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## Hedonic adaptation to treatment: Evidence from a medical intervention

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**Hedonic adaptation to treatment:  
Evidence from a medical intervention**

by

*Marta Barazzetta, Simon Appleton, Trudy Owens*

**Abstract**

We investigate adaptation of subjective well-being using a randomised controlled trial. We find that providing medical equipment to a random sample of Ugandan adults with lower limb disabilities has a positive effect on their physical health, using both objective and self-reported measures. Treated patients experience a significant improvement in life satisfaction initially, but the effect is not prolonged. After one year, life satisfaction returns to the pre-treatment level. This evidence of adaptation is supported by observations of changes in reference levels and is robust to alternative estimation methods including instrumental variable estimation and intention-to-treat analysis.

**JEL Classification:** I31, O15

**Keywords:** Happiness; adaptation; health

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**Centre for Research in Economic Development and International Trade,  
University of Nottingham**



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## 1. Introduction

In the last two decades "happiness economics" has emerged as a burgeoning field of research with potentially significant implications for public policy (e.g. Oswald, 1997, Layard, 2006). Governments have recognised this development and increasingly track measures of subjective well-being (SWB); for example, since 2012 the UK's Office for National Statistics has included personal well-being as part of its National Well Being measurement (Self et al., 2012). One concern with using SWB to evaluate policy or measure welfare over time is the phenomenon of hedonic adaptation. The literature on hedonic adaptation suggests that after major events that initially increase or decrease SWB, with time individuals tend to adapt to their condition. This implies that a policy which objectively improves people's quality of life may not lead to a long-term improvement in SWB. Evidence to date on adaptation has been predominately based on non-experimental data. This paper takes a novel approach. Using a randomised controlled trial of a health intervention in Uganda, we examine whether and to what extent individuals adapt to objective improvements in their well-being. Specifically, we use the randomised provision of medical equipment to adults with lower limb disabilities as an exogenous shock causing significant changes in patients' quality of life. Using the longitudinal data collected from the baseline and three follow-ups, we evaluate the impact of this exogenous intervention on patients' lives, and capture the contemporaneous changes in objective and subjective well-being following treatment.

The phenomenon of hedonic adaptation occurs when there are transitory changes in subjective well-being following changes in circumstances, so that life satisfaction returns to the pre-change level, or close to it in the case of partial adaptation (see e.g. Helson, 1964, Parducci, 1968, Frederick and Loewenstein, 1999). Due to this phenomenon, a strand of the literature, mainly in psychology, supports the hypothesis that individuals have a genetic "set point" of satisfaction, from which they can temporarily move but to which they return in the long-run (see e.g. Lykken and Tellegen, 1996). However, recent evidence from longitudinal studies shows that life satisfaction is not stable over time (see e.g. Fujita and Diener, 2005, Lucas, 2007a) and that people adapt to changes in income (see e.g. Clark et al., 2008, Di Tella et al., 2010) and to non-severe disability (see e.g. Albrecht and Devlieger, 1999, Brickman et al., 1978), but not to events such as widowhood (see e.g. Lucas et al., 2003), unemployment (see e.g. Lucas et al., 2004), poverty (see e.g. Clark et al., 2015) and severe disability (see e.g. Lucas, 2007b, Oswald and Powdthavee, 2008). Most of the evidence to date is non-experimental, giving rise to concerns about inferring causation from correlation. While panel data or instrumental variables can be used to identify causation, we contribute to the literature by using data from a randomised controlled trial (RCT).

RCTs are increasingly used in development economics; Datta and Mullainathan, 2014, refer to this as an "evaluation revolution". However, despite the large number of recent RCTs in developing countries, few have measured the impact of interventions on participants' subjective well-being (for exceptions, see e.g. Haushofer and Shapiro, 2013, for Kenya, Cattaneo et al., 2009, for Mexico, Devoto et al., 2011, for Morocco). None have addressed the issue of adaptation.

Closely related to the concept of adaptation is the notion of reference levels, namely aspirations. When adaptation occurs, people adjust their aspirations to their new conditions, which can make them unsatisfied with what they have (see for example, Frederick and Loewenstein, 1999, Brickman and Campbell, 1971, Van Praag, 1968, for the related concept of preference drift). Despite the link between aspirations and adaptation, the two concepts have been explored separately in the empirical literature, due in part to the difficulty of capturing aspirations and more generally data constraints.

Expectations are a second form of internal reference level whereby people evaluate their condition compared to what they expected. While aspirations are related to the level of welfare one needs in order to reach a certain level of SWB, so they tend to exert a negative effect on SWB until fulfilled, expectations can influence SWB both positively and negatively in the form of savouring or dreading depending on whether the individual is expecting something good or bad. This is due to their effect as anticipatory emotions (see e.g. Loewenstein, 1987, Caplin and Leahy, 2001). The indirect effect, that is, the gap between reference levels and realizations, is instead similar to aspirations, as both expectations and aspirations have a negative effect on SWB if not fulfilled (see e.g. Bell, 1985, Loomes and Sugden, 1986, Gul, 1991, for models of disappointment aversion; Gilboa and Schmeidler, 2001, Kőszegi and Rabin, 2006, for models of reference-dependent preferences using aspirations and expectations as reference points respectively).

The medical treatment we provide could change the patients' reference levels in two ways: initially raising their expectations, if the patients expect their overall quality of life to be improved by the treatment; and raising their aspirations in the long run, if the treatment is successful but the patients adapt to their new conditions over time. The aim of this work is to understand whether there is an improvement in life satisfaction, whether this is sustained over time, and whether patients experience changes in their reference levels.

Our findings provide strong support for the adaptation hypothesis. The treatment had a positive impact on the patients' physical health and subjective well-being. After one year, however, life satisfaction returned to the baseline level despite the improvement in physical health. Our results are robust to the use of different estimation methods that control for potential bias in the results. Moreover, the evidence of adaptation is supported by the findings related to the patients' reference levels. The patients treated had significantly higher expectations than the control group at the

beginning of the project. After one year, their expectations decreased to a similar level of the control group, while their aspirations increased significantly.

The rest of the paper is organised as follows: section 2 describes the Uganda Polio Project and the data. Section 3 displays the results of the impact evaluation related to life satisfaction. Section 4 contains the impact evaluation for the medical data. Robustness checks are presented in Section 5. Section 6 discusses the changes in expectations and aspirations caused by the treatment. Section 7 concludes.

## **2. The Uganda Polio Project: data and descriptives**

The Uganda National Household Survey (2010) estimates that 16% of the Ugandan population aged over 5 is disabled. In general, people with disabilities in developing countries are often poor and excluded from education and the job market. Their medical conditions are made more serious due to limited access to a health care system and deficiencies in that system, including scarcity of appropriate equipment for their disability. The Ugandan government has recognised 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 people with disabilities and the work of local NGOs to give more attention to their needs, 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 individuals with disabilities.

The Uganda Polio Project aimed to help adult Ugandans affected by polio or other lower limb disabilities by providing them with medical equipment for their impairment. The project was designed as an RCT in order to evaluate the benefits of the intervention. It was implemented in June 2012 by 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) were donated by hospitals, orthotic manufacturers and individuals, and collected from around the UK and transported to Kampala, Uganda. The project was based in the Orthopaedic Workshop, Old Mulago Hospital, Kampala.

From February to June 2012, in collaboration with the University of Makerere and the two main disability charities in Uganda, the National Union of Disabled Persons of Uganda (NUDIPU) and

Uganda National Action on Physical Disability (UNAPD), we identified potential candidates for the intervention. We conducted a snowball sampling method to draw up a list of names of individuals with lower-limb disabilities from NGO registers, health clinics and hospitals. From the sampling frame we randomly invited 200 patients to be assessed, fitted with the orthotic equipment and surveyed from day 1 to 9 of the intervention (treatment group). A further 100 subjects were invited to be assessed and surveyed from day 10 to day 15 (control group).

Being a medical intervention there were a number of ethical issues to deal with during the trial. First, ethical clearance was obtained from both the Government of Uganda and the University of Nottingham.<sup>1</sup> Second, in the field, word of mouth generated a torrent of hopeful patients, making it necessary to adjust this sampling strategy to include uninvited patients. In particular, from day 1 to day 9 all study participants, invited and uninvited, were to receive treatment. Exceptions included cases where the equipment required was not available. In this case (45 instances) uninvited patients were included in the study as controls. From day 10 onwards, none of the patients received treatment. This part of the intervention involved assessing and interviewing subjects, which are used as controls in the analysis.

Our final sample in June 2012 is composed of 370 patients: 245 disabled adults were assessed, interviewed and treated (the “treatment” group), and 125 were only assessed and interviewed, to be treated one year later (the “control” group). From these we had to exclude 16 patients from the analyses because their medical condition was considered too different from the rest of the sample, leaving a total number of 354 observations.<sup>2</sup> No significant differences were found on average between the two groups in all the main socio-economic characteristics and variables related to subjective well-being. The same holds for the baseline medical data (see Appendix, Table A4).

An extensive questionnaire collected information on the patients’ socio-economic characteristics. A medical assessment measured their mobility and general health using both objective and subjective measures. The information collected in June 2012 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). A detailed timeline of the project is provided in Table A1 in Appendix. Due to attrition,<sup>3</sup> our final sample consists of 236

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<sup>1</sup> Ethical approval was granted by both the University of Nottingham and the Uganda National Council for Science and Technology, June 2012, reference SS 2781.

<sup>2</sup> These were patients too severely disabled to be treated with an orthotic intervention (e.g. amputee), but they have been interviewed and received medical attention (e.g. physiotherapy, wheelchair).

<sup>3</sup> Attrition was an issue mainly in the last wave of data collection due to a transport strike in Kampala.

observations available in the first and last waves and 197 in all the four waves (137 treatment cases and 60 controls). As our main goal is to explore the pattern of SWB over time, in the following analyses we use the sample balanced in all the four waves. Our analyses suggest that the sample does not suffer from attrition bias. For all the patients' characteristics there is no difference between those who remained in the projects and those who exited (see Table A5). Randomization holds after the attrition for all the individual characteristics, with the only exception of length of disability (see Table A6).<sup>4</sup>

Tables A2 and A3 in Appendix contain the summary statistics at the baseline. The average age of the sample is 40, with a fairly even split between men and women (59% are men). The majority are disabled due to polio (65%); other sources of disability include road traffic accidents, infections, strokes and other diseases. For most patients, the onset of their disability occurred in childhood, with an average length of disability of 30 years. Table 1 compares a selection of variables with the national figures. In terms of educational level, marital status, employment status, our sample compares well with the rest of the Ugandan population. Average monthly income in our sample is however much lower than the national mean. As the project aims to improve the living conditions of people with disability who are not able to afford medical care, the evidence that our sample is composed of low-income patients is in line with our expectations. Life satisfaction is also slightly lower than the national mean.

**Table 1 - Comparison of baseline data of the Uganda Polio Project (June 2012) with 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	3.5	6.6	17.3
Primary	37.4	30.5	51.4
Secondary or higher	59.1	62.9	31.2
<b>Employment status</b>			
Wage employed	28.3	-	23.6
Self-employed	46.1	-	76.4

<sup>4</sup> As a further test, we also implemented 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. Results available upon request.

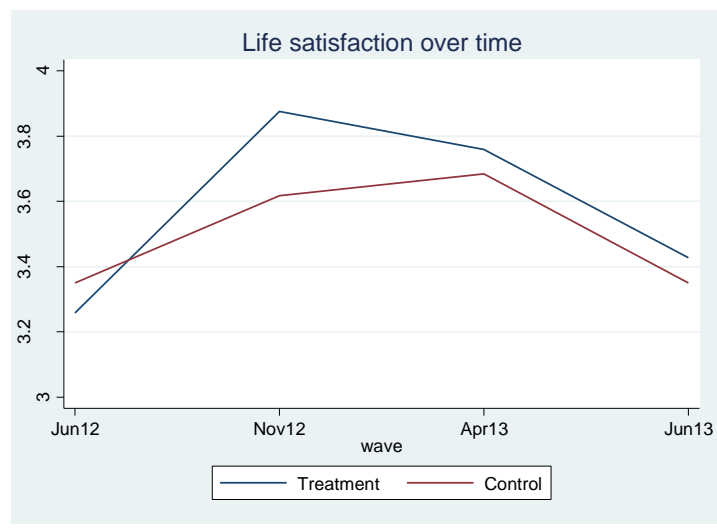


<b>Average Satisfaction with life</b>	3.4	-	3.9
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Source for national data: Uganda National Household Survey, 2009/10. Source for national life satisfaction: World Database of Happiness.

### 3. Impact on life satisfaction

We use the well-established subjective well-being measure namely the response to the following statement “I am satisfied with my life” measured on a 7-pt scale (1=strongly disagree, 7=strongly agree) asked in each wave of the project. Questions on satisfaction were asked in the middle of the questionnaire to avoid as much as possible normative answers that can result from participating in the project. Overall, the patients report very low levels of satisfaction. In June 2012, the mean value of life satisfaction is 3.4 and the mode is 2 (reported by a third of the sample). Figure 1 shows the pattern of mean life satisfaction for the two groups over time, for the balanced sample (N=197). Given the majority of our sample suffers from polio, results are also presented for this particular group whose outcomes should be more comparable (Figure 1A). Four months after the intervention, life satisfaction is markedly higher for the treatment group, with a mean score of over 3.8 compared to 3.3. However, this gain is not maintained. It has been eroded slightly by the second follow-up in April 2013. One year after the intervention, in June 2013, it has returned close to the original level and is similar to the level reported by the control group.



**Figure 1 - Average life satisfaction of treatment and control group over time, full sample**

Although the initial rise in life satisfaction for the treated group is statistically significant (at the 1% level on a non-parametric test for equality of distributions in November 2012, p-value=0.002, and at 5% in April 2013, p-value=0.011), the diff-in-diff estimate is insignificant for the whole sample (see Table A10 in Appendix). This is because initially life satisfaction also increased, albeit not significantly,

for the control group. For ethical reasons, the patients in the control group were informed they were going to be treated in the next year.<sup>5</sup> As current expectations 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 for the control group may reflect the effect of participating in the program and the expectations derived 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.

Given that half of the sample report very low levels of life satisfaction in the baseline (i.e. report values of one or two on the 7-point scale), we focus our modelling exercises on the probability of such low reports. Specifically, we create a dummy variable (LS) for life satisfaction being three or higher:

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

We estimate the effect of treatment in different months, allowing for both individual fixed effects and time dummies. In the context of a linear model, the estimating equation is:

$$(1) \quad LS_{it} = \alpha + \sum_{t=2}^4 \beta_t T_i W_t + \sum_{t=2}^4 \gamma_t W_t + f_i + \varepsilon_{it} \quad (1)$$

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),  $f_i$  are individual fixed-effects and  $\varepsilon_{it}$  is a residual error term.

Table 2 reports the results of our modelling. Columns (1) and (3) use a linear model with individual fixed effects. Given that our dependent variable is binary, there is a case for using a fixed effects logit model, which drops all the invariant observations from the estimation reducing the sample size. These results are reported in columns (2) and (4). The results are robust to the estimation method. There is a positive effect of treatment after four months, but it diminishes and is never significant for the full sample. For the sub-sample of polio sufferers, the effect is significant at the 1% level in November 2012 but then falls and becomes insignificant. The pattern of life satisfaction first rising following treatment and falling is consistent with the hypothesis of adaptation, but this finding is statistically significant only for the polio sub-group. As will be discussed further in section 6 polio patients had much higher expectations regarding their life outcomes as a result of treatment compared to the other patients. This role of expectations could be driving this finding.

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<sup>5</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.

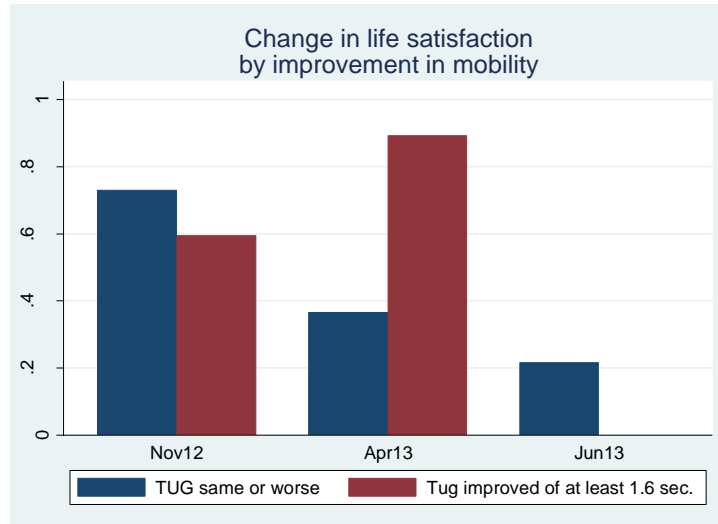
**Table 2 – Effect of treatment on life satisfaction**

	LINEAR Full sample	LOGIT Full sample	LINEAR Polio only	LOGIT Polio only
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)
Constant	0.506*** (0.0288)		0.532*** (0.0352)	
Time effects	Yes	Yes	Yes	Yes
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: Coefficients reported with standard errors in bracket. Omitted category: June 2012. \* $p < 0.10$  \*\* $p < 0.05$  \*\*\* $p < 0.01$ .

An alternative explanation for the lack of a persistent treatment effect on SWB is that, rather than adaptation, it is merely the result of the treatment failing to improve health. Section 3 looks at the impact of the treatment on medical measures. Here we examine whether the treatment effects on SWB varied according to the improvement in mobility of the patients. To do this, we use an established locomotive measure, the time it takes a person to stand up from a chair, turn around, walk back and sit down (known as Timed Up and Go or TUG). We divide the patients treated into 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 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% improvement), which corresponds to an effect size of 0.2<sup>6</sup> (i.e. 20% of baseline standard deviation). Using this threshold, one third of the sample treated belongs to the improved group. Figure 2 shows the mean changes in life satisfaction of the patients treated distinguished by their improvement in mobility (TUG). 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 improve. However, after one year from the treatment life satisfaction of the improved group (red bars in Figure 2) is on average the same as the pre-treatment level (the average change in June 2013 is equal to zero for the improved group).

<sup>6</sup> Computed as standardized mean change according to Cohen's d criteria.



**Figure 2 - Change in life satisfaction over time by improvement in mobility. Data refer to treatment group only. Mobility improvement measured by performance on Timed Up and Go (TUG). Changes are calculated relative to pre-treatment baseline values (June 2012).**

We next estimate the impact of the treatment on life satisfaction through the following model:

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

where  $D_i$  is a dummy variable equal to 1 if the patient has experienced an improvement in TUG of at least 1.6 seconds after one year. Table 3 reports the results of estimating equation (2) through a linear model with fixed effects for the total sample (Column 1) and the polio group (Column 2).<sup>7</sup> We find a significant positive effect of the treatment in April 2013 for patients whose mobility improved. This implies that, for this type of patient, the treatment significantly reduced the probability of them having low life satisfaction in April 2013. However, consistent with the adaptation hypothesis, this treatment effect has disappeared by June 2013, with the coefficient on the relevant interaction term becoming close to zero and completely insignificant, despite their improved physical health conditions. For the polio group, we find a positive effect in November 2012 for the patients who did not experience an improvement in their mobility after one year. This could be explained as an expectation effect. More discussion on this is provided in section 6.

<sup>7</sup> Using a logit model with fixed effects produce the same results, available upon request.

**Table 3 - Effect of treatment on life satisfaction distinguishing by the improvement in mobility**

	Tot. sample	Polio
Treatment effect in Nov 2012	0.090 (0.1174)	0.235* (0.1263)
Treatment effect in Apr 2013	0.030 (0.1190)	0.100 (0.1314)
Treatment effect in Jun 2013	0.060 (0.1210)	0.063 (0.1416)
Treatment effect in Nov '12*mobility improved	0.108 (0.1285)	0.145 (0.1460)
Treatment effect in Apr '13*mobility improved	0.297*** (0.1129)	0.279* (0.1504)
Treatment effect in Jun '13*mobility improved	-0.054 (0.1361)	0.138 (0.1794)
Constant	0.500*** (0.0322)	0.541*** (0.0377)
Time effects	Yes	Yes
Individual Fixed-effects	Yes	Yes
<i>N</i>	632	436
<i>R</i> <sup>2</sup>	0.15	0.15

Notes: Dependent variable: Dummy for life satisfaction $\geq$ 3. Mobility improved =1 if patient experienced an improvement in time to up and go of at least 1.6 seconds after one year; 0 else. Omitted category: June 2012. Standard errors in parenthesis. \* $p<0.10$ ; \*\* $p<0.05$ ; \*\*\* $p<0.01$ .

#### 4. Impact on medical measures<sup>8</sup>

The impact of the intervention on health was also assessed using various medical measures based on patient-reported outcomes (PROs). Despite being based on patient's own evaluation, PROs are considered important for the evaluation of a medical treatment due to the difficulty in measuring conditions known only to the patients (e.g. functional status). The PROs used in this study are the Short Form Health Survey (SF-8) and the World Health Organisation Disability Assessment Schedule II (WHODAS II) (see Appendix, Tables A7 and A8, for the full questionnaires). The SF-8 is a health-related quality of life instrument composed of eight questions assessing the physical and emotional health of the patients in the last four weeks. Two questions of the SF-8 are particularly related to mobility difficulties, and are discussed in more detail in the following analysis.<sup>9</sup> The WHODAS II is an indicator developed by the World Health Organisation to assess the physical and emotional consequences of disability. Two of the twelve questions on the WHODAS specifically ask about

<sup>8</sup> As the focus of the paper is hedonic adaptation, we present only the summary results of the medical intervention. A more detailed analysis is provided in a separate paper (see Barazzetta et al., 2015).

<sup>9</sup> The two questions on physical health on the SF-8 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 were each scored out of 100, higher values representing better health. Our physical health variable therefore can range 0-200.

mobility. We consider these two questions separately as well as the aggregate 12-item schedule.<sup>10</sup> The WHODAS assessment was conducted in the first and last waves; the SF-8 assessment was conducted in all four waves.

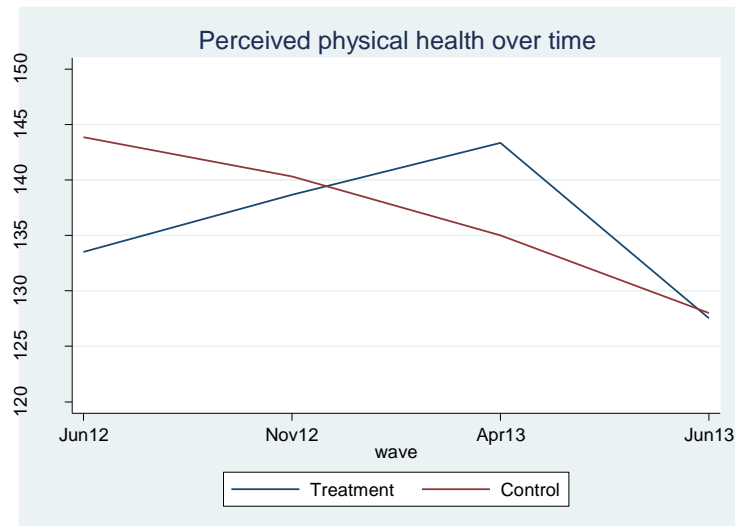
**Table 4 - Diff-in-diff estimates of the treatment impact on patient-reported outcomes.**

	Treatment		Control		Diff-in-Diff	
	June 2012	June 2013	June 2012	June 2013	June '12 - June '13	
Severity of disability <sup>a</sup> – mobility	6.44 (0.22)	6.07 (0.18)	6.19 (0.34)	6.60 (0.25)	-0.781**	(0.39)
Severity of disability <sup>a</sup> – aggregate	24.53 (0.77)	23.77 (0.56)	23.56 (1.15)	24.20 (0.84)	-1.401	(1.41)
Physical health <sup>b</sup>	133.50 (3.88)	127.52 (3.42)	143.85 (4.80)	128.00 (5.04)	9.865	(7.37)

Notes: a) Severity of disability is measured through the WHODAS II; its mobility component refers to the two questions on mobility only. The mobility component score can range 2-10; severity of disability in aggregate can range 12-60; higher values indicate more severity. b) Physical health is measured by the SF8 questionnaire, sum of questions 2 and 3. Its total score ranges 0-200 with higher values indicating better health. \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

Table 4 reports the diff-in-diff estimates of the effect of the treatment on the patient-reported outcomes for the overall sample, comparing responses in June 2012 with those in June 2013. Results for the polio group are provided in Appendix, Table A9. The results show a significant treatment effect on mobility as perceived by the patients as measured by WHODAS II (lower values indicate lower impairment). The estimated treatment effect of 0.78 is non-trivial, given that the score for this indicator ranges from 2 to 10 and corresponds to a Cohen’s d effect size of 0.3. The treatment effects for the total WHODAS II severity of disability and the SF-8 assessment of physical health are of the right signs, but statistically insignificant. Figure 3 shows the mean changes in perceived physical health for the treatment and control groups over time. The baseline values for the two groups are somewhat different, but not significantly so (see Table A4). We observe an improvement in physical health for the treatment group up to ten months after the intervention. In April 2013, the diff-in-diff estimate of the treatment effect on physical health is significant at the 1% level (p-value=0.005). However, the effect disappears in June 2013. According to the self-assessment measure, the treatment seems to have an effect for only the first 10 months. For the control group, we observe instead a continuous worsening in the physical health as perceived by the patients.

<sup>10</sup> We use the 12-item version of WHODAS II. The two items on mobility in the WHODAS II are: *In the last 30 days, how much difficulty did you have in: (1) standing for long periods such as 30 minutes?; and (2) walking a long distance such as a kilometre (or equivalent)?* Patients score the level of difficulty they have in performing a certain activity on a 5-pt scale 1(=No difficulty; 5=Extreme difficulty).



**Figure 3 - Average perceived physical health of treatment and control group over time, full sample.**

There can be two possible explanations for this finding. One explanation is that objectively the treatment effect does not endure. Patients may experience an improvement in their mobility for a few months after receiving the equipment, but later on, without any new intervention, the effect of the treatment disappears. This could be due to deterioration in the equipment, a change in the patient’s medical condition that requires a different or new intervention, or both. The second explanation may be due to a form of adaption, similar to that for subjective well-being. Empirical evidence from the medical literature using PROs shows that often an improvement in the clinical measures does not correspond to an improvement in the patients’ own evaluations of their conditions. The treatment itself can cause 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 conceptualise their quality of life (“reconceptualization”) (see e.g. Schwartz et al., 2007, Schwartz et al., 2013). The mechanisms that cause a response shift include coping, social comparison, and/or reframe of expectations or goals, similarly to the phenomenon of hedonic adaptation.

As with SWB, we can explore how patient-reported outcomes varied according to improvements in the objective mobility of patients. In terms of the objective medical conditions, we cannot rely on the diff-in-diff estimations because information on the pre-treatment levels of the control group were not available in the second year. The severity of disability fell for patients who experienced an improvement in objective mobility (see Table 5). Treated patients whose TUG improved by at least 1.6 seconds also experienced an improvement in the perception of the severity of their disability measured by the WHODAS II, especially in the mobility component. For those

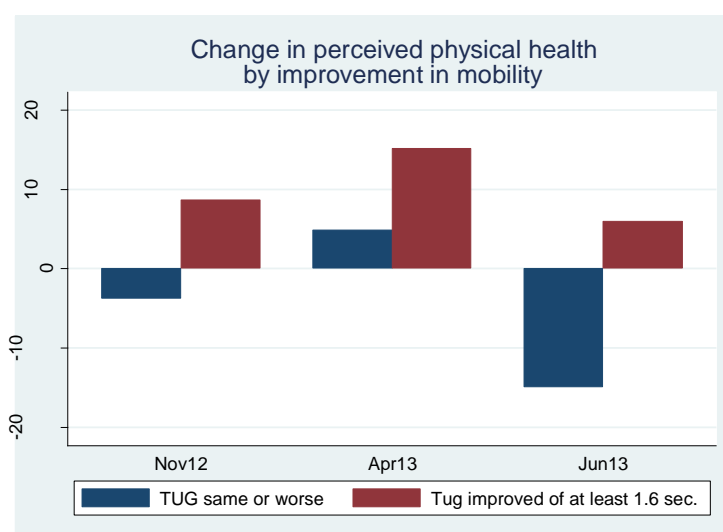
whose TUG has not improved, we find no impact on the severity of disability, while a significant negative effect on perceived physical health.

**Table 5 - Mean (median) change in patient-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 by at least 1.6 seconds		TUG did not improve by at least 1.6 seconds	
	Mean	Median	Mean	Median
Severity of disability <sup>a</sup> -mobility	-1.1**	(-1.0)	0.1	(0.0)
Severity of disability <sup>a</sup> – aggregate	-3.8*	(-2.0)	1.0	(1.0)
Physical health <sup>b</sup>	5.9	(0.0)	-13.4**	(-10.0)

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 health is measured by the SF8 questionnaire, sum of questions 2 and 3. Its total score ranges 0-200 with higher values indicating 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.

Figure 4 shows the pattern of perceived physical health over time according to the mobility improvement of treated patients. Those who one year later experience a clinical improvement in their mobility (red bars in Figure 4) report a much higher increase in their physical health over time compared to the patients who did not experience a similar improvement (blue bars). This suggests that the perceived physical health measure is initially reflecting improvements in the objective measures. However, the improvement in perceived physical health does not endure. For the patients whose mobility has improved, the change in the perceived physical health reaches its maximum in April 2013, but by June 2013 the difference with the pre-treatment level is instead very small. The patients whose mobility has not improved report a large decrease in their physical health after one year.



**Figure 4 - Change in physical health over time by improvement in mobility. Data refer to treatment group only. Perceived physical health measured by sum of questions 2 and 3 of SF8. Mobility improvement measured by performance on Timed Up and Go (TUG) from June 2012 to June 2013. Changes are calculated relative to pre-treatment baseline values (June 2012).**



Comparing the patterns of life satisfaction and perceived physical health (Figures 2 and 4), we see that for the patients whose mobility has improved 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 is in June 2013. The fact that in both cases the effect disappears in one year, despite the improvement in their objective conditions, seems best explained by process of adaptation.

## 5. Robustness checks

### 5.1. Instrumental variable approach

We further check the robustness of our results using an instrumental variable approach with the date of appointment as the instrument. As explained in section 2, those who randomly showed up at the hospital were also divided between treatment and control groups. However, the probability of being assigned to the control group was higher the closer the patient arrived to the end of week 2 of the intervention. With the medical team having left at the end of week 2, patients who randomly arrived in week 3 were all assigned to the control group. For these non-invited patients, the probability of receiving the treatment depended thus in part on the date of arrival to the hospital. In order to control for this difference, we replicate the analyses using that date of arrival to the clinic as the instrument for the treatment dummy. The date is directly linked to the treatment dummy, but not to the final outcomes. The results of the instrumental variable approach are displayed in Table 6.

**Table 6 – Instrumental variable estimates of treatment effect on life satisfaction**

	Total sample	Polio
Treatment effect in Nov 2012	0.268** (0.1354)	0.400*** (0.1509)
Treatment effect in Apr 2013	0.104 (0.1332)	0.207 (0.1509)
Treatment effect in Jun 2013	-0.004 (0.1508)	0.078 (0.1509)
November12	0.128 (0.1068)	0.067 (0.1083)
April13	0.251** (0.1008)	0.156 (0.1083)
June13	0.053 (0.1155)	-0.001 (0.1083)
<i>Instrument:</i>		
<i>Date of arrival to the clinic*wave</i>	-0.087***	-0.097***
Time effects	Yes	Yes
Individual Fixed-effects	Yes	Yes
<i>N</i>	770	504
<i>R</i> <sup>2</sup>	0.13	0.14
F-stat	120.13	135.26
Endogen. test (p-value)	0.17	0.42

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 treatment effect in each wave is instrumented by interacting the date of arrival to the clinic with the time effects. The effect of the instrument on the probability of receiving the treatment is the same for all waves so we report in Table 6 only one coefficient of the instrument for the three first-stage equations. The instrument is significant and not weak. Instrumenting the treatment variable, the treatment effect in November 2012 appears now significant also for the full sample (column 1). For the group of polio patients (column 2), the instrumental variable approach confirms our previous findings.

### **5.2. Intention-To-Treat analysis**

As we mentioned in the project description, attrition was an issue, especially in the last wave. Despite the finding that attrition does not depend on specific characteristics of the patients and the randomization still holds after the attrition, it is a concern that we do not have information on the medical conditions and SWB of the patients who dropped out of the project. It could be possible that these patients exited the sample for reasons which are independent of the project causing random attrition. It could be the case, however, that some patients exited the project because the treatment was successful and so their perception was they did not need any further medical care; or, vice versa, because the treatment failed or were disappointed by the outcomes and not willing to participate further. In order to take into account these possible scenarios, we replicate the estimates through an ITT analysis, where we assign to the non-compliers, whose outcomes are not observed, a best and a worst scenario. Namely, we compare the results for the balanced sample observed in all the four waves, with the results imputing the missing values of life satisfaction of patients' who exited the project with the best possible value (1, i.e. life satisfaction equal to or higher than 3) and with the worst value (zero). We also control for patients' baseline characteristics, i.e. gender, age, marital status, job status, household size, education, severity of disability.<sup>11</sup> The ITT analyses confirm our findings (see Table 7). Polio patients are those experiencing a significant increase in their life satisfaction four months after the intervention, but the effect does not last.

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<sup>11</sup> Due to missing values in the control variables, the sample size is lower than the fixed effect models. This is also the reason for which we excluded household income from the controls, due to its large amount of missing values. The analyses including income give the same results.

**Table 7 – Intention-to-Treat analysis**

	Balanced sample		Worst scenario		Best scenario	
	Full sample	Polio	Full sample	Polio	Full sample	Polio
Treatment*Nov '12	0.089 (0.0709)	0.197** (0.0766)	0.063 (0.0599)	0.120* (0.0656)	0.063 (0.0598)	0.121* (0.0655)
Treatment*Apr '13	0.043 (0.0682)	0.051 (0.0759)	0.033 (0.0551)	0.039 (0.0631)	0.033 (0.0552)	0.040 (0.0631)
Treatment*Jun '13	0.116 (0.0803)	0.135 (0.0928)	0.117 (0.0720)	0.124 (0.0858)	0.108 (0.0722)	0.136 (0.0855)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	660	452	974	656	974	656
<i>R</i> <sup>2</sup>	0.17	0.17	0.14	0.12	0.14	0.12

*Notes: Dependent variable: Dummy for life satisfaction* $\geq 3$  *Omitted category: June 2012. Standard errors in parenthesis. \* $p < 0.10$  \*\* $p < 0.05$  \*\*\* $p < 0.01$ . Controls (baseline levels): age, gender, education, marital status, job status, hh size, severity of disability.*

The analysis distinguishing the sample by the improvement in mobility (Table 8) again confirms the large significant effect of the treatment ten months after the intervention (April 2013) for the patients' whose mobility improved. This effect disappears in one year for the polio patients, except in the best scenario. However, in June 2013 we observe now a negative effect for the full sample whose mobility improved, with the exception of the best scenario, and a positive one for the patients whose mobility did not improve. These results, which appear counterintuitive, could be explained in terms of expectations for being visited again in June 2013 for those whose mobility did not improve, and a strong adaptation effect for those whose mobility improved. In June 2013 every patient who was treated in the year before was reassessed and the orthotic equipment adjusted when necessary, which could have raised expectations of an improvement in the patients whose mobility did not improve in the first stage. The patients who appear to have benefitted in the first intervention did not instead receive any new equipment or adjustment, which could have made them disappointed explaining the negative effect in June 2013.<sup>12</sup>

<sup>12</sup> This effect is driven by the subsample of non-polio patients.

**Table 8 – Intention-to-Treat analysis distinguishing by the improvement in mobility**

	Balanced sample		Worst scenario		Best scenario	
	Full sample	Polio	Full sample	Polio	Full sample	Polio
Treatment*Nov '12	0.080 (0.0789)	0.147* (0.0856)	0.059 (0.0620)	0.105 (0.0688)	0.084 (0.0665)	0.160** (0.0713)
Treatment*Apr '13	0.017 (0.0801)	0.009 (0.0878)	-0.004 (0.0588)	0.011 (0.0671)	-0.039 (0.0676)	-0.017 (0.0754)
Treatment*Jun '13	0.153* (0.0897)	0.057 (0.1029)	0.161** (0.0764)	0.109 (0.0897)	0.150* (0.0790)	0.082 (0.0931)
Treat*Nov '12*mobility improved	-0.034 (0.0820)	0.053 (0.0637)	0.014 (0.0747)	0.128** (0.0499)	-0.038 (0.0593)	-0.074 (0.0667)
Treat*Apr '13* mobility improved	0.166** (0.0659)	0.190*** (0.0655)	0.163*** (0.0554)	0.177*** (0.0507)	0.132** (0.0607)	0.124* (0.0705)
Treat*Jun '13* mobility improved	-0.234** (0.1002)	0.053 (0.1373)	-0.169* (0.0935)	0.074 (0.1300)	-0.115 (0.0848)	0.176* (0.1045)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	596	412	847	576	847	576
<i>R</i> <sup>2</sup>	0.18	0.18	0.15	0.15	0.15	0.15

Notes: Dependent variable: Dummy for life satisfaction  $\geq 3$ . Omitted category: June 2012. Standard errors in parenthesis. \* $p < 0.10$  \*\* $p < 0.05$  \*\*\* $p < 0.01$ . Controls (baseline levels): age, gender, education, marital status, job status, hh size, severity of disability.

## 6. Changes in patients' reference levels: aspirations and expectations

Accounts of the process of adaptation frequently refer to changes in people's reference levels. In the survey, questions on aspirations were asked with respect to levels of 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. It is an ordinal variable taking five values of household income per month. The range of possible answers goes from less than 50,000 UGX (about \$19) to more than 200,000 UGX (about \$76). In June 2012 most of the respondents both in the treatment and in the control group choose the highest category. After one year, we observe an increase in the aspirations for the overall treatment group and polio patients. The increase in aspirations for both the total sample and polio group is significant at the 10% level. A decrease in aspirations is found instead for the control group, although it is not significant (see Figure A2 in the Appendix).

In terms of expectations, patients were 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. The question was asked to each patient as they left the clinic, in order to capture the effect of the intervention on their expectations. At the beginning of the project the percentage of respondents expecting their life to improve in June 2012 is much higher for the treatment group than for the control group, statistically significant at the 1% level ( $p$ -value=0.005). 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, expectations are now lower than a year before, and the two groups are not statistically different (see Figure A3).

Within the treatment group, we find that the polio patients had significantly higher expectations than the non-polio patients. A possible explanation for this could be the length of disability: polio patients were more likely to have had their disability for a longer time period than those who became disabled more recently due to accidents or other illnesses. The majority of the patients affected by polio have been disabled since childhood but have never received any medical attention, which could explain their high expectations from the medical treatment. This difference is due to a higher percentage of polio patients answering that they expected 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 9). This could help to explain the larger significant increase in life satisfaction found for this group in November 2012 compared to the rest of the treatment group.

**Table 9 - 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>	3.8	3.8	5.7	75.5	11.3

**7. Conclusions**

Using a randomised controlled trial we evaluated the effect of the provision of medical equipment on subjective well-being for a sample of Ugandan adults with physical disabilities. All the patients participating in the project had lower limb disabilities, mostly due to polio. The treated sample were provided with orthotic technology for their disability. An extensive questionnaire and a medical assessment were 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 scaled-down 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 patient-reported outcomes, significantly increasing the perception of their mobility one year later 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. However, the perceived improvement disappeared after one year.

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 three for the polio patients in November 2012; second, the treatment had a positive significant effect for the patients whose mobility improved, but only in the second wave (April 2013). The results are robust to the use of an instrumental variable approach and ITT analysis.

The pattern of life satisfaction over the four waves appears very similar to that found for the perceived physical health. For the patients treated whose mobility improved, we observe an increase in both the satisfaction and subjective medical measure up to April 2013, and a decrease in June 2013 close to the pre-treatment level. These similar results reinforce the hypothesis that people adapt over time to their new conditions due to a shift in their values or reference levels. Our analysis of reference levels revealed 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. 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.

This study is the first attempt to explore the phenomenon on adaptation in the context of a randomised controlled trial. Following the patients for one year after the medical intervention, we were able to explore the changes in objective and subjective well-being on the patients, together with the shift in their reference levels. Future research is needed to study the pattern of individuals' subjective well-being after exogenous events, and the role of reference levels in causing the discrepancy between objective and subjective well-being.

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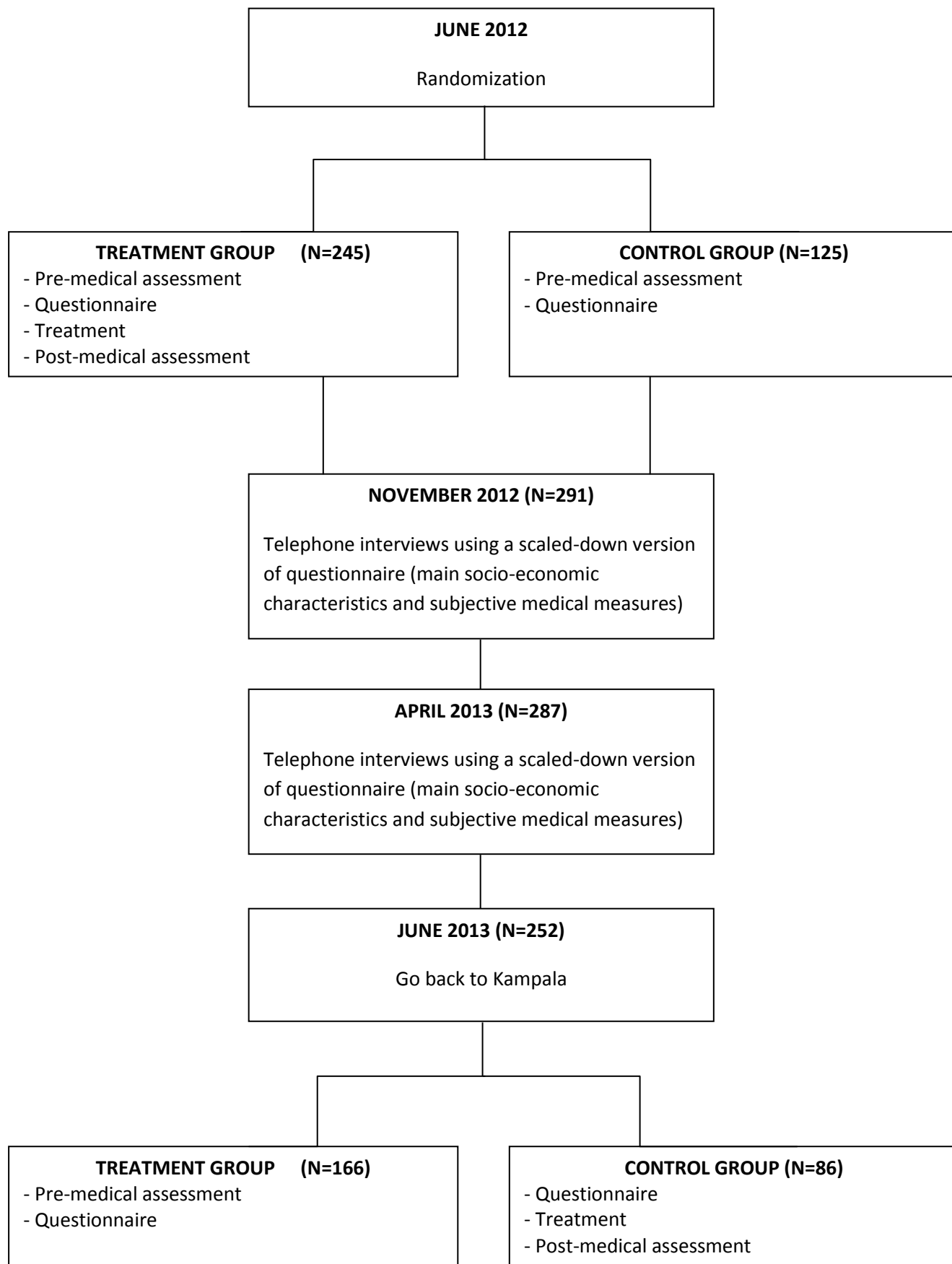
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## APPENDIX

Table A1 - Timeline of the project



**Table A2 – Summary statistics in June 2012**

Variable	mean	sd	min	max
<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
job status	2	0.7	1	3
marital status	2.9	1.8	1	6
hh size	5.1	2.4	1	12
no. children	2.2	2.0	0	9
<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
severity of disability <sup>a</sup>	24.1	7.6	12	56
severity of disability_mobility <sup>a</sup>	6.5	2.3	2	10
physical and emotional health <sup>b</sup>	528.4	121.8	160	780
physical health <sup>b</sup>	133.9	39.1	40	200
length of disability	29.6	16	0	73.3
<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 aspirations	4.6	0.8	1	5
expectations about life	3.9	0.7	1	5
expectations about health	3.8	0.8	1	5

Notes: a) Severity of disability and its mobility component are measured by WHODAS II; total score ranges 12-60 and its mobility component 2-10; higher values indicate more severity. b) Physical and emotional health is measured by SF8; total score ranges 0-800 and its physical component 0-200; higher values indicate better health.

**Table A3 – 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 A4 - Randomization**

Variable	mean (T)	mean (C)	Ttest (p-value)
<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
job status	2.0	2.0	0.652
marital status	2.9	3.1	0.280
hh size	5.1	5.3	0.352
no. children	2.2	2.1	0.760
<b>Medical data</b>			
TUG	13.1	13.0	0.892
10M	12.3	13.6	0.179
severity of disability <sup>a</sup>	24.3	23.8	0.564
severity of disability_mobility <sup>a</sup>	6.5	6.4	0.694
physical and emotional health <sup>b</sup>	527.0	531.5	0.762
physical health <sup>b</sup>	131.6	138.8	0.123
length of disability	28.7	31.6	0.126
<b>Subjective well-being</b>			
life satisfacion	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 and expectations</b>			
income aspirations	4.6	4.7	0.252

Notes: a) Severity of disability and its mobility component are measured by WHODAS II; total score ranges 12-60 and its mobility component 2-10; higher values indicate more severity. b) Physical and emotional health is measured by SF8; total score ranges 0-800 and its physical component 0-200; higher values indicate better health.

**Table A5 – 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	Available in all follow-ups	Ttest (p-value)
<b>Socio-economic characteristics</b>			
age	39	42	0.078
years of schooling	9.0	9.0	0.922
hh income	174748	167223	0.492
job status	2.0	2.0	0.562
marital status	2.9	3.0	0.650
hh size	5.1	5.1	0.990
no. children	2.3	2.0	0.114
<b>Medical data</b>			
TUG	12.5	13.6	0.224
10M	12.3	13.1	0.342
severity of disability <sup>a</sup>	23.8	24.2	0.602
severity of disability_mobility <sup>a</sup>	6.6	6.4	0.318
physical and emotional health <sup>b</sup>	522.7	533.4	0.431
physical health <sup>b</sup>	130.8	136.6	0.185
length of disability	29.2	31.1	0.306
<b>Subjective well-being</b>			
life satisfacion	3.5	3.3	0.329
happy	3.8	3.8	0.909
angry	2.8	2.6	0.209
sad	2.5	2.5	0.560
worried	3.2	3.2	0.945
perceived quality of life	2.8	2.9	0.670
<b>Aspirations and expectations</b>			
income aspirations	4.6	4.6	0.708
expectations about life	3.9	3.9	0.692

*Notes: a) Severity of disability and its mobility component are measured by WHODAS II; total score ranges 12-60 and its mobility component 2-10; higher values indicate more severity. b) Physical and emotional health is measured by SF8; total score ranges 0-800 and its physical component 0-200; higher values indicate better health.*

**Table A6 – Randomization after attrition (N=197)**

	mean (T)	mean (C)	Ttest (p-value)
<b>Socio-economic characteristics</b>			
age	41	42	0.630
years of schooling	9.1	8.7	0.544
hh income	170850	159121	0.449
job status	2.0	2.0	0.957
marital status	2.9	3.1	0.526
hh size	5.1	5.3	0.654
no. children	2.3	2.3	0.891
<b>Medical data</b>			
TUG	13.5	13.8	0.847
10M	12.6	14.3	0.240
severity of disability <sup>a</sup>	24.5	23.6	0.471
severity of disability_mobility <sup>a</sup>	6.4	6.2	0.528
physical and emotional health <sup>b</sup>	534.2	531.5	0.900
physical health <sup>b</sup>	133.5	143.8	0.119
length of disability	29.4	35.8	0.031
<b>Subjective well-being</b>			
life satisfacion	3.3	3.4	0.753
happy	3.8	3.6	0.097
angry	2.6	2.7	0.839
sad	2.4	2.6	0.329
worried	3.2	3.3	0.386
perceived quality of life	2.9	2.9	0.725
<b>Aspirations and expectations</b>			
income aspirations	4.6	4.7	0.328

Notes: a) Severity of disability and its mobility component are measured by WHODAS II; total score ranges 12-60 and its mobility component 2-10; higher values indicate more severity. b) Physical and emotional health is measured by SF8; total score ranges 0-800 and its physical component 0-200; higher values indicate better health.

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**Table A7 – Physical and emotional health (SF-8)**

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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?
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**Table A8– 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?
-



**Table A9 – Diff-in-diff estimates of the treatment impact on patient-reported outcomes – Polio sample**

	Treatment		Control		Diff-in-Diff	
	June 2012	June 2013	June 2012	June 2013	June '12 - June '13	
Severity of disability_mobility <sup>a</sup>	6.17 (0.27)	5.87 (0.24)	6.16 (0.39)	6.36 (0.28)	-0.508	(0.44)
Severity of disability <sup>a</sup>	22.73 (0.76)	22.54 (0.68)	22.61 (1.16)	23.00 (0.84)	-0.575	(1.52)
Physical health <sup>b</sup>	146.03 (4.30)	136.71 (4.36)	147.73 (5.02)	131.92 (5.44)	6.494	(7.97)

Notes: 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 health is measured by the SF8 questionnaire, sum of questions 2 and 3. Its total score ranges 0-200, with higher values indicating better health. \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

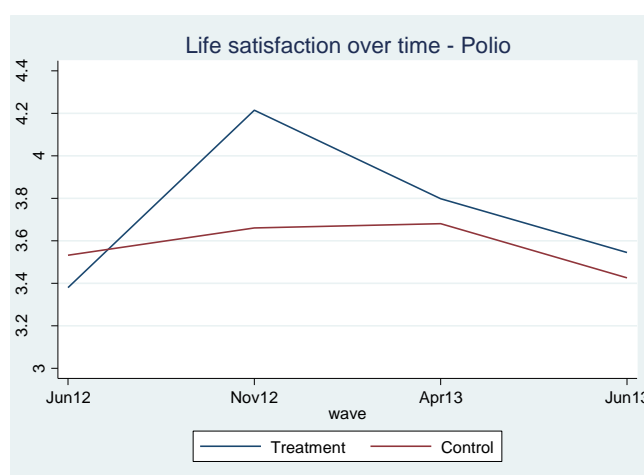
**Table A10 - Diff-in-Diff estimates of the treatment impact on life satisfaction in the three waves after the intervention for total sample (Panel A) and subgroup of polio patients (Panel B).**

	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)

**Panel B) - Polio (N=126)**

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



**Figure A1 – Average life satisfaction of treatment and control group over time, Polio sub-sample**

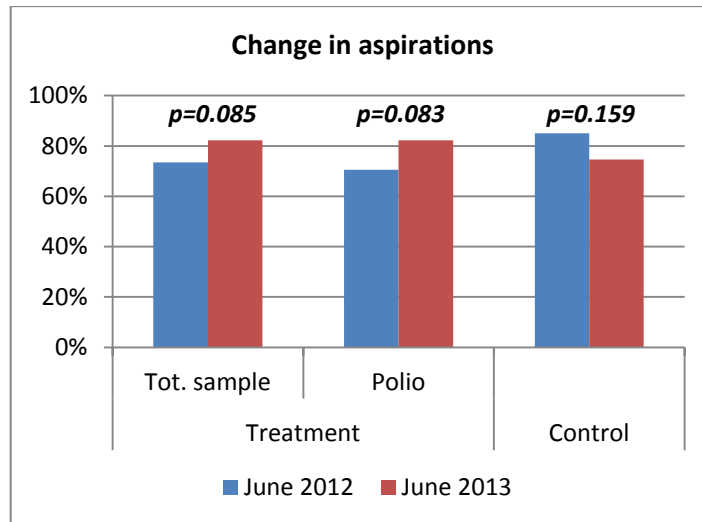


Figure A2 - Frequencies of patients choosing the highest category of income aspirations (income per month sufficient to live well) by treatment and control in June 2012 and June 2013. The treatment group has been further split considering only the polio subgroup.

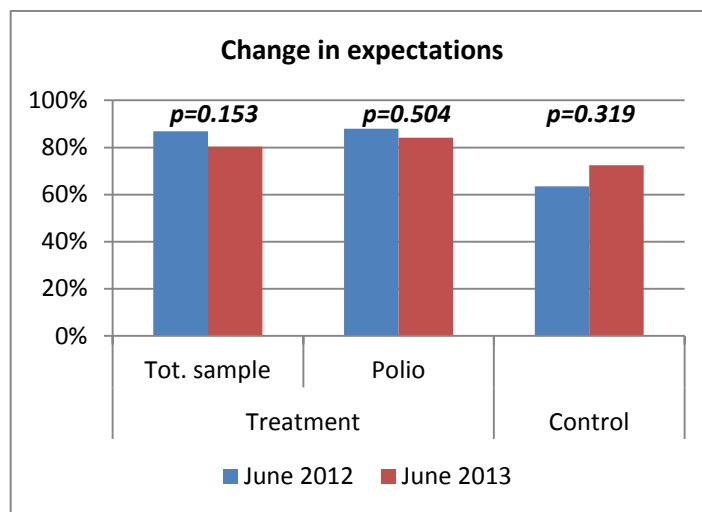


Figure A3 - Frequencies of patients reporting to expect their life to improve or strongly improve by treatment and control in June 2012 and June 2013. The treatment group has been further split considering only the polio subgroup.