and satisfaction with life, reinforces the hypothesis that people adapt over time to their new conditions due to a shift in their values or reference levels.

In order to better understand the findings related to life satisfaction, we analysed how expectations and income aspirations changed after the treatment. We found that expectations were significantly higher for the treatment group than the controls when the project started; one year later, expectations decreased for the treated patients and increased for the controls, making the two groups not statistically different anymore. In terms of aspirations, the two groups were not statistically different at the baseline, but aspirations significantly increased for the treatment group after one year.

The significant effect of the treatment on life satisfaction found in November 2012 for the polio patients, and in April 2013 for the total sample whose mobility improved, can be explained by a joint effect of expectations and aspirations. The effect found for the group of polio patients, who according to the analysis of the medical measures benefitted less than the rest of the sample, seems to be due to the effect of expectations. Indeed, we found that in June 2012 the patients treated affected by polio had significantly higher expectations than the other patients in the treatment

group. For the patients whose mobility improved, the significant increase in the probability of reporting a life satisfaction higher than the baseline median found in April 2013 and the following decrease in June 2013 can be explained in terms of adaptation.

Future research is needed to better capture the changes in objective conditions together with the changes in subjective measures and reference levels over time, in order to shed new light on the phenomenon of adaptation, if and to what extent it occurs. Indeed, despite the large amount of randomized-control trials in developing countries, very little attention has been given to date to their effect on the participants' subjective well-being and on the changes in their reference levels.

Also, as stated in the introduction, almost no research exists on the impact of rehabilitation programs in developing countries. This work aimed at exploring the effect of an orthotic intervention on adult people affected by lower limb disabilities. What we observe is an average improvement in the patients' perceived mobility, and an improvement in their objective mobility for about 30 percent of the patients treated. However, we also do find a significant improvement in physical health as perceived by the patients but only until ten months after the intervention. These results seem to indicate the need to collect the medical measurements more frequently. Despite most of the interventions in developing countries collecting information about the participants once a year, it could be that in the case of an orthotic treatment the effects occur earlier than a year. We leave this issue for future research.

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## **APPENDIX**

**Table A1 – Summary statistics in June 2012**

<b>Variable</b>	<b>mean</b>	<b>sd</b>	<b>min</b>	<b>max</b>
<b>Socio-economic characteristics</b>				
age	40.5	12.8	14	82
years of schooling	8.9	4.1	0	16
hh income	170246	101839	25000	282622
individual earnings	237048	326379	1000	2700000
job status	2	0.7	1	3
marital status	2.9	1.8	1	6
<b>Medical data*</b>				
Timed Up and Go	13.1	7.9	3.1	87
10 Meters Walk	12.7	7.4	5.3	85
REACH test	22.9	11.3	2	100
pain at rest	1.5	2.5	0	10
pain when active	4.3	3.1	0	10
frequency of falls per month	2.8	7.9	0	91
severity of disability (WHODAS II)	24.1	7.6	12	56
severity of disability_mobility	6.5	2.3	2	10
physical and emotional health (SF8)	528.4	121.8	160	780
physical health	133.9	39.1	40	200
length of disability	29.6	16	0	73.3
muscle strength	44.9	16.5	2	70
<b>Subjective well-being</b>				
life satisfaction	3.4	1.9	1	7
happy	3.8	0.9	1	5
angry	2.7	1.1	1	5
sad	2.5	1.1	1	5
worried	3.2	1.1	1	5
perceived quality of life	2.9	0.9	1	5
<b>Aspirations and expectations</b>				
income aspiration (sufficient income)	4.6	0.8	1	5
expectations about life	3.9	0.7	1	5
expectations about health	3.8	0.8	1	5

*\*With the exception of length of disability, medical data are available for the core sample only (348 of the original 370 obs.).*

**Table A2 – Univariate frequencies in June 2012**

<b>Variable</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>
<b>Gender</b>			
female	146	41.2	41.2
male	208	58.8	100.0
<b>Marital status</b>			
married	141	39.8	39.8
married polygamously	21	5.9	45.8
divorced/separated	49	13.8	59.6
widowed	30	8.5	68.1
never married	89	25.1	93.2
cohabitating	24	6.8	100.0
<b>Job status</b>			
wage employed	100	28.3	28.3
self-employed	163	46.1	74.3
unemployed	91	25.7	100.0
<b>Religion</b>			
catholic	114	32.2	32.2
protestant	100	28.3	60.5
muslim	75	21.2	81.6
other	65	18.4	100.0
<b>Source of disability</b>			
RTA/injury	45	13.1	13.1
congenital deformity	5	1.5	14.6
injection/infection	19	5.5	20.1
osteoarthritis/stroke/other	52	15.2	35.3
polio	222	64.7	100.0

**Table A3 - Randomization**

<b>Variable</b>	<b>mean (T)</b>	<b>mean (C)</b>	<b>Ttest (p-value)</b>
<b>Socio-economic characteristics</b>			
age	40	41	0.960
years of schooling	8.9	8.8	0.759
hh income	173218	164070	0.429
individual earnings	249518	214845	0.443
job status	2.0	2.0	0.652
marital status	2.9	3.1	0.280
<b>Medical data*</b>			
TUG	13.1	13.0	0.892
10M	12.3	13.6	0.179
REACH test	24.2	20.2	0.003
pain at rest	1.6	1.5	0.815
pain when active	4.2	4.5	0.415
frequency of falls per month	2.3	3.9	0.094
WHODAS II	24.3	23.5	0.425
WHODAS II_mobility	6.5	6.4	0.694
SF8	527.0	531.5	0.762
SF8_physical	131.6	138.8	0.123
length of disability	28.7	31.6	0.126
muscle strength	46.2	42.1	0.041
<b>Subjective well-being</b>			
life satisfaction	3.4	3.4	0.811
happy	3.8	3.7	0.626
angry	2.7	2.7	0.668
sad	2.5	2.6	0.359
worried	3.2	3.3	0.303
perceived quality of life	2.9	2.9	0.964
<b>Aspirations</b>			
income aspiration (suff)	4.6	4.7	0.252

*\*With the exception of length of disability, medical data are available for the core sample only (348 of the original 370 obs.).*



**Table A4 – Randomization after attrition (N=197)**

<b>Variable</b>	<b>mean (T)</b>	<b>mean(C)</b>	<b>Ttest (p-value)</b>
age	41	41	0.945
years of schooling	9.1	8.7	0.528
hh income	172940	158196	0.320
individual earnings	230625	166675	0.110
job status	2.5	2.2	0.204
marital status	2.9	3.1	0.368
TUG	13.4	14.1	0.610
10M	12.5	14.8	0.104
REACH test	24.2	19.3	0.014
pain at rest	1.6	1.7	0.646
pain when active	4.1	4.2	0.927
frequency of falls per month	2.0	3.9	0.027
WHODAS II	24	24	0.701
WHODAS II_mobility	6.4	6.3	0.601
SF8	535	529	0.781
SF8_physical	242	251	0.411
length of disability	29	35	0.032
muscle strength	47	40	0.013
angry	2.6	2.6	0.788
life satisfaction	3.3	3.4	0.758
happy	3.8	3.6	0.118
sad	2.4	2.5	0.509
worried	3.1	3.2	0.480
perceived quality of life	2.9	2.9	0.687
income aspiration (suff)	4.6	4.8	0.164
expectations about life	4.0	3.6	0.002
expectations about health	4.0	3.6	0.002

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**Table A5 – Severity of disability (WHODAS II)**

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In the last 30 days, how much difficulty did you have in:

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- 1 - Standing for long periods such as 30 minutes?
  - 2 - Taking care of your household responsibilities?
  - 3 - Learning a new task, for example, learning how to get to a new place?
  - 4 - How much of a problem did you have joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?
  - 5 - How much have you been emotionally affected by your health problems?
  - 6 - Concentrating on doing something for ten minutes?
  - 7 - Walking a long distance such as a kilometre (or equivalent)?
  - 8 - Washing your whole body?
  - 9 - Getting dressed?
  - 10 - Dealing with people you do not know?
  - 11 - Maintaining a friendship?
  - 12 - Your day-to-day work/school?
- 

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**Table A6 – Physical and emotional health (SF8)**

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- 1 - Overall, how would you rate your health during the past 4 weeks?
  - 2 - During the past 4 weeks, how much did physical health problems limit your usual physical activities (such as walking or climbing stairs)?
  - 3 - During the past 4 weeks, how much difficulty did you have doing your daily work, both at home and away from home, because of your physical health?
  - 4 - How much bodily pain have you had during the past 4 weeks?
  - 5 - During the past 4 weeks, how much energy did you have?
  - 6 - During the past 4 weeks, how much did your physical health or emotional problems limit your usual social activities with family or friends?
  - 7 - During the past 4 weeks, how much have you bothered by emotional problems (such as feeling anxious, depressed or irritable)?
  - 8 - During the past 4 weeks, how much did personal or emotional problems keep you from doing your usual work, school or other daily activities?
-

**Table A7 - Diff-in-diff estimations of medical data between June 2012 and June 2013 (sample balanced in first and last wave).**

	Treatment				Control				Diff-in-Diff	
	June 2012		June 2013		June 2012		June 2013		June '12	June '13
<b>Panel A) - Tot. Sample (N=236)</b>										
<b><i>Patients' reported outcomes</i></b>										
Severity of disability (WHODAS II)	24.33	(0.69)	24.04	(0.53)	23.54	(1.00)	23.86	(0.72)	-0.60	(1.21)
Severity of disability_mobility (WHODAS II, Q.1 and 7)	6.40	(0.20)	6.07	(0.17)	6.15	(0.29)	6.52	(0.22)	-0.70**	(0.34)
Physical and emotional health (SF8)	535.18	(11.09)	492.17	(10.52)	532.62	(14.19)	496.23	(13.52)	-6.63	(18.60)
Physical health (SF8, Q. 2 and 3)	132.65	(3.47)	130.14	(3.36)	141.85	(4.33)	130.73	(4.57)	8.62	(6.67)
Pain at rest	1.52	(0.21)	2.82	(0.27)	1.92	(0.36)	2.16	(0.36)	1.06**	(0.52)
Pain when active	4.31	(0.29)	4.39	(0.30)	4.34	(0.38)	4.46	(0.38)	-0.04	(0.59)
<b><i>Objective measures</i></b>										
Timed up and go (sec.)	13.20	(0.77)	14.78	(1.03)	13.69	(0.94)	19.35	(2.06)	-4.57**	(2.17)
10 Meters walk (sec.)	12.23	(0.74)	13.58	(0.74)	14.24	(0.89)	17.00	(1.25)	-1.42	(1.30)

**Panel B) - Polio (N=152)**

***Patients' reported outcomes***

Severity of disability (WHODAS II)	22.74	(0.70)	23.00	(0.64)	22.34	(0.99)	23.13	(0.77)	-0.531	(1.34)
Severity of disability_mobility (WHODAS II, Q.1 and 7)	6.19	(0.24)	5.84	(0.21)	5.96	(0.33)	6.33	(0.25)	-0.724*	(0.39)
Physical and emotional health (SF8)	575.00	(11.90)	529.20	(13.51)	549.06	(14.89)	505.93	(15.18)	-2.674	(21.09)
Physical health (SF8, Q. 2 and 3)	141.59	(3.98)	141.51	(4.15)	146.55	(4.60)	133.68	(5.07)	12.78*	(7.41)
Pain at rest	1.54	(0.22)	2.84	(0.32)	1.96	(0.35)	2.25	(0.37)	1.19**	(0.58)
Pain when active	3.72	(0.36)	3.85	(0.39)	3.83	(0.41)	4.11	(0.42)	-0.161	(0.72)

***Objective measures***

Timed up and go (sec.)	12.89	(0.68)	15.00	(1.12)	13.45	(0.99)	21.44	(2.53)	-5.88**	(2.26)
10 Meters walk (sec.)	11.83	(0.61)	14.32	(0.96)	13.72	(0.87)	17.65	(1.51)	-1.44	(1.33)

**Table A8 – Diff-in-diff estimations on the patients’ reported outcomes by subgroups of population.**

	Severity of disability <sup>a</sup>		Severity of disability_mobility <sup>a</sup>		Physical and emotional health <sup>b</sup>		Physical health <sup>b</sup>		Pain at rest		Pain when active	
<b>Gender</b>												
female	-0.5	(2.1)	0.0	(0.5)	-45.9	(30.9)	0.6	(9.9)	0.8	(0.8)	-0.1	(0.8)
male	-2.4	(1.9)	-1.5***	(0.5)	35.4	(28.6)	17.7	(10.7)	0.3	(0.8)	0.0	(0.9)
<b>Age</b>												
<=30	6.8*	(3.8)	0.3	(0.9)	14.7	(45.1)	9.1	(15.9)	2.3*	(1.2)	1.5	(1.3)
31-55	-2.2	(1.4)	-1.0**	(0.5)	-19.9	(26.7)	7.9	(9.8)	0.1	(0.7)	-1.0	(0.8)
>55	-2.5	(4.6)	-1.3	(1.1)	25.2	(52.4)	19.5	(14.9)	0.4	(1.5)	0.6	(1.8)
<b>Polio</b>												
Polio	-0.6	(1.52)	-0.5	(0.44)	-22.0	(23.4)	6.5	(7.97)	1.0	(0.64)	-0.1	(0.77)
Others	-1.8	(3.6)	-1.7**	(0.8)	14.7	(54.2)	9.2	(19.2)	0.1	(1.2)	0.6	(1.0)

Notes: a) Severity of disability is measured through the WHODAS II; its mobility component refers to questions 1 and 7 only. Total score ranges 12-60 and its mobility component 2-10; higher values indicate more severity. b) Physical and emotional health is measured through the SF8 questionnaire; physical health refers to questions 2 and 3 only. Total score ranges 0-800 and its physical component 0-200; higher values indicate better health. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

**Table A9 – Effect of treatment on subjective well-being measures controlling by the improvement in objective mobility.**

	Life satisfaction b/se	Quality of Life b/se	Net affects b/se
Treatment effect in Jun '13	-0.142 (0.3920)	0.424** (0.2029)	-0.310* (0.1751)
Treatment effect in Jun '13 X TUG improved	-0.347 (0.3799)	-0.072 (0.1987)	0.040 (0.1695)
June13	-0.007 (0.3217)	-0.109 (0.1704)	0.318** (0.1392)
constant	3.612*** (0.0398)	2.866*** (0.0407)	3.272*** (0.0360)
Individual fixed-effects	Yes	Yes	Yes
N	632	314	302
R <sup>2</sup>	0.01	0.06	0.04

Notes: Dependent variable at the top of each column. Linear models with fixed effects. Omitted category: June 2012. Standard errors in parenthesis. \* $p < 0.10$  \*\* $p < 0.05$  \*\*\* $p < 0.01$ .