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Do people have a preference for increasing or decreasing pain? An experimental comparison of psychological and economic measures in health related decision making

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This paper investigates preferences for different health profiles, especially sequences of increasing and decreasing pain. We test conflicting predictions in terms of preferences over two painful sequences. The QALY concept relevant for the determination of different levels of health-related quality of life implies indifference, whereas behavioral theories find preferences related to ordering, following the peak-end-rule. Using an experimental design with real consequences we generate decisions about painful sequences induced by the cold pressor test. The results are compared with hypothetical choice data elicited using standard methods. We find that hypothetical methods reveal decisions in line with the peak-end-rule. However when it comes to real consequences of their decisions, subjects are on average not willing to pay for that preference.

act

Keywords: pain, peak-end-rule, willingness-to-pay

JEL classification: D8, C9

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1. Introduction

People rarely experience their health state to be constant over time. In most cases, the perceived state of health varies temporally, which is especially the case when patients undergo medical treatments. The paper investigates perception of pain and addresses the question on whether people have systematic preferences for treatments in which pain varies. Specifically, we analyze whether experimental subjects have systematic preferences for either gradually increasing or decreasing pain intensities. Because economic and behavioral literature leads to different conclusions about peoples´ preferences, we compare both strands of literature with experimental methods including real consequences. Additionally, we try to identify whether people in addition of stating a preference for one option or the other, are also willing to pay for receiving that preferred option over the alternative. We find that in contrast to behavioral studies on pain, people do not demonstrate a preference for one option when facing real consequences of their choices.

Our results are particularly important as they clarify fundamental decision situations people are confronted with when they suffer from pain. This situation can involve both the patient when choosing a treatment or medical staff when decisions concerning a treatment are taken substitutionally for the patient (Ariely 1998; Choinière u.a. 1990). As the number of pain patients is constantly rising (Breivik u.a. 2006; Dagenais, Caro & Haldeman 2008; Phillips & Harper 2011), preference-related questions are highly relevant. Our findings shed light on the preference structure for sequences with increasing or decreasing pain levels using real pain. This means that participants make a preference decision on painful sequences and afterwards the corresponding pain sequence is induced with the cold pressor test (CPT) (Hines & Brown 1936). By means of this decision making situation associated with real consequences, we aim to enlarge the general understanding of preferences pain patients have. Beyond that, we clarify experimentally whether either behavioral or economic literature adequately describes decision-making on painful sequences and whether real choice data confirm empirical findings from hypothetical choice scenarios.

Following economic theory, decision makers have consistent and stable underlying preferences. Furthermore, Rational Choice Theory includes the assumption of additive separability (Samuelson 1937) which states that the value of a sequence of outcomes equals the value of its component parts (Kahneman, Wakker & Sarin 1997). An application of economic theory for the context of health-related decision-making is the QALY concept (Weinstein & Stason 1977). The QALY is an index that describes a preference order of different health states and courses of a disease. The index is calculated using two factors: quality of life and time. Quality of life is defined by a factor between 0 (death) and 1 (perfect health) reflecting the current health state and is multiplied with the remaining life expectancy. Hence the index consists of the factor quality of life including all restrictions like disability or pain and the factor time but it disregards whether over the duration of an illness health improves or deteriorates. Instead, the QALY concept assumes neutrality towards the timing of different health states (Dolan 2008). According to the QALY concept and Rational Choice Theory, people must be indifferent when confronted with a choice scenario including two experiences which differ only in the arrangement of its inherent parts.

The assumption that sequence order is of no relevance has been criticized repeatedly (Loewenstein & Prelec 1993) and various studies demonstrate deviations from additive separability. The relevance

of order within sequences is not investigated only in the domain of health economics. The psychological literature presents a variety of studies that investigate deviations from the theory. One strand of literature focuses on the overall order of elements within a sequence, especially whether the trend is improving or declining. Concerning wages for example, workers have strong preferences for an increasing development (Loewenstein & Sicherman 1991). In terms of aversive outcomes, Varey and Kahneman (1992) find a preference for improving sequences.

Apart from the order of elements, another strand of literature points out the relevance of the specific position of an item within a sequence. For example, the recency-effect describes the dominance of the last item in a sequence in determining individuals´ preference order (Miller & Campbell 1959; Eysenck & Keane 2010). Besides the final element, the item in a sequence of strongest intensity, the peak, outstandingly influences overall evaluation of a sequence. This phenomenon is called the peak-end-effect (Kahneman u.a. 1993). Preferences according to these decision rules are obtained for various circumstances, such as pain (Redelmeier & Kahneman 1996; Redelmeier, Katz & Kahneman 2003), learning experience (Finn 2010), pleasurable goods (Do, Rupert & Wolford 2008), and overall long-term evaluation of life (Diener, Wirtz & Oishi 2001).

Models of rational choice, such as the QALY, are frequently violated in empirical studies on decision-making. However such findings base on hypothetical choice scenarios. Results from hypothetical questionnaires are generally valid (Kühberger, Schulte-Mecklenbeck & Perner 2002) but decisions involving real consequences often differ from hypothetical settings. Holt and Laury (2002) show that risk aversion increases when lottery choices are real compared with hypothetical choices. Furthermore, in risk-free settings Voelckner (2006) focused on buying behavior and reports that subjects pay less for products in a real buying scenario compared to their hypothetically stated willingness to pay (WTP). That means, a lack of real consequences in such choice situations can lead to a hypothetical bias (Murphy u.a. 2005; Harrison & Rutström 2008), which causes deviations from rational predictions in hypothetical choice scenarios. In general, people tend to make decisions more in line with rational choice models once real consequences are introduced (Camerer & Hogarth 1999; Hertwig & Ortmann 2001).

For health-related decision-making, there are only few studies available that analyze differences in decision making in hypothetical and real choice scenarios (Christensen-Szalanski 1984; Read & Loewenstein 1999; Blumenschein u.a. 2001; Pesheva, Kroll & Vogt 2011). Blumenschein et al. (2001) demonstrate empirically that asthma patients´ WTP for an asthma management program is lower if participants really have to pay for it instead of stating their hypothetical WTP. Experiments on decisions involving pain applying the cold pressor test (CPT) (Hines & Brown 1936) find that participants´ WTP to avoid pain is higher in hypothetical scenarios than when facing real consequences (Pesheva, Kroll & Vogt 2011). In addition, Read (1999) shows that subjects who read a description of a painful scenario have a higher willingness to accept pain in exchange for money than people who really experienced the described pain before stating their decisions. Because of these findings demonstrating differences in real and hypothetical health-related settings, we elicit subjects´ preferences for a scenario involving improving and declining sequences of pain including real consequences.

To investigate whether participants´ choices represent distinct perceived differences between both sequences or whether both are comparatively similar to them, we include different amounts of real

WTP. Thus the preferred option is available only if subjects pay for it. Inconsiderate answers can occur if evaluations of both sequences rarely differ or if they are equal. In this case, secondary mechanisms or the avoidance of cognitive effort of finding very small differences might cause a decision for one alternative which does not reflect the actual preference (Kühberger, Schulte-Mecklenbeck & Perner 2002). People tend to reduce effort when the decision task is complex and requires high mental effort (Wilcox 1993). This is often the case when subjects do not have a lot of experience in performing the task at hand. In cases where differences between consequences do not provide adequate incentives to reveal the true preference, secondary motives may lead to a choice that does not reflect the true preference.

As a standard method from psychology and medical practice to elicit preferences, we implement a numerical rating scale (NRS) (Amelang & Zielinski 2002) which is commonly applied and considered to be reliable and valid in clinical research (Dworkin u.a. 2005). However such studies on reliability and validity for rating scales all base on questioning subjects whose answers never include any consequence (Jensen 2003). Economists commonly use WTP to investigate preference intensities reflected by the amounts of money subjects pay. For various goods participants choose one of two alternatives and additionally state how much they are willing to pay (Loewenstein & Prelec 1991; Varey & Kahneman 1992) to receive the desired option over the alternative. To implement real consequences from decisions, participants in our experiment choose one option (a sequence of painful stimuli) which they receive at the end of the experiment. Consequences regarding the preference of painful sequences are realized using the CPT (Hines & Brown 1936), which is a standard method used in pain research (Lovallo 1975; Lee, Watson & Frey Law 2010; Streff u.a. 2010).

By combining the two standard methods, numerical rating scale and WTP, with the controlled induction of different pain levels, we can analyze whether the empirical violations of Rational Choice Theory are robust to the implementation of real consequences. Additionally the analysis of WTP allows us to judge whether participants are actually willing to pay to receive either the improving or declining sequence of pain levels.

We find that participants state preferences for one of the options. According to that preference, the unfavored option is rated more painful on the NRS with a median difference of two points. Previous work in clinical research considers this difference to be significant (Farrar u.a. 2001). However the median WTP to receive the preferred sequence is 0.

That means while elicited preferences using NRS or simple choice between the options are significantly in favor of the improving sequence, people are not willing to pay for receiving that sequence over the other. Therefore, these preferences are considered to be secondary. Once real consequences are introduced, we find that participants are indifferent between the two options, which is in line with rational predictions.

2. Experiment

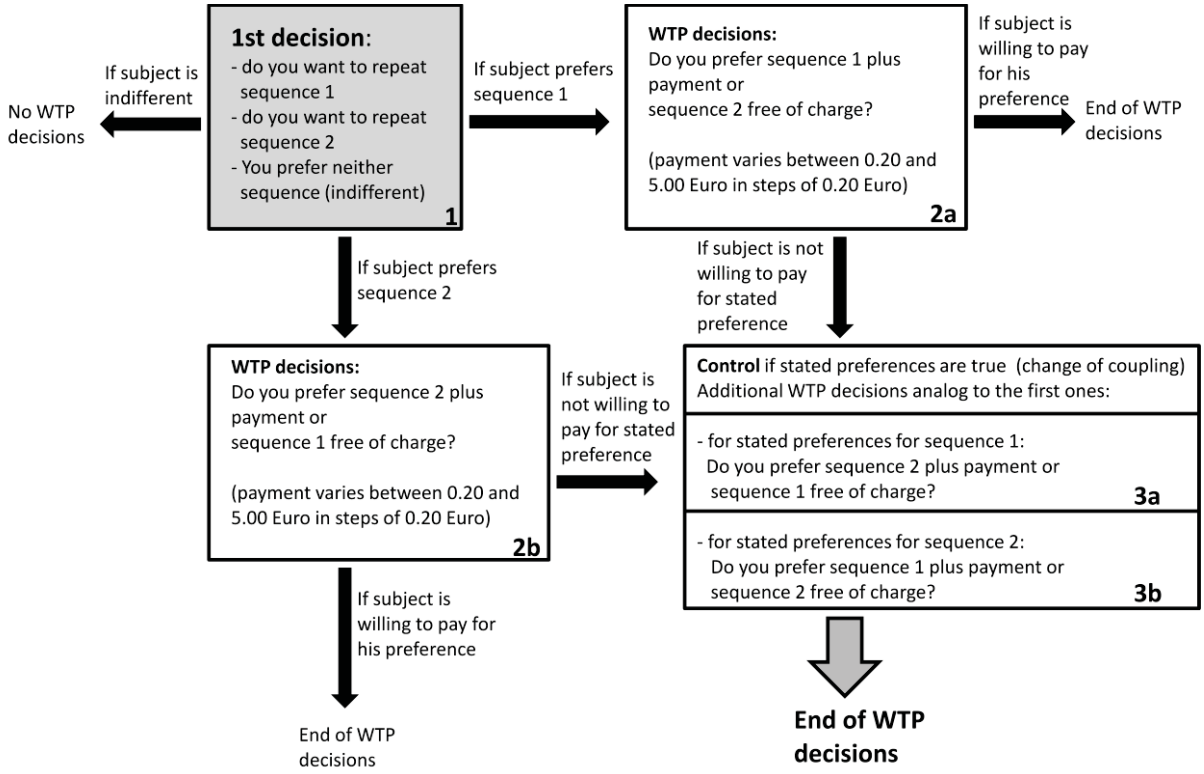
2.2 Experimental task

At the beginning of each session the participants received written instructions about the general setup of the experiment. After they read the instructions, the experimenter started the test phase of

the experiment, where participants experience two sequences of painful stimuli realized with the CPT (Hines & Brown 1936). Each sequence was realized in separate water bowls, with each sequence consisting of three water bowls with temperatures of 4°C, 8°C, and 12°C. One sequence provided rising temperatures (4-8-12) and the other falling temperatures (12-8-4). The sequence starting with 4° Celsius represents the one a decider would prefer based on the peak-end-rule, because peak (4°) and end (12°) diverge which means that the last part is positive. This is different for the declining sequence where both, the worst moment and the last moment coincide which makes it even more unattractive. Each sequence was experienced with one hand; the second sequence always included a change of the hand. Within a sequence a change to the next bowl must be done without any break whereas between the test of the two sequences there was a short break of about 30 seconds for the participants before the continuation with the other hand. Whether participants tested the improving or declining sequence first was determined randomly. During the test phase, participants were neither informed about the temperatures of the water in any bowl nor about the immersion durations of one minute per bowl.

In the decision phase, subjects received written instructions about the payoff mechanism for the experiment. They were informed that they would perform a series of decisions but only one of them would be realized at the end of the session. The decision process is outlined in figure 1 and explained subsequently.

Figure 1: Overview of the experimental procedure



The first decision (table 1) requires participants to determine whether they prefer to repeat the first or second experience or whether they are indifferent between the two, provided that they had to repeat one of the sequences (figure 1, box 1).

No.	A	B	A	B	indifferent
1	Repetition of the first experience	Repetition of the second experience			

Table 1: The first decision

The second decision sheet consisted of 25 choices. Since we set out to test whether subjects are willing to pay for receiving their preferred option, the composition of the second decision sheet depended on the first decision (tables 2a and 2b).

No.	Alternative A	Alternative B	A	B	indifferent
2	2. Experience	1. Experience plus payment of 0.20 Euro			
3	2. Experience	1. Experience plus payment of 0.40 Euro			
…					
26	3. Experience	1. Experience plus payment of 5.00 Euro			

Table 2a: WTP answer sheet for participants who prefer sequence 1

No.	Alternative A	Alternative B	A	B	indifferent
2	1. Experience	2. Experience plus payment of 0.20 Euro			
3	1. Experience	2. Experience plus payment of 0.40 Euro			
…					
26	1. Experience	2. Experience plus payment of 5.00 Euro			

Table 2b: WTP answer sheet for participants who prefer sequence 2

Each participant was asked to perform choices between their less desired option of the two and their preferred option. The less desired option was always free of charge, while subjects had to pay specified amounts of money for receiving their preferred option (cp. figure 1, boxes 2a and 2b). The charge for the latter varied between the 25 choice scenarios systematically between 0.20 Euro and 5 Euro in increments of 20 cent.

For those subjects who choose the unfavored sequence for decisions 2 through 26, indicating no willingness to pay for their favored option of decision 1, there was an additional answer sheet. Since this decision pattern can indicate that subjects did not state their real preference in decision 1, we use this to control whether subjects have positive WTP for receiving one of the options. The answer sheet was the same as before, but the varying amounts of payment were added for receiving the sequence subjects did not choose in decision 1 (figure 1, box 3a and b). Indeed, none of the subjects indicated WTP on the control answer sheet which is consistent with their choices indicated in the first decision.

At the end of the decision phase, we asked participants to rate pain intensities for the two sequences they experienced in the test phase on eleven point numerical rating scales (NRS). Low numbers reflect low pain intensity and high numbers reflect high pain intensity. This approach is the standard for pain measurement in clinical studies (Jensen 2003). Participants who had been indifferent between both sequences in the first decision (figure 1, box 1) immediately continued with the NRS omitting the WTP questions.

Finally, as it was described to the subjects at the beginning of their session, we used an urn with numbered balls (one for each decision the subject performed) to determine randomly which of the decisions was going to be realized. This procedure was repeated for each subject individually. The number on the ball reflected the decision that was realized. For that randomly selected decision, the subject received the sequence of pain stimuli they preferred, and where applicable paid the specified amount to the experimenter. Every participant realized their received sequence of pain stimuli as previously done during the test phase. After the participant finalized this realization stage, the experimental session was concluded.

3.2 Experimental procedure

The group of participants consisted of 80 students (41 females) from the Otto-von-Guericke University Magdeburg from different fields of study recruited using ORSEE {Greiner 2004}. Students were not informed in the invitation that it was an experiment on pain and had no prior experience with CPT type experiments.

The experiment was conducted at the laboratory of the Department for Sensor Technology at the Otto-von-Guericke-University Magdeburg in sessions with one participant at a time. The laboratory provides the equipment to administer the CPT using six circulating coolers[2]. These machines include a water bowl for which the water temperature can be regulated by a thermostat. Additionally a pump guarantees that within the bowl the temperature is the same everywhere, on the surface as well as on the ground or in the area close to the immersed hand.

One week before participating in the experiment, subjects came to our office to receive a show-up fee of 12 Euro. The show-up fee was paid in advance of the actual experimental session to reduce the influence of the house money effect (Thaler & Johnson 1990) and create a choice scenario where subjects behave as if they were using their own out-of-pocket money (Müller, Kroll & Vogt 2011). With accepting the show-up-fee, subjects agreed to show up for their experimental session and agreed to pay back the 12 Euro to the experimenter if they did not. All participants who received the show-up fee of 12 Euro did show up for their assigned session.

At the beginning of every session, each subject was informed that the experiment involves pain induced by cold water. Subsequently, the circulating coolers were presented and explained. Participants were informed that the experiment excludes any risk for health and safety. After being fully informed about the CPT-procedure and having time to ask the experimenter any further questions they may have, each participant was asked to sign a consent form before the actual choice experiment started. All subjects agreed to sign the consent form and proceeded to the experiment.

[2] We used a Julabo F12-ED Refrigerated/Heating Circulator; Detailed technical information about the system can be found here: http://www.julabo.de/us/p_datasheet.asp?Produkt=F12-ED

4. Results

In the NRS task, where subjects rate their displeasure for both pain sequences, subjects provide a mean rating of 4.66 for the sequence with declining pain levels, while they report 5.99 for the declining sequence (cp. Figure 1).

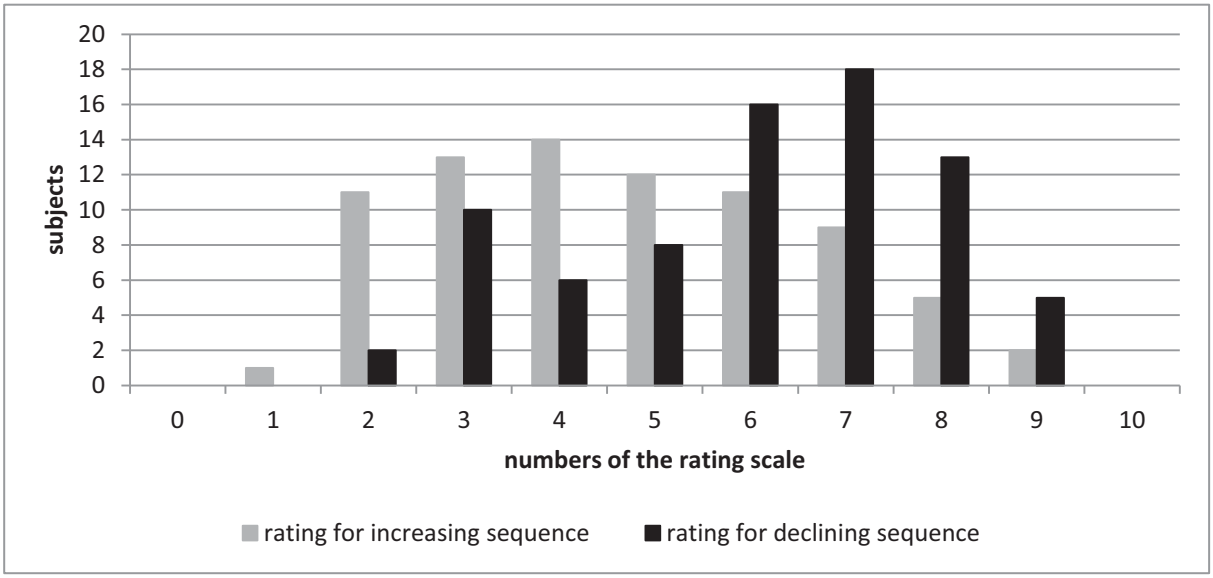


Figure 1: Ratings for both sequences on the NRS

The median difference in the ratings of both sequences is two points indicating a preference for the sequence with an improving trend. According to Farrer et al. (2001) this is clinically important. The same preference relation can be elicited for the first decision which includes real consequences: 57 out of 80 subjects choose the improving sequence. Therefore, the preference elicited using the standard measure deployed in clinical studies and the experimental task applied in this study is in favor of the sequence with decreasing pain intensities. This result is in line with the previous studies on pain related decision making that use hypothetical settings (Varey & Kahneman 1992) and consistent with peak and end evaluation (Diener, Wirtz & Oishi 2001; Do, Rupert & Wolford 2008).

The remaining decisions allow us to analyze whether subjects are willing to pay for receiving the improving sequence. We elicit the maximum willingness to pay for receiving the preferred option for each participant individually (cp. figure 2).

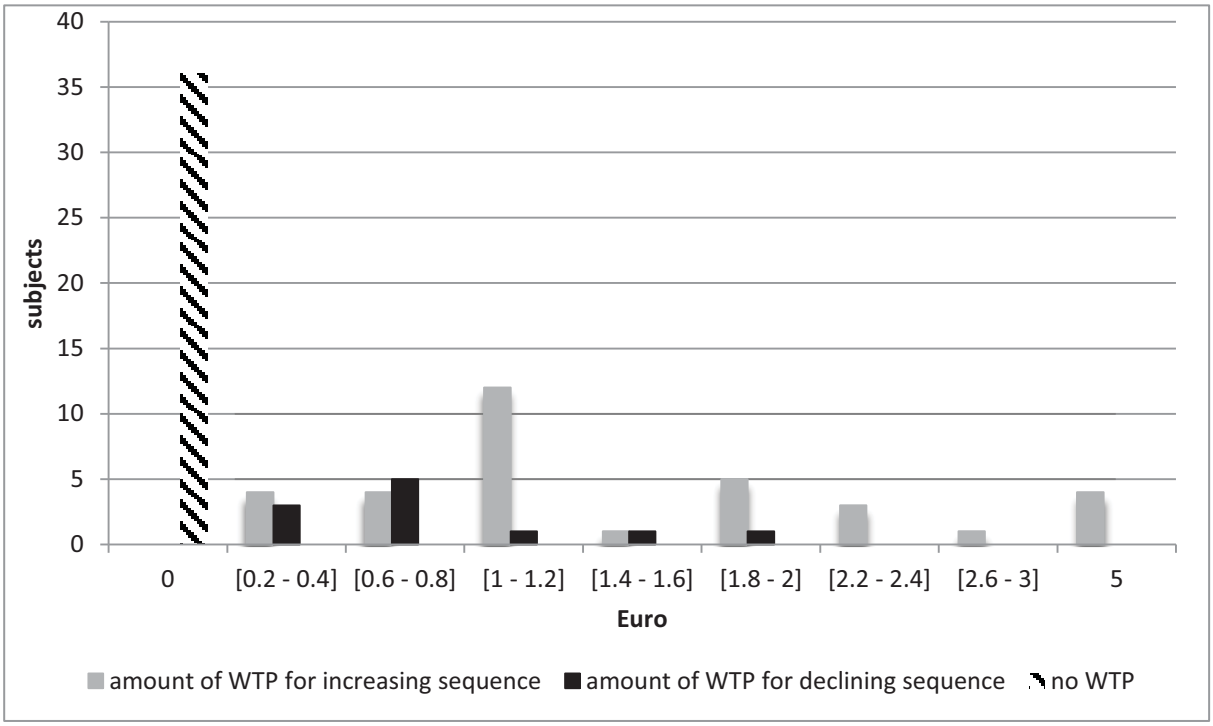


Figure 2: Amounts subjects were willing to pay for the two sequences. None of the subjects indicated a maximum WTP between 3.20 and 4.80 Euro, thus we leave these values out in the table.

We calculate for each participant the maximum willingness to pay for the improving sequence. Note that we code a preference for the declining sequence with a negative willingness to pay. Although 76 participants state preferences for one of the sequences (four subjects are indifferent in the first decision), only 44 of them are also willing to pay to receive their preferred option, whereas 36 subjects do not state WTP for either sequence. Hence, the median willingness to pay for the improving sequence is not significantly different from zero (Binomial-Test, 1%-level), which means that subjects are not willing to pay for any of the two preferences.

At the next step we control for sequence effects. This means that the order in which both sequences are experienced can have an influence on the later evaluation. For the experimental procedure, the sample was randomly divided into one group who first experiences the increasing sequence ("increasing first") and another group starting with the declining sequence ("declining first") (cp. Table 3, column 1 and 2). We focus on the WTP of these two groups. The distribution of preferences for the increasing and declining sequence strongly varies between them. In group "increasing first" 36 out of 37 subjects prefer the increasing sequence (a preference in line with the peak-end-effect), in group "declining first" 21 out of 43 participants favor the increasing sequences, 18 state preferences for the declining one (4 are indifferent). This strongly differing distribution between the two groups "increasing first" and "declining first" is noticeable because the only difference between the groups is the order in which the sequences were experienced at the beginning. However, this order is of no relevance for the level of pain intensity, particularly because the hand was changed for the second sequence. This means that preferences do not result from the peak-end-effect alone but also a primacy effect is evident. This effect states that subjects prefer the first element within a row because it can enter memory more easily as no other elements interfere so far (Murdock 1962). In case of the primacy-effect, the row consists of two elements, namely the two sequences. To better

understand the individual influence of the peak-end-effect and the primacy-effect we focus on the four quadrants in table 3 in more detail. At first sight, the first column is more striking because of the strong disequilibrium of preferences. The 36 subjects have experienced the increasing sequence first and also favor it. However here we cannot elicit if subjects state preferences in line with peak-end- or primacy-effect. Therefore, we focus on the second column: we can interpret that 21 subjects answer according to peak-end-predictions, whereas the 18 other participants realized predictions from the primacy-effect. Thus we find that there are two different categories of subjects. At the next step we investigate whether their WTP differs in relation to their category. Therefore, we only compare the two groups of the second column: declining sequence experienced first; preferences either in line with peak-end or primacy. We find that WTP in both groups significantly differs (Mann-Whitney-U-test, 1% level), which confirms our assumption of two categories of subjects, the peak-end-decider and the primacy-decider.

experienced first / preferred	Improving 4° - 8° - 12°	Declining 12° - 8° - 4°
Improving 4° - 8° - 12°	**36** Mean WTP: 1.15 Euro	**21** Mean WTP: 0.75
Declining 12° - 8° - 4°	**1** WTP: 0 Euro	**18** Mean WTP: 0.47

Table 3: Distribution of preferences depending on the sequence which was experienced first

However, the discrimination of subjects as decider either in line with the primacy-effect or the peak-end-effect is not relevant for the general finding that subjects significantly report preferences for sequences differing in trend of pain intensity. They are not willing to pay for receiving their preferred option in the case that it requires costs. Thus for the elicitation of people´s preferences, the inclusion of real consequences is relevant for an adequate comparability of experimental with real decision situations.

5. Conclusion

The study presented in this paper focuses on the elicitation of preferences for painful sequences that either rise or drop in pain intensity. Employing a setup that combines previous approaches used in the literature with an experimental design where subjects face real consequences from their choices, we analyze whether subjects have a systematic preference for a specific sequence of painful stimuli, when pain intensities and time of exposure remain constant.

While previous studies report a preference for improving sequences (Loewenstein & Prelec 1991; Varey & Kahneman 1992), economic models of rational choice do not account for such preferences (Camerer & Hogarth 1999; Hertwig & Ortmann 2001). We find that when decision makers do not have to pay for their preferred option, they report preferences that are in line with behavioral literature even when facing real consequences from their choices. However, when adding costs to

the preferred option our study shows that subjects are not willing to pay significant amounts for the improving sequence.

One of the frequently applied economic models that is criticized based on the findings of peak-end phenomena is the QALY concept. Although findings concerning trend and order preferences within a sequence of experiences are valid (Redelmeier & Kahneman 1996; Redelmeier, Katz & Kahneman 2003; Finn 2010; Do, Rupert & Wolford 2008; Diener, Wirtz & Oishi 2001) and thus question the construction of a quality index, our findings confirm the adequacy of this construction when assessing economic efficiency of health related policies. Since subjects do not reveal willingness to pay for their elicited preference, prioritizing treatments based on these findings does not create welfare in an economic sense. Therefore, the QALY concept is applicable for economic analyses of health related policies.

To summarize our findings, the inclusion of real consequences in our experiment relativized the criticism of behavioral studies in terms of the appropriateness of Rational Choice Theory to describe subjects´ decision making behavior. Validations of findings from hypothetical studies are crucial especially in health-related contexts because their results can cause adjustments of important concepts like the QALY and far-reaching decisions underlie such findings. Though our results show that the assumptions of the QALY concept concerning the rationality people demonstrate in decision making situations are correct. Accordingly the QALY concept does not lack validity but adequately respects the preferences of affected people.

6. References

Amelang, Manfred & Zielinski, Werner 2002. *Psychologische Diagnostik und Intervention.* 3., korrigierte, aktualisierte und überarb. Aufl./ unter Mitarb. von Thomas Fydrich … Berlin [u.a.]: Springer.

Ariely, Dan 1998. Combining experiences over time: the effects of duration, intensity changes and on-line measurements on retrospective pain evaluations. *Journal of Behavioral Decision Making* 11, 19–45.

Blumenschein, Karen, u.a. 2001. Hypothetical versus real willingness to pay in the health care sector: results from a field experiment. *Journal of Health Economics* 20, 441–457.

Breivik, Harald, u.a. 2006. Survey of chronic pain in Europe: Prevalence, impact on daily life, and treatment. *European Journal of Health Economics* 10(4), 287–333.

Camerer, Colin F. & Hogarth, Robin M. 1999. The Effects of Financial Incentives in Experiments: A Review and Capital-Labor-Production Framework. *Journal of Risk and Uncertainty* 19(1-3), 7–42.

Choinière, Manon, u.a. 1990. Comparisons between patients´and nurses´assessment of pain and medication efficacy in severe burn injuries. *Pain* 40, 143–152.

Christensen-Szalanski, J. J. 1984. Discount Functions and the Measurement of Patients' Values: Women's Decisions During Childbirth. *Medical Decision Making* 4(1), 47–58.

Dagenais, S., Caro, J. & Haldeman, S. 2008. A systematic review of low back pain cost of illness studies in the United States and internationally. *Spine Journal* 8(1), 8–20.

Diener, E., Wirtz, D. & Oishi, S. 2001. End Effects of Rated Life Quality: The James Dean Effect. *Psychological Science* 12(2), 124–128.

Do, Amy M., Rupert, Alexander V. & Wolford, George 2008. Evaluations of pleasurable experiences: The peak-end rule. *Psychonomic Bulletin & Review* 15(1), 96–98.

Dolan, Paul 2008. The measurement of health-related quality of life, in Culyer, Anthony J. & Newhouse, Joseph P. (Hg.): *Handbook of health economics*. Amsterdam [u.a.]: Elsevier, 1723–1762.

Dworkin, Robert H., u.a. 2005. Core outcome measures for chronic pain clinical trials: IMMPACT recommendations. *Pain* 113, 9–19.

Eysenck, Michael W. & Keane, Mark T. 2010. *Cognitive psychology: A student's handbook.* 6. Aufl. Hove: Psychology Press.

Farrar, John T., u.a. 2001. Clinical importance of changes in chronic pain intensity measured on a 11-point numerical pain rating scale. *Pain* 94, 149–158.

Finn, Bridgid 2010. Ending on a high note: Adding a better end to effortful study. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 36(6), 1548–1553.

Greiner, B. (2004). The Online Recruitment System ORSEE 2.0 - A Guide for the Organization of Experiments in Economics. In K. Kremer & V. Macho (Eds.), Forschung und wissenschaftliches Rechnen 2003. GWDG Bericht 63 (pp. 79-93). Göttingen: Gesellschaft für wissenschaftliche Datenverarbeitung.

Harrison, Glenn W. & Rutström, Elisabet 2008. Experimental Evidence on the Existence of Hypothetical Bias in Value Elicitation Methods. *Handbook of Experimental Economics Results* 1, 752–767.

Hertwig, Ralph & Ortmann, Andreas 2001. Experimental practices in economics: A methodological challenge for psychologists? *Behavioral and Brain Sciences* 24(3), 383–451.

Hines, Edgar A. & Brown, George E. 1936. The cold pressor test for measuring the reactibility of the blood pressure: data concerning 571 normal and hypertensive subjects. *The American Heart Journal* 11(1), 1–9.

Holt, Charles A. & Laury, Susan K. 2002. Risk Aversion and Incentive Effects. *American Economic Review* 92(5), 1644–1655.

Jensen, Mark P. 2003. The Validity and Reliability of Pain Measures in Adults with Cancer. *The Journal of Pain* 4(1), 2–21.

Kahneman, Daniel, Wakker, Peter P. & Sarin, Rakesh 1997. Back to Bentham? Explorations of Experienced Utility. *The Quarterly Journal of Economics* 112(2), 375–405.

Kahneman, Daniel, u.a. 1993. When more pain is preferred to less: Adding a better end. *Psychological Science* 4(6), 401–405.

Kühberger, Anton, Schulte-Mecklenbeck, Michael & Perner, Josef 2002. Framing Decisions: Hypothetical and real. *Organizational Behavior and Human Decision Processes* 89, 1162–1172.

Lee, Jennifer, Watson, David & Frey Law, Laura 2010. Lower-Order Pain-Related Constructs Are More Predictive of Cold Pressor Pain Ratings than Higher-Order Personality Traits. *The Journal of Pain* 11(7), 681–691.

Loewenstein, George F. & Prelec, Dražen 1993. Preferences for sequences of outcomes. *Psychological Review* 100(1), 91–108.

Loewenstein, George & Prelec, Drazen 1991. Negative Time Preference. *The American Economic Review* 81(2), 347–352.

Loewenstein, George & Sicherman, Nachum 1991. Do Workers Prefer Increasing Wage Profiles? *Journal of Labor Economics* 9(1), 67–95.

Lovallo, William 1975. The Cold Pressor Test and Autonomic Function: A Review and Integration. *Psychophysiology* 12(3), 268–282.

Miller, Norman & Campbell, Donald T. 1959. Recency and primacy in persuasion as a function of the timing of speeches and measurements. *The Journal of Abnormal and Social Psychology* 59(1), 1–9.

Müller, Holger, Kroll, Eike B. & Vogt, Bodo 2011. Do real payments really matter? A re-examination of the compromise effect in hypothetical and binding choice settings. *Market Lett* forthcoming.

Murdock, Bennet B. 1962. The serial position effect of free recall. *Journal of Experimental Psychology: General* 64(5), 482–488.

Murphy, James J., u.a. 2005. A meta-analysis of hypothetical bias in stated preference valuation. *Environmental and Resource Economics* 30, 313–325.

Pesheva, Daniela, Kroll, Eike B. & Vogt, Bodo 2011. Gender differences in willingness to pay to avoid pain and their correlation with risk. *Journal of Neuroscience, Psychology, and Economics* 4(3), 181–191.

Phillips, Ceri J. & Harper, Christie 2011. The economics associated with persistent pain. *Current Opinion in Supportive and Palliative Care* 5, 127–130.

Read, Daniel & Loewenstein, George 1999. Enduring pain for money: decisions based on the perception and memory of pain. *Journal of Behavioral Decision Making* 12, 1–17.

Redelmeier, Donald A., Katz, J. & Kahneman, Daniel 2003. Memories of colonoscopy: a randomized trial. *Pain* 104(1-2), 187–194.

Redelmeier, Donald A. & Kahneman, Daniel 1996. Patient´s memories of painful medical treatments: real-time and retrospective evaluations of two minimally invasive procedures. *Pain* 66, 3–8.

Samuelson, Paul A. 1937. A note on measurement of utility. *The Revew of Economic Studies* 4(2), 155–161.

Streff, Anouk, u.a. 2010. Differential physiological effects during tonic painful hand immersion tests using hot and ice water. *European Journal of Pain* 14(3), 266–272.

Thaler, Richard H. & Johnson, Eric J. 1990. Gambling with the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choice. *Management Science* 36(6), 643–660.

Varey, Carol & Kahneman, Daniel 1992. Experiences extended across time: Evaluation of moments and episodes. *J. Behav. Decis. Making* 5(3), 169–185.

Voelckner, Franziska 2006. An empirical comparison of methods for measuring consumers' willingness to pay. *Market Lett* 17(2), 137–149.

Weinstein, Milton C. & Stason, William B. 1977. Foundations of Cost-Effectiveness Analysis for Health and Medical Practices. *New England Journal of Medicine* 296, 716–721.

Wilcox, Nathaniel T. 1993. Lottery Choice: Incentives, Complexity and Decision Time. *The Economic Journal* 103, 1397–1417.

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