Making decisions about future activities: The role of age and health

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A.S. Melenhorst, Making decisions about future activities: The role of age and health. Gerontechnology 2002; 1(3): 153-162. Do older people experience the postponement of a desired or planned activity as more troublesome than do younger people, or, on the contrary, do they exhibit more patience? In the present study 24 independently living adults, 12 aged 40 - 45 years and 12 aged 70 - 75 years, judged delayed rewards, in this case freely obtainable holidays, by means of pair–wise comparison. The participants' preferences showed a stronger 'temporal discounting' in older and in less healthy individuals than in younger and in healthy individuals, respectively. Delay-time was perceived as a risk factor for enjoying future holidays. This risk perception was related to participants' own and their partners' subjective physical health. However, subjective health could not fully explain the high temporal discount rates in the older participants, suggesting that also age by itself contributed to the perceived risk of postponement. The implications of this study may also address other activities and plans, such as older adults' preparedness to learn using new technology.

Key words: aging, health risk, postponement, present-oriented, temporal discounting

Aging introduces people into the field of tension between their wishes and aspirations and the assessment of their own future capabilities. The perception of future time might affect one's decisions about longer-term investments, for example regarding independent living, particular purchases for instance of a computer, or learning new skills that will be fruitful later. This paper examines the considerations of older and younger adults when they think about the future and make plans.

Aging is inversely related to future time remaining in one's life. Both the amount of chronological time and the amount of 'quality time' are likely to decrease. Health decline is an age-related threat to 'quality of life' and might limit one's future capability to perform demanding activities such as traveling. Moreover, one's physical condition might indicate one's chronological place in the life-cycle. Future time, therefore, implies uncertainty. Older people might feel this inherent uncertainty differently from younger people in their expectations of changing circumstances over time.

Gerontological studies[1-6] suggest that people become more present-oriented in the course of aging. With age, physical and mental resources decrease[7-9]. As a consequence, to a

greater extent than younger people, older people will aim at an economic use of these resources. This is consistent with the principle of 'Selective Optimization with Compensation' in the studies of Baltes and Baltes[2] and with Carstensen's concept of 'Socio-emotional Selectivity'[10]. A study by Carstensen and Fredrickson[11] about social preference related to age and health recognized the perception of 'time as a risk factor'. Carstensen states that social aspirations are inherently determined by the perceived place in the lifecycle. Studies in which time perspective was manipulated[3,12] or in which *younger* participants had a limited perspective due to a life-threatening disease[11] indicate that the present-oriented shift is not related to age per se, but to one's perception of future time as limited or as expansive.

These studies suggest that older and less healthy people make a cost-benefit analysis different from younger and healthy people before making an investment. In this context 'investment' means the use of mental and physical resources and making efforts. On the cost-side of the balance an effort might be experienced as more costly because of felt, feared-for, or expected decline in health. For the same reason devaluation occurs on the benefit side: within a few years the intended result might not be reached or enjoyed anymore.

In classical decision making theory the devaluating impact of a postponement is called temporal discounting. The issues 'risky choice' and 'choice over time' have been studied extensively in a quantitative way[13-15]. This research shows that a postponement, or a delay-time, reduces the perceived value of objects, outcomes, and rewards. It was assumed that the phenomenon of temporal discounting applies to everyone in principle, irrespective of age. An explanation is that delay time implies an uncertainty, involving the risk that the delayed reward will not be obtained[16]. However, the content or cause of this perceived uncertainty was not clarified.

Only two studies have addressed the role of age in decision making over time[17,18] and the results were inconsistent. Green and colleagues[18] found no significant difference between younger and older people, whereas, surprisingly, in the other study[17] a lower temporal discounting in older people was found. From the latter study it should be concluded that older people are more long-term oriented than are younger people. This does not correspond with gerontological observations suggesting an increasing present-orientedness with increasing age.

However, the stimulus material and the test situation in the two mentioned temporal discounting experiments were not very representative of the personal situation of the decision-maker. In the studies of Green[17,18] the participants were asked to make decisions about hypothetical amounts of money of which the obtainment was postponed. For example, participants of 65 -70 years old were asked to choose between '$100 now' and '$10,000 in 25 years'. Many of them chose the higher amount in 25 years. Considering that they would have been over 90 by then, the actual identification with the topic seems doubtful, which might have influenced the decision making in the experiment. In the case of a rather distant, 'abstract' decision, fewer personal considerations might be involved than in the case of a decision that is a direct reminder of the participant's personal situation.

The present study deals with the considerations of older people when they make plans, for example, decide about activities and purchases in their future. Planning for future holidays seems an appropriate issue to evoke such considerations: traveling involves future expectations and plans and requires physical health. The paper focuses on the role of time in these considerations. Do older people perceive the passing of time as a 'health risk', for example because they foresee a decline of their physical abilities over time? If so, does this affect their decisions for their

future? Based on gerontological research and personal observations made in several pilot studies, the following was expected, in contrast with the earlier study[17]: (I) Older people show a stronger degree of temporal discounting than do younger people, (II) unhealthy people show a stronger degree of temporal discounting than do healthy people and (III) particularly older people refer to 'health risk' as it relates to 'delay time'.

The experiment presented next was a modified version of traditional temporal discounting experiments (see the method section for a description). To examine age differences, participants in two age ranges were selected. The age samples were similar with respect to gender, independent living, and education. In order to reduce differences between the age groups, the younger group consisted of middle-aged, rather than very young adults. Middle-aged individuals may lead more steady lives than do younger individuals, and radical changes in one's life, such as parenthood in the near future, are less likely to occur. In this respect, older and middle-aged individuals are more alike. Furthermore, none of the younger that is middle-aged participants had very young children, which reduced another possible restriction on traveling plans in this age group.

METHODS

Participants

Participants in this study were 12 adults age 40-45 years (6 men, 6 women; M = 42.3, SD = 1,2) and 12 adults age 70-75 years (6 men, 6 women; M = 71.4, SD = 1,8), selected from a research volunteer pool. All were living independently. Educational levels of the both groups were similar: most participants had about 4 years High School and an additional professional education. Two older and two younger participants had a Bachelor's or a Master's degree. Ten of the older and nine of the younger participants owned a car. Travel experience was measured according to verbal reports. Six older and seven younger participants considered themselves as experienced travelers. The groups differed with respect to subjective physical health. In the oldest group ten participants reported poor health of themselves or of their spouses, limiting their freedom of movement; in the younger group only three participants reported such limitations (the correlation of health and age was $r\phi = 0.58$ in this sample). In each of both groups, three participants lived alone. None of the younger participants had children younger than ten years old. Another five participants volunteered in a pilot study. Two were young and three were old.

Procedure

The above-mentioned type of temporal decision making experiments presented the participants with dilemmas. Just as an example, in these experiments they were asked, respectively, whether they preferred the receipt of

$100 in 5 months	or	$ 500 in 1 year
$100 in 5 months	or	$ 500 in 1.5 years
$100 in 5 months	or	$ 500 in 2 years

In this example the delay time imposed on the higher amount increases. Whereas people tend to prefer the higher amount in the first dilemma, they may get in doubt if this amount is delayed by 1.5 years, and may even prefer the smaller amount if the higher amount is delayed by 2 years. This would indicate that the perceived value of the higher amount drops when its obtainment is increasingly delayed (even if corrected for currency inflation), consistent with the principle of temporal discounting.

In the present experiment the participants were also asked to choose between pairs of delayed rewards, analogous to the previous example and to the experiments of Green[17,18]. However, these rewards were holidays instead of amounts of money. An item was defined as a hypothetical, free holiday to a specific destination to be spent after a specified delay.

Each participant was asked to mention three

personally appreciated holiday destinations. There were no further restrictions, provided that the participant preferred one destination to the other. This free choice was an attempt to equate the initial subjective values between participants: whereas to one the favorite holiday could be represented by a journey to China, the other would rather go to Austria or Disneyland. The same variation between individuals was assumed for the 'second best' destinations. The subjective difference between the non-delayed favorite and the non-delayed 'second best' destination per individual was estimated later, based on the calculation of preference strengths resulting from the experiment (see the results section).

As in traditional temporal discounting experiments, the perceived values of rewards, in this case holidays, were expected to reach zero when the postponement of their obtainment exceeded a certain time span. In other words, holidays lose their value when they are perceived as unattainable, for example due to postponement. A pilot study among three older and two younger volunteers showed that the amount of delay time making holidays 'worthless' varies between individuals, indicating a different acceptance of delay. In the present study, one's acceptance of delay was defined as the delay time maximally accepted to obtain one's favorite holiday destination. For example, a delay time acceptance smaller than 2 years meant that the favorite holiday was not preferred to any alternative when it was delayed by two years or more.
The pilot study roughly indicated three relevant delay time acceptance ranges: (A) smaller than 2 years, (B) 3 to 6 years, and (C) 8 to 10 years and over. To avoid bothering the participants with irrelevant and redundant questions, their individual delay ranges were estimated before the actual experiment. The above-mentioned delay ranges were the starting points of these pretests.

The procedure of the pretest was as follows: (1) The participant was asked to choose between the (personal) favorite destination delayed by 2 years, and the second best delayed by only 5 months. Preference for the second best indicated little delay acceptance. These participants were assigned to acceptance range A. (2) Those selecting their favorite holidays postponed by 2 years were asked to postpone it by 6 years, and to decide again. Participants still preferring this 'favorite' destination in spite of the delay belonged to acceptance range C. The others were assigned to acceptance range B. The three acceptance ranges resulting from the pilot study were satisfactory; there were no participants exceeding the established acceptance ranges.

Each acceptance range comprised a set of five delay times. Each set overlapped parts of the two other sets. Table 1 shows the five delay times per range, expressed in months. In the experiment the '0.25 month' delay was presented as 'a week'. Delays of 12 months and up were presented in terms of 'years'.

A set of ten pairs of delayed holidays was construed per participant. These items were combinations of the participant's holiday destinations and the delay times from the

Table 1: Delay times per delay acceptance range

Set	Acceptance Range (years)	Delays (months)				
		I	II	III	IV	V
A	0 to 2	0.25	5	12	18	24
B	2 to 6	0.25	5	24	36	72
C	8 to 10	0.25	5	72	96	120

appropriate set. Two holidays multiplied by five delays gives ten delayed holidays, leading to 100 possible pair-wise comparisons. However, many of these comparisons were not usable for the assignment. First, the ten pairs of identical items were excluded. Each of the 90 pairs remaining occurred twice, which allowed halving the set. Still many of the 45 pairs remaining were not meaningful regarding the research question. To begin with, ten pairs with the 'second best' holiday delayed to a greater extent than the 'favorite' holiday were excluded. Twenty pairs comprised the same holiday with different delay times and were excluded as well. Fifteen pairs remained. Five of these pairs comprised the 'favorite' and the 'second best' holiday with the same delay time, and were therefore also excluded. Table 2 shows the composition of presented pairs per participant in terms of their 'favorite' (H1) and their 'second best' (H2) holidays, and the respective delays imposed on these holidays (ordinal numbers), corresponding to the delay times presented in Table 1.

In the course of the assignment these pairs were written down and read aloud. For example, the comparison of [H2, II] with [H1, IV] for one participant in delay range C was: "What would you prefer, 10 days to the nearest seaside resort delayed by at least 5 months, or 7 weeks to China delayed by at least 8 years?" The pairs were presented in random order. The participants were asked to motivate their choices.

In a brief interview after the assignment the participants were asked to indicate their own physical health and their spouses' health, if applicable. They were also asked whether they felt physical limitations on demanding activities such as traveling. The total sample was split into two health groups based on these verbal reports. The 'healthy' group reported 'reasonable', 'good' or 'excellent' physical health both for themselves and their spouses, and did not experience serious physical limitations. Participants in the 'unhealthy' group felt physically restricted due to their personal or their partner's health, or both. Marital status, education, traveling experience, and car possession were inquired as well.

RESULTS

The participants were assigned to the three acceptance groups as follows: thirteen participants showed a maximum delay acceptance of 2 years and belonged to group A, four accepted at most 6 years and belonged to group B, and seven accepted 10 years or longer (group C). Now we are interested in the subjective values assigned to the delayed holidays by these different groups.

'Response strength' is an indicator for the attractiveness of an item. The probability that a 'favorite' delayed holiday [H1,IV] is preferred to a 'second best' but less delayed holiday [H2,II] depends on the difference of their 'response strengths'. For example, the chance that [H1,IV] is preferred to [H2,II] is expressed as P([H1,IV] > [H2,II]) = (preference for [H1,IV] +1) / [(preference for

Table 2: Presented pairs of favorite (H1) and second best (H2) delayed holidays. (I represents the smallest delays corresponding to the sets in Table 1)

	Delay of H1				
Delay of H2	I	II	III	IV	V
I		x	x	x	x
II			x	x	x
III				x	x
IV					x
V					

[H1,IV]+1) + (preference for [H2,II] + 1)]. Concretely, if four participants in group C prefer [H1,IV] to [H2,II] and three prefer [H2,II] to [H1,IV], this leads to a probability of [(4+1) / (4+1) + (3+1)] = 5/9 that [H1,IV] is preferred by participants in group C, and a probability of 4/9 that [H2,II] is preferred. These probabilities were transformed into logits, so that the difference between response strengths of the compared items could be determined. In this way, the differences between response strengths of each of the delayed holidays in table 2 were calculated, for each group (A, B, and C) separately.

The Luce choice model[19] could describe these data very well. The goodness of fit, expressed as proportions of explained variance, were 0.94, 0.96, and 0.97 for groups A, B, and C, respectively. This implies that the groups were very homogeneous: people within a group assigned almost identical response strengths to each of their delayed holidays.

The participants' favorite (non-delayed) holidays in this study revealed that 50% of the older and 83% of the younger participants appreciated an intercontinental trip. Only two participants proposed a national trip as 'favorite'. However, differences between the initial response strengths of these non-delayed H1 and H2 holidays were similar for participants in both age groups and in each of the groups A, B, and C, irrespective of the specific holidays. This is also illustrated by figure 1: the distances between H1 and H2 on the y-axis were almost equal for both groups. The same was true for the 'middle' discount group, not presented in figure 1.
In order to examine the effect of delay on

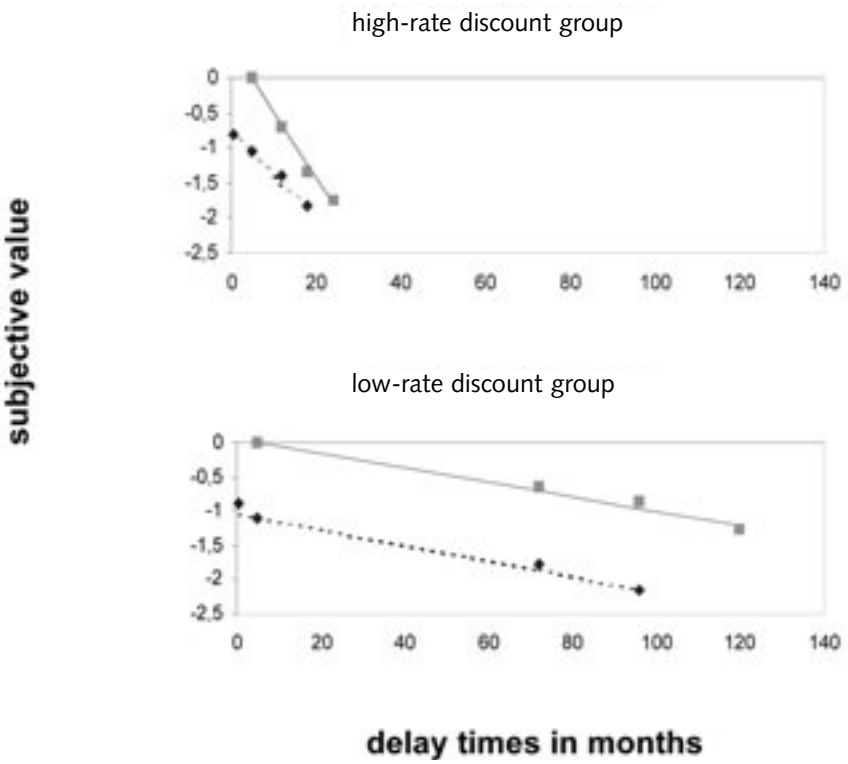

Figure 1. Temporal discount functions of favorite and second best holidays (upper and lower lines, respectively) for the high-rate (A) and the low-rate (C) discount group. 'Subjective value' represents response strengths expressed in logits.

subjective value, the subjective values of holidays were expressed as a function of delay. Based on the response strengths (one per delayed holiday) a linear function was estimated as $V = v_0 + kD$, which provided the best fits. In this function, v_0 is the initial subjective value and V the subjective value when a delay is imposed on it. Both are expressed by the estimated response strengths. D is the delay-time in months, and k the discount factor, which is expected to vary over the groups. Higher negative values of k, corresponding to a steeper slope, indicate a stronger temporal discounting. Slope (k) and linearity (r^2) of this simple regression line are presented in table 3 for each acceptance group.

Group A demonstrated the highest degree of temporal discounting for both first and second best holidays (H1 and H2, respectively). Group B showed a lesser degree of temporal discounting for H1 than did group A, and yielded unstable results for H2. Group C shows the lowest discount rates for both H1 and H2.

For the H1 holidays the slopes of groups A and B were significantly different ($t(6) = -4.41$, $p < .01$) as were the slopes of groups A and C ($t(6) = -5.35$, $p < .01$). The slopes of group B and C were not ($t(6) = -1.46$). For the H2 holidays the difference between A and C was in the same direction as for H1, and significant as well ($t(6) = -2.70$, $p < .05$). In the comparison of H2 holidays, group B was left out of consideration. Within the groups the differences between the slopes of H1 and H2 holidays were not significant ($t(6) = 1.37$ and 0.98, for group A and C, respectively).

Next, we focus on group A and group C, most obviously demonstrating different discount behaviors. They show stable results for both first and second-choice holidays and represent 83% of the total sample. Figure 1 shows the discount functions for both group A and group C, as from now indicated as the 'high-rate discount group' and the 'low-rate discount group', respectively.

Nine out of thirteen persons in the high-rate discount belonged to the older participants, whereas the low-rate discount group included no older people (see table 4). According to the Fischer Exact probability test, the high-rate discount group contains significantly more elderly people than the low-rate discount group ($p < .005$).

The verbal reports in the concluding interviews as well as during the pair-wise comparison task indicated that a delicate physical health was an important factor of constraint on planning future activities, irrespective whether it concerned personal health or the spouse's health. Also widowhood as a consequence of disease was mentioned: "it makes one realize how fragile we are".

A compound health variable was defined as the combination of the scores on 'delicate physical health' and ' partner's delicate health'. The numbers of people who were and were not affected by serious health problems in their direct living atmosphere are presented in table 5 (defined as 'unhealthy' and 'healthy', respectively). In the high-rate

Table 3: Temporal discount rates (k) and linearity (r^2) for favorite and second best holidays (H1, H2) per acceptance group

	group and holidays					
	A		B		C	
	H1	H2	H1	H2	H1	H2
k	-.0944	-.0618	-.0216	+.0012	-.0105	-.0115
r^2	.993	.928	.926	.249	.852	.965

discount group significantly more people reported health restrictions (Fischer Exact gives $p < .01$).

CONCLUSIONS AND DISCUSSION

The holiday experiment showed that individuals demonstrating strong temporal discounting were more likely to be old, and were more likely to experience health limitations. This accords with the respective hypotheses I and II.

Both younger and older participants in the high-rate discount group referred to health limitations. However, the older participants mentioning 'health' did not necessarily experience health problems, whereas all of the (few) younger participants in this group did. This is consistent with findings of Carstensen and Fredrickson[11], suggesting that not only chronological age but also health limitations affect one's perception of future time. Moreover, older participants in the present study seemed not to need a concrete 'trigger' to be aware of future health risks, whereas younger participants did. This suggested that older adults, to a greater extent than younger adults, perceived the passing of time per se as a risk factor related to health. This is in line with hypothesis III.

The identification with the topic in the holiday experiment may explain the contrast with the study of Green[17]. The participants in the present study realized the practical implications of their choice and took their personal situation into account, which appeared from their motivations and comments. For example: "probably my husband will not be able to make that journey anymore in six years, because it requires a good physical condition." Participants spontaneously mentioned the health issue during the experiment, which indicated that this largely determined their considerations. The interview for personal characteristics (e.g., health) was conducted after the experiment so that it cannot have triggered these comments.

The participants' proposals for specific holidays were informative as well. The younger group mentioned more intercontinental trips and fewer national trips than did the older group. Travel experience, however, was not very different between the age groups. The slightly more conservative selection by the older adults might, for instance, reflect anticipating expected future capabilities. In this case, age-related discount rates might have been even more different if the holiday destinations had been exactly the same for each participant.

Interestingly, all participants chose 'favorite' and 'second best' holidays with subjective values differing to the same extent, so that their 'starting points' (see the y-axes in figure 1) in the present experiment were equal. This finding was not an artifact of the method or the model[19].

A limitation of the present study was the

Table 4: Numbers of participants per discount group according to age

age group	high rate discount	low rate discount	total
70 to 75 years	9	0	9
40 to 45 years	4	7	11
	13	7	20

Table 5: Numbers of participants per discount group according to personal subjective health and/ or spouses' health (healthy and unhealthy)

health group	high rate discount	low rate discount	total
unhealthy	11	1	12
healthy	2	6	8
	13	7	20

small number of participants. Although the age samples were similar regarding education, car possession, traveling experience and living situation, they may not be representative for the total population. In addition, also the number of stimuli was small. However, the results within the groups were extremely robust and consistent: participants within a discount group demonstrated choice behavior as if they were one individual. The participants' verbal comments further supported their consensus. The method applied in the present examination may be an improvement on the traditional decision making experiments, because it did not overburden the participants with stimuli and still yielded stable results.

In sum, the holiday experiment illustrated that the appreciation of future 'rewards' depends on the perceived guarantee of their attainment. The attainment of rewards does not only involve their acquisition, but also the probability of enjoying them. This is consistent with findings in traditional temporal discounting experiments[15,16]. The present experiment, however, also provided insight into the participants' motivations. The explicit elicitation of these motivations could explain that the outcomes were radically different from those in Green and colleagues' experiment[17]. In particular the older participants seemed to make a match between the assessment of their own future capabilities and the required capabilities to enjoy a particular reward. This assessment was strongly motivated by their physical health.

The findings in this study accord with the concepts of 'Optimization with Compensation'[2] and 'Socio-emotional Selectivity'[4,5,10]. This suggests that the results were not confined to holidays; temporal discounting might also motivate older adults' decisions about other 'future outcomes'. For example, older adults may invest only in particular social relationships that provide emotional support and friendship now and in the near future. Moreover, they may decide to learn handling the computer to use e-mail only if they foresee that this contributes to their personal communications and is learnable within a short period of time. These examples illustrate that research on 'temporal discounting by older adults' could also address other domains, such as daily life activities, social relationships, interpersonal communication and the use of new technologies.

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