

# Master thesis on adaptation

Anne de Hond

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## 1 Introduction

An accurate measure of the level of adaptation elicited by certain (chronic) health states can in practice be highly relevant. For example, the matter of adaptation has been of vital importance to the debate on health state evaluation affecting allocation of health care resources (Menzel, Dolan, Richardson & Olsen, 2002; Versteegh & Brouwer, 2016). The psychological processes underlying adaptation to positive or negative life events have captivated scientists and scholars for centuries. The evolutionary driven ability to adjust to new circumstances seems inherent to human behaviour, yet no empirical evidence to date provides unambiguous support regarding the occurrence or level of adaptation.

This apparent contradiction should not be surprising, since the study of adaptation is associated with many methodological complications. For example, many of the empirical findings are based on cross-sectional data, but in order to study the development of adaptation over time, panel data is required. Another complication arises when one wishes to measure adaptation to a particularly lamentable life event: chronic illness. The deterioration associated with these diseases when they are progressive (as is the case for rheumatoid arthritis and almost all cancers) complicate the measurement of adaptation, since the progressive debilitation is thought to have a negative effect on health state in contrast to adaptation (Frederick & Loewenstein, 1999). To quote Frederick and Loewenstein: “the hedonic deterioration that is commonly observed does not provide evidence that adaptive processes are not occurring - only that they are not occurring fast enough to keep pace with the progression of the disease” (1999, p. 312).

It is the aim of this thesis to study the extent to which adaptation occurs in several chronic (progressive) health states. In order to do so, the effects of progressive debilitation ought to be separated from those of potential adaptation.

This proposal is build up as follows. Section 2 is concerned with a literature review on adaptation theory as well as an overview of the most important empirical findings on adaptation (to illness) and the methodological issues that have arisen. Section 3 provides a preliminary overview of the data from the SHARE project and the last section contains the proposed methods.

## 2 Adaptation theory and empirical research

### 2.1 Hedonic adaptation

While the academic study of adaptation is stemming from halfway the 20th century, the topic of relative happiness and wellbeing goes at least as far back as the Epicurean and Stoic philosophers of ancient Greece. Moreover, the idea that human levels of happiness return to a relatively stable baseline after experiencing major positive or negative (life) events was subsequently picked up by writers like St Augustine in the 1600's and finally evolved into psychological theories of adaptation in the 20th century. Hence, the construct of adaptation is not exactly new, but the empirical evidence for the occurrence of adaptation is ambiguous and the extent of the adaptation is not well studied and highly debated (Oswald & Powdthavee, 2008; Frederick & Loewenstein, 1999). A review of the empirical evidence for adaptation follows below, but first a definition of adaptation will be given and expanded upon.

This thesis is concerned with what Frederick and Loewenstein (1999) have referred to as *hedonic adaptation*. Frederick and Loewenstein describe hedonic adaptation as “a reduction in the affective intensity of favorable and unfavorable circumstances” (1999, p.302). They identify two main functions of adaptation. First of all, adaptation protects the individual by lowering the internal impact of external stimuli. Furthermore, adaptation enhances perception by elevating the signal value produced by departures from the baseline level. A physiological example of this latter function is the adaptation our vision makes upon entering a dark environment. At first, we will not be able to differentiate subtle differences in hues, but after adapting to the low level of light we will be able to identify shapes and sizes. These two functions are also believed to govern hedonic states (hunger, thirst, pain etc.) leading to hedonic adaptation. Hedonic states are crucial as they alert our attention on pressing needs and avert us from engaging in dangerous activities. Nevertheless, prolonged exposure to a strong hedonic state (stress for example), is believed to have detrimental physiological and psychological effects (Sapolsky, 1999). Hence, the ability to adapt may serve a protective function here. Additionally, if an aversive state is persistent, the perception enhancing function of hedonic adaptation might redirect motivation to productive changes in one's situation as opposed to lingering attempts to change the unchangeable. Thus, “adaptation provides the serenity to accept the things one cannot change, the courage to change the things one can, and the wisdom to know the difference” (Frederick & Loewenstein, 1999, p.303).

A more extensive operationalization of the processes that could lead to these productive changes is provided by Menzel, Dolan, Richardson and Olsen (2002). They identify the following eight elements. Firstly, people may simply acquire greater skills to achieve their exciting goals without adjusting them or the activities required to attain them. This is referred to as skill enhancement. Secondly, without changing their goals, people may change the activities enabling them to reach their goals, which is referred to as activity adjustment. Additionally, the goals themselves could be adjusted indicating substantive goal adjustment. Also, people might alter their conception of health. This means that a person adopts a different definition of health that is more

productive in thinking about their state of health. For example, the humanistic conception of health construes that health should be evaluated in terms of one's ability to adapt to the problems in life, not by the biostatistical nature of the problems themselves (Nordenfelt, 1993). These first four elements were deemed by Menzel et al. to be admirable achievements in the light of the unfortunate circumstances in which they occurred.

The next three elements of adaptation are described as regretful (yet aiding the adaptation) and Versteegh and Brouwer point out that they are perception biases than an "adjustment of oneself" per se (2016, p.70). First of all, cognitive denial of one's functional health leads to a factually mistaken self-evaluation of health. Another cognitive deficiency classified as an element of adaptation is the suppressed recognition of full health, meaning that there is no acknowledgment of what it is like to be in full health and what type of possibilities that allows for. Thirdly, people can change their expectations regarding what level of achievement for a certain goal would be acceptable. These lowered expectations appear to be the least desirable out of all elements of adaptation. The last element is heightened stoicism and it is not deemed particularly admirable nor regrettable. Somewhat related to lowering expectations, heightened stoicism states that people come to evaluate their happiness by means of what is achievable. Hence, they realize that not coming as close to reaching their goals as they might have done previously does not have to impede their happiness.

## **2.2 Empirical research on adaptation**

The extent to which adaptation occurs is a highly debated issue in the literature, with some researchers claiming to have found no adaptation at all and others a considerable amount. Of course, whether or not adaptation is present might be highly reliant on the nature of the event that is thought to be driving the adaptive processes. With this in mind, a review will follow on the most important empirical findings on adaptation to date, focusing on adaptation to disability and chronic illness.

Adaptation has mainly been studied within the field of psychology and is largely disregarded by the economics discipline (Oswald & Powdthavee, 2008). The most important reason for the absence of the notion of adaptation in the economics framework is that economists usually consider utility functions that do not take adaptation into account. This dichotomy between the two social sciences is remarkable, and in the current context of adaptation to disability regrettable, since it might be a highly relevant factor in determining one's quality of life.

Within the psychological literature, the presence of adaptation is often universally accepted (Diener et al., 1999). However, there only appears to be a small set of high-quality studies that have actually empirically examined adaptation (Frederick & Loewenstein, 1999). The most famous study by Brickman, Coates and Janoff-Bullman (1978) is easily misconstrued as proof that paraplegics are as happy as people with no functional limitations. To the contrary, Brickman et al. found that paraplegics were significantly less happy than the control group, but scored above the midpoint of the 5-point scale. Hence, they argue that the accident victims are happier than what might have been expected given their circumstances. Other researchers have

come to similar conclusions. Tyc (1992) found that pediatric amputees seem to adjust remarkably well considering their limitations, with limb salvage patients not reporting a higher quality of life than amputees. Note that the definition of a “well-adjusted” individual varies wildly across the different studies discussed by Tyc, which makes the true psychosocial status of the subjects hard to compare.

Since the study by Tyc (1992) did not have a control group available, only tentative conclusions can be drawn regarding the quality of life of these individuals in comparison with the public norm (as was done for the Brickman et al. results). A study by Dijkers (1997) does allow for this comparison with the general public. Dijkers performed a cross-sectional meta analysis for people with spinal cord injuries and found that affected individuals reported a lower subjective well-being than able-bodied individuals<sup>1</sup>.

## 2.3 Methodological issues

It is important to point out several methodological limitations applying to most of the aforementioned studies. First of all, since we are interested in an adaptive process that is thought to develop over time, panel data is required. However, most studies investigating adaptation are cross-sectional and therefore only patients’ current level of well being can be compared with that of a healthy sample (Lucas, 2007). Moreover, most studies on adaptation are not prospective, meaning that they do not include the onset of the illness or trauma for the patients in their sample. This is important since it allows us to compare the premorbid levels of well being with those after the debilitating event has occurred. Even though disability due to chronic illness is thought to be largely exogenous (Oswald & Powdthavee, 2008), some selection bias might still be present depending on the disability. For example, even before the injury had occurred, burn victims were more prone to have developed psychological disorders (Patterson et al., 1993) Hence, due to the two issues mentioned above, cross-sectional data might be inappropriate for measuring adaptation. Moreover, a panel data study allows us to assess the development of adaptation over time for different individuals. A final methodological issue is the involvement of a stimulus that is most likely not constant (Frederick & Loewenstein, 1999). Specifically, it is probable that chronic illness will deteriorate over time, which leads to an opposite effect on well being than adaptation. Hence, additionally to measuring the onset of the illness, a variable should be present to measure the intensity of the illness as well.

## 3 Data

The data used for this study is obtained from the SHARE (Survey of Health, Ageing and Retirement in Europe) database. It consists of a self-completed survey whose

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<sup>1</sup>Dijkers did not control for other factors that determine quality of life, particularly socioeconomic status, gender and age. However, he claims that the results are consistent enough to conclude that on average a person with spinal cord injury has a lower quality of life compared to somebody without injury.

“ultimate goal is to provide high-quality micro-level panel data of economic, social and health factors that accompany and influence ageing processes at the individual and societal levels” (Börsch-Supan et al., 2013, p. 993). The subjects are sampled from 18 European countries and Israel, with the eligibility of the subjects based on their age. Subjects of fifty years and over at the time of sampling were asked to participate in the SHARE project, whereas their spouse was asked to participate regardless of his or her age (SHARE Release Guide 6.0.0, 2017).

Waves 1, 2, 4, 5 and 6 are used for the current analysis <sup>2</sup>. The first wave (collected in 2004) consists of 30451 individuals, which expands to 68231 subjects in wave 6 (collected in 2015) <sup>3</sup>. The total number of subjects for the different waves is given in table 2. Individual retention from wave 1 to wave 2 lies around 69%. From wave 2 to wave 4 this is 51%, which might be due to relatively more attrition in this longer interim. The retention rates between wave 4 and 5, and 5 and 6, is approximately 67%. Descriptive statistics regarding the gender and age of the subjects over the consecutive waves are given in table 1.

In order to measure well-being two measures are used. First, a self-perceived health measure is used, where satisfaction is measured on a 5-point scale (with 1 corresponding to excellent and 5 to poor). Secondly, the CASP-12 index is used. CASP exclusively measures non-health dimensions of quality of life (Makai, Brouwer, Koopmanschap, Stolk & Nieboer, 2014), with higher scores indicating better quality of life (CASP, 2017). CASP includes questions like *“I look forward to each day”* and *“My age prevents me from doing the things I would like to”*. Again, descriptive statistics regarding both the self-perceived health and CASP measure can be found in table 1. The two measures enable a comparison of the possible effects of adaptation on self-perceived health and on the more general construct well-being.

Table 2 contains an overview of the proportion of chronically ill subjects in each wave and a subdivision displaying the types of doctor diagnosed illnesses prevalent in the sample. Whether or not somebody is suffering from a chronic illness is asked as follows: *“Some people suffer from chronic or long-term health problems. By chronic or long-term we mean it has troubled you over a period of time or is likely to affect you over a period of time. Do you have any such health problems, illness, disability or infirmity?”* It becomes clear from the table that high blood pressure or hypertension are most prevalent amongst the chronically ill subjects, with more than half having received this diagnosis.

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<sup>2</sup>DOIs: 10.6103/SHARE.w1.600, 10.6103/SHARE.w2.600, 10.6103/SHARE.w4.600, 10.6103/SHARE.w5.600, 10.6103/SHARE.w6.600, see Börsch-Supan et al. (2013) for methodological details.

<sup>3</sup>Wave 3 is excluded because it diverges too much from the other waves and does not contain the variables of interest on physical health and quality of life.

Table 1: SHARE data descriptive statistics

	Mean	Std. deviation	Min.	Max.
<i>% Female</i>				
2004	58.92			
2007	59.69			
2011	59.53			
2013	58.87			
2015	60.60			
<i>Age</i>				
2004	63.67	10.59	23	103
2007	63.53	14.69	15	105
2011	64.43	14.54	12	111
2013	64.38	16.76	22	104
2015	64.09	18.99	22	106
<i>CASP</i>				
2004	37.12	6.16	12	48
2007	36.96	6.30	12	48
2011	37.06	6.44	12	48
2013	37.95	6.25	12	48
2015	37.08	6.34	12	48
<i>Self-perceived health</i>				
2004	2.95	1.07		
2007	3.10	1.11		
2011	3.25	1.09		
2013	3.14	1.09		
2015	3.19	1.08		

Table 2: SHARE data prevalence illnesses across waves

	Waves				
	2004	2007	2011	2013	2015
Total observations	30451	37183	58202	66246	68231
% Chronically ill	48.75	48.05	52.88	50.42	52.21
% Not chronically ill	50.76	51.63	46.63	49.30	47.58
% Heart attack	25.12	25.86	25.99	22.73	21.88
% High blood pressure or hypertension	64.50	72.65	74.05	77.51	78.52
% High cholesterol	42.30	45.09	43.44	46.05	46.59
% A stroke or cerebral vascular disease	7.63	7.42	8.28	7.99	7.25
% Diabetes or high blood sugar	20.58	23.21	23.42	25.23	26.15
% Chronic lung disease	9.97	10.46	12.46	12.36	12.02
% Asthma	9.32	10.34	1.40	-	-
% Arthritis	37.92	42.84	46.07	-	-
% Osteoporosis	15.45	17.63	2.51	-	-
% Cancer or malignant tumor	10.84	8.38	9.99	11.17	8.77
% Stomach or duodenal ulcer	12.00	9.88	10.77	7.99	7.80
% Parkinson disease	1.29	1.56	1.37	1.68	1.73
% Cataracts	15.33	15.07	16.03	17.29	15.60
% Hip fracture	4.12	3.92	4.54	3.80	3.46

The number of total observations across waves and the proportion of chronically ill subjects with a subdivision regarding different diseases. Note that subjects often report having several of the illnesses outlined here.

## 4 Proposed methods

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