



## Different domains – Different time preferences?

Eskild Klausen Fredslund<sup>a,\*</sup>, Morten Raun Mørkbak<sup>b,c</sup>, Dorte Gyrd-Hansen<sup>a</sup>

<sup>a</sup> DaCHE - Danish Centre for Health Economics, Department of Public Health, University of Southern Denmark, J.B. Winsløvs vej 9 B, Odense DK-5000, Denmark

<sup>b</sup> University of Southern Denmark, Department of Business and Economics, Campusvej 55, DK-5500 Odense, Denmark

<sup>c</sup> Incentive, Holte Stationsvej 14,1, DK-2840 Holte, Denmark

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### ABSTRACT

The vast majority of studies examining the relation between time preferences and health behavior have applied a measure of preferences in the financial rather than in the health domain. Most studies find a small but significant correlation. If time preferences for health and money are not the same, this can have substantial consequences for the reliability of these results. In the present paper, we set out to examine potential differences in time preferences between the two domains – money and health.

Preferences over time were elicited using a stated preference matching method. Using a split sample design, the health domain was described in the context of back pain. Individuals were to match a certain sooner shorter period of pain relief against a later longer period of pain relief in the health domain, while the match in the financial domain was described as a match between a sooner smaller monetary reward and a larger later monetary reward. Data was collected through an online survey, distributed to a sample of members of fitness dk on the 7th of February 2016 and the 6th of March 2016 yielding a sample of 1687 members.

In the analyses we assume quasi-hyperbolic discounting which allows us to estimate both a parameter measuring present bias and a parameter measuring impatience at an individual level. Our results demonstrate remarkably similar time preference estimates for both long term discounting and present biasedness. When analyzing differences between subgroups we observe small but significant differences between time preferences for women, retirees and individuals with a longer education.

Our results shows that time preferences measured in the money and health domain in our sample are close to identical but that small differences occur in certain subgroups.

## 1. Introduction

### 1.1. Relevance

Physical exercise is a popular way to improve health and wellbeing, and a common decision faced by many individuals in the developed world is whether to work out or not.

The decision to work out is intertemporal in its nature. Working out has immediate opportunity costs in terms of leisure time forgone and working out might be tedious for some. On the other hand, the future long-term health benefits are well established in both the shorter and the long run.

One major factor influencing the actual level of physical exercise that the individual is willing to engage in here and now is the relative valuation of the present compared to the future, which in the economic literature is captured by time preferences. In the recent literature this is formalized using quasi-hyperbolic discounting to capture the time inconsistencies that we frequently observe (Laibson, 1997; O'Donoghue

and Rabin, 1999).

Time preferences, and in particular time inconsistency, may be a good predictor of poor adherence to health related behavior. Time preferences may thus represent a valuable tool for identifying individuals who need support (in the form of e.g. commitment devices) in sustaining healthy life-styles. The question that arises is, however, whether time preferences are generalizable across domains, or whether it is important to elicit domain specific preferences as predictors. Individuals may be impatient when it comes to consumption of entertainment, but patient when it comes to “consuming” future health. However, if there is little difference in time preference structures across domains, it may be an advantage to elicit time preferences in the monetary domain.

Only a few studies have to date compared time preferences within the monetary domain with time preferences expressed in the health domain. Of these, three studies suggest that time preferences are identical across these domains, and five studies indicate different degrees of disparities in time preferences across domains. Hence, the

\* Corresponding author.

E-mail address: [efredslund@health.sdu.dk](mailto:efredslund@health.sdu.dk) (E.K. Fredslund).

evidence is clearly mixed. It is, however, notable that the studies operating with the larger samples of respondents suggest that preferences do not differ. Moreover, only a single study (Bleichrodt et al., 2016) examined time preferences in the context of other intertemporal models than the discounted utility model (DUM). In this study we reiterate the question of whether time preferences are domain dependent and extend current evidence by eliciting preferences amongst a large sample of more than 1800 Danish members of a fitness center, and by examining not only potential differences in time preferences but also potential differences in time inconsistent preferences across the two domains, thus moving away from the discounted utility model.

The paper is organized as follows: In section two we present a short overview of the current literature on domain specific time preferences. The theoretical model employed in this study is described in section three followed by a presentation of the experimental setup, the data used and a brief overview of the econometrics. Section five reports the results, while section six discusses and concludes.

### 1.2. Previous evidence from the literature

The literature on domain dependent time preferences with specific focus on the health domain is limited, and exhibits mixed evidence. Table 1 presents the nine studies that to the authors' knowledge have been published to date.

Attema, Bleichrodt, L'Haridon, and Peretti-Watel (2018) used a delay sequence to measure time preferences in a representative sample of citizens in Paris, France. They included 505 subjects in the study. The subjects were presented with two options – a sooner smaller health gain or larger later health gain in the health domain and a sooner smaller monetary reward or larger later monetary reward in the monetary domain. The subjects were then to indicate how long they were willing to wait to get the better outcome. The study used lower back pain with symptoms described by the EQ-5D when measuring preferences in the health domain. The authors found median discount rates of 6.5% and 2.2% for money and health respectively.

Bleichrodt et al. (2016) used a delay sequence to measure time preferences within the two domains money and health. In the delay sequence 63 subjects were presented with two options – a sooner smaller health gain or larger later health gain in the health domain and a sooner smaller monetary reward or larger later monetary reward in the monetary domain. The subjects were then to indicate how long they were willing to wait to get the larger and better outcome. The authors concluded that there were substantial deviations from the standard exponential discounting in both domains towards the hyperbolic model, and that the deviation from the standard model is more pronounced within the health domain compared to the monetary domain.

Khwaja et al. (2007) used data from 663 individuals who participated in a survey of smoking. Respondents were asked to choose between a smaller sooner and larger later reward in the monetary domain and a matching task in the health domain. In the health question, the respondents were asked to indicate the number of healthy days in  $x$  years that would make them indifferent to 20 healthy days this year.

**Table 1**

Overview of literature on domain differences between money and health with respect to time preferences.

Source	N	Intertemporal model	Results
Attema et al. (2018)	505	Hyperbolic discounting	Larger discount rate for money than health
Cairns (1992)	29	DUM	Larger discount rate for money
Cropper et al. (1994)	3000	DUM	No differences
Chapman and Elstein (1995)	104	DUM	Low correlation between domains
Chapman and Coups (1999)	412	DUM	Small correlation between money measured time preferences and acceptance of the flu vaccination
Khwaja et al. (2007)	663	DUM	No differences
Bleichrodt et al. (2016)	63	Hyperbolic discounting	Deviation from the standard model is more pronounced within the health domain
Hardisty and Weber (2009)	90	DUM	Larger/lower discount rate for health gains/losses
Moore and Viscusi (1990)	1463	DUM	No differences

The delay  $x$  was varied. Assuming exponential discounting, the authors find no difference in time preferences between smokers and non-smokers. This holds for both the monetary and health domain.

In another study examining the correlation between time preferences and actual behavior, measured in both the monetary and the health domain, Chapman and Coups (1999) find a small correlation between money measured time preferences and acceptance of the flu vaccination but no correlation between time preferences measured in the health domain and flu vaccination – again assuming exponential discounting. There are some challenges in the study that might explain that no correlation is observed between the health domain time preferences and the acceptance of flu vaccine. The study was performed on a sample of 412 employees in a company providing flu vaccination to their employers. In this particular study, time preferences were all measured in losses – both within the monetary and the health domain. The respondents faced either a small fine now or a larger fine later or a short period with the flu now or a longer period later. In the latter scenario respondents will naturally anticipate the disutility of the flu in the future which will give them a negative utility today as they know for certain that they will get this illness spell in the future. This anticipation disutility may impact on results. That anticipation is a major driver is supported by another observation in this study: that when subjects were faced with a choice between a flu that starts out bad and gets better and a flu that starts out gently but ends badly, they prefer to “get it over with” and choose the sequence that starts out with the severe flu and ends mildly. An additional important finding is that when outcomes are framed as losses, many respondents are future biased – especially within the health domain. For the majority of the respondents (85%) two days with the flu now was exactly as bad as two days with the flu in three months.

Van der Pol and Cairns (2001) used a discrete choice experiment to measure time preferences in a health domain. A sample of 182 UK citizens were presented with an illness described by EQ-5D and asked to choose between treatment with smaller relief now or larger relief later, thus measuring time preferences in the gain domain. This study finds comparable discount rates compared to other studies.

The existing evidence on whether discounting differ by domain is clearly mixed as is also concluded in more recent reviews by Attema (2012) and Story et al. (2014).

## 2. Theoretical framework

In standard neo-classical economic theory it is assumed that individuals maximize their utility. Maximization of utility is also assumed to happen over time. That is an individual maximizes her present utility by spreading consumption of goods over time. Samuelson (1937) proposed a Discounted Utility Model (DUM), where future utility is discounted. This model captures the idea that individuals may value utility in the present more than utility derived in the future. Samuelson proposed the following value function:

$$V(x, t) = \delta^t \cdot U(x), \quad \delta = \frac{1}{1+\theta} \quad (1)$$

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