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Consumer Perception and Evaluation of Waiting Time: A Field Experiment

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We varied telephone waiting times for a commercial service in 2 different experiments. In the 1st experiment, the telephone rate was either 0 or fixed at Dfl 1 (approximately $0.40) per minute. Consumer perceptions of waiting times could be described best by a psychophysical power function. Furthermore, wait evaluations were mainly influenced by the difference between the consumers' acceptable and perceived waiting times. The negative effect of perceived waiting time on wait evaluations was increased by the monetary costs of waiting.

In the 2nd experiment, the waiting times were filled in different ways: with music, queuing information, and information about expected waiting time. Information about the expected waiting time significantly reduced the overestimation of waiting time, although it increased the negative effect of perceived waiting time on wait evaluations.

In the marketing and consumer research literature, a number of studies have investigated waiting times for services, such as hospitals and banking (e.g., Hui & Tse, 1996; Katz, Larson, & Larson, 1991; Pruyn & Smidts, 1998). In these studies, researchers generally have been interested in the relation between objective and perceived waiting times and the effect of (perceived) waiting time on the consumer's evaluation of the waiting time, service (i.e., customer satisfaction), or both. In general, a negative relation between wait evaluation and perceived waiting time has been found. Furthermore, studies have investigated the effects of waiting-time fillers on consumer perceptions and evaluations of waiting times (e.g., Katz et al., 1991; Pruyn & Smidts, 1998; Taylor, 1994; Tom, Burns, & Zeng, 1997). The latter is based on the idea of changing waiting time into experienced time by "entertaining, enlightening and engaging" the consumer (Katz et al., 1991).

We aimed at extending the research on waiting time as follows. First, our study focused on the psychophysics of telephone waiting time. Neither of the waiting-time studies reviewed explicitly dealt with psychophysics, but all studies assumed an ordinary linear relation between objective waiting time and perceived waiting time. However, psychophysical research suggests that the relation between "physical" stimuli (i.e., waiting time) and their subjective counterparts should have the form of a power function (e.g., Stevens, 1957). Second, we used several means to study influencing consumer perception and evaluation of waiting time. In previous research, most researchers have investigated only one or two fillers at a time, whereas we compared the consequences of providing information on waiting time, queuing information, music, and silence in one experiment. Furthermore, we studied whether the fillers moderated the effect of perceived length on wait evaluations. Third, we investigated whether monetary costs moderated the effect of perceived length on the evalua-

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tion of waiting time. Fourth, we explicitly modeled an asymmetric effect of positive and negative differences between expected waiting time and actually perceived time on wait evaluation (Kahneman & Tversky, 1979; Tversky & Kahneman, 1991). Finally, the context of this study was commercial telephone communications (i.e., 800 and 900 numbers), which is widely used both in the United States and in Europe (Henley Center, 1997). For example, Morrow and Tankersley (1994) reported that 44% of U.S. consumers call 800 and/or 900 numbers over 10 times per half year.

These issues were addressed in two experiments, in which the participants called an information phone number. Waiting times were varied systematically in both experiments. In the first experiment, we examined the psychophysical relation between objective and perceived time and the effect of monetary costs of waiting on wait evaluations. In the second experiment, we examined the effects of music, information on expected waiting time, and queue on both perceived waiting time and wait evaluation.

The structure of this article is as follows. First, we discuss the literature on the psychophysics of waiting time, waiting-time fillers, the costs of waiting, and the resulting hypotheses. Next, we separately discuss the experimental procedures and the results of each experiment. Finally, we end with a discussion.

LITERATURE AND HYPOTHESES

Two psychological reactions to waiting, perception, and evaluation were considered. In wait perception, objective waiting time is psychologically transformed into perceived waiting time. Psychophysical functions should be appropriate to describe this process. Furthermore, time perceptions may be influenced by several waiting-time fillers, such as repeated information about wait duration and length of queue and music. In wait evaluation, it is assumed that the wait is evaluated with respect to a reference point. The monetary costs of waiting and waiting-time fillers may influence wait evaluations further.

Objective and Perceived Waiting Time

Psychophysical functions have been used to describe a variety of relations between objective stimuli and sensations (e.g., Galanter, 1990). For sensory stimuli (e.g., taste, brightness, pain) and monetary losses and gains, marginally decreasing sensations have been found, at least in a large range of the stimulus scale (Christensen, 1989; Galanter, 1990; Price, Harkins, & Baker, 1987). The shape of the psychophysical function has been modeled in different ways. A brief discussion of the most common models and their theoretical bases follows.

Weber's law holds that the just noticeable difference (JND) between two stimuli is a constant fraction of the stimulus intensity. Fechner's law considers the JND to be the unit of sensation. Together, these laws imply a single-logarithmic relation between sensation and stimulus intensity, which is marginally decreasing. However, Stevens (1957) showed that Fechner's law is invalid. In many cases, a stimulus that is twice as intensive as another stimulus is also perceived as being twice as "sensational," implying that it contains twice the number of JNDs. This observation is also inconsistent with Weber's law. Stevens' law assumes that equal objective ratios produce equal subjective ratios. Stevens' assumption implies an exponential relation between sensation and stimulus intensity, which usually is transformed into a double-logarithmic relation for estimation purposes. Double-logarithmic functions were found to be superior to both single-logarithmic and linear functions in describing psychophysical relations (Stevens, 1957).

Psychophysical functions might also be relevant for describing the relation between objective and perceived waiting time. In this respect, Fraisse (1984) reported that in general, exponential relations (power functions) for duration have yielded coefficients around 1, implying linearity. However, the studies reported mainly included durations less than 1 sec. Eisler (1976), also including durations of several minutes in his overview of experiments, reported an average coefficient of around .90, implying marginally decreasing sensations. However, despite the extensive literature on psychophysical functions, consumer and marketing researchers predominantly have used linear specifications relating objective and subjective time scales (Hornik, 1984; Pruyn & Smidts, 1998; Taylor, 1994).

Following the psychophysical literature (e.g., Eisler, 1976; Galanter, 1990; Stevens, 1957), we assumed that the relation between objective and perceived waiting time is best described by an exponential function, that is, a function allowing for marginally decreasing perception of time. This amounts to the double-logarithmic specification; that is, both time and subjective experience are transformed to the log scale to obtain a linear model:

$$\ln \psi_i = \alpha_1 + \beta_1 \ln t_i + \gamma_1 X_i + \varepsilon_{1i} \qquad (1)$$

In Equation 1, the objective waiting time of consumer i (t_i) is related to perceived waiting time (ψ_i) with the double-logarithmic specification according to Stevens' (1957) law. The matrix X_i contains the values of other experimental variables, such as the presence of waiting-time fillers. The coefficient β_1 and the vector γ_1 capture the effect sizes of the variables, α_1 is a constant term, and ε_{1i} is a normal error term. Equation 1 is a regression equation that can be estimated with ordinary least squares. Because we expected a marginally decreasing effect of objective waiting time on time perception; that is, sensation is a concave function of time, β_1 should have been smaller than 1. Given the previous assumptions, Hypothesis 1 (H1) is as follows:

H1: The relation between objective and perceived waiting time is described by a marginally decreasing psychophysical function rather than a linear function. The coefficient of the function, β_1, is greater than zero and smaller than one.

Waiting-Time Fillers

Waiting-time fillers are generally assumed to affect both perceived waiting time and the evaluation of the wait, depending on the type of filler used (e.g., Hui & Tse, 1996; Taylor, 1994). Several ways of filling waiting-time intervals have been investigated. Table 1 provides a summary of the literature on the effect of fillers on both perceived waiting time and wait evaluation, which is discussed next.

Fillers and perceived waiting time. In the psychophysical literature, Ornstein (1969) argued that perceived duration increases with the complexity of stimuli presented during a time interval. Fraisse (1984) assumed that the number of stimulus changes affects time perception in a similar way. Hogan (1978) assumed that there exists an optimal level of complexity, implying that simple stimuli (e.g., easy-listening music) may reduce perceived duration but complex stimuli (e.g., participants performing a difficult task during the wait) might increase it.

Research in the services marketing literature has shown that the effect of time fillers on perceived waiting time is generally small (Durrande-Moreau, 1999) and seems to depend on the context studied and the type of experiment used (i.e., laboratory or field). Note, however, that all studies in her overview used linear relations between perceived and objective waiting times, which might have been inappropriate, as argued in the previous section. Katz et al. (1991) reported a negative effect of duration information on perceived waiting time, which they explained by the fact that information about the expected wait duration either reduced the overestimation of waiting time or made people more aware of the exact wait length. Hui and Zhou (1996) stated that waiting-time information releases people from the cognitive effort of processing the passage of time themselves, resulting in shorter perceived durations. The latter argument fits Hogan's (1978) hypothesis, mentioned previously.

Pruyn and Smidts (1998) reported that television entertainment during the wait extends the perceived waiting time. In contrast with the latter study, Tom et al. (1997) showed that musical entertainment shortened perceived waiting time in one of their experiments. Because television provides more complex stimuli than music, Hogan's (1978) hypothesis may explain these results.

Based on the previous overview, there is evidence for waiting-time information to shorten perceived waiting time. Because information about the length of the queue is similar to duration information, we expected this factor also to reduce perceived waiting time. With regard to the other type of fillers, no conclusive evidence has been found. From this, Hypothesis 2 (H2) follows:

H2: Information on wait duration and/or queue length reduces perceived waiting time.

Fillers and evaluation of waiting time. Table 1 shows that time fillers may positively affect waiting-time evaluation. The authors of two studies (Hui, Dube, & Chebat, 1997; Pruyn & Smidts, 1998) reported positive effects of entertainment, such as television programs and music. Both Hui and Tse (1996) and Hui and Zhou (1996) showed positive effects of information about expected duration on wait evaluations. The latter result may be explained by the fact that people feel less stressed due to this information (Osuna, 1985; Unzicker, 1999). Hui and Tse also reported a positive effect of information about the length of the queue in a long-wait condition (10–15 min). Note, however, that Hui and Tse did not control for the effect of perceived waiting time.

This study focused on how fillers might moderate the effect of perceived duration on consumer wait evaluation. Recent research showed duration neglect for time spent on activities and experiences (Kahneman, 1994). Rather, the quality of one's experiences affected the evaluation of an episode. This is consistent with the idea of changing waiting time

TABLE 1
Overview of Studies on Waiting-Time Fillers

Study	*Context*	*Type of Experiment*	*Waiting-Time Fillers*	*Perceived Waiting Time*[a]	*Wait Evaluation*[a]
Hui and Tse (1996)	Signing up for university courses	Laboratory	Information on waiting times	0	+
			Queue information	0	+
Hui and Zhou (1996)	Signing up for university courses	Laboratory	Information on waiting times	0	+
Hui, Dube, and Chebat (1997)	Signing up for university courses	Laboratory	Music	NA	+
Katz, Larson, and Larson (1991)	Banking	Field	News	0	0
			Information on waiting times	–	0
Pruyn and Smidts (1998)	Hospitals	Field	Entertainment	+	+
Tom, Burns, and Zeng (1997)	Telephone communication	Laboratory	Music	–/0	NA

[a]0 = No filler effect found; + = positive effect found; – = negative effect found; NA = effect not available.

into experienced waiting time by entertaining, enlightening, and engaging the consumer (Katz et al., 1991). We thus expected that music during the wait would reduce the effect of perceived duration on wait evaluation.

In contrast, the effect of information about expected waiting time and the queue length may increase the negative effect of perceived duration on wait evaluation. The rationale for this moderating effect is that the information provided makes consumers more aware about the fact that they are waiting. Hence, the negative effect of perceived duration on wait evaluation increases. From this, Hypothesis 3 (H3) and Hypothesis 4 (H4) follow:

H3: Information on wait duration and queue length increases the negative effect of perceived duration on wait evaluation.

H4: Music during waiting reduces the negative effect of perceived duration on wait evaluation.

Acceptable waiting time and wait evaluation. There is considerable evidence of a negative effect of perceived waiting time on the consumer's wait evaluation (Pruyn & Smidts, 1998). Besides this direct effect, it is important to notice that both expectations and outcomes influence customer evaluations (Anderson & Sullivan, 1993; Oliver, 1980). Kumar, Kalwani, and Dada (1997) offered their participants waiting-time guarantees. They found that satisfaction with the wait was relatively positive if the waiting time was actually shorter than the guaranteed time limit. This result pointed to the asymmetry in the evaluation of positive and negative outcomes with respect to a certain reference point. The evaluation of negative outcomes with respect to a reference point is generally convex and relatively steep, whereas for positive outcomes it is concave and relatively flat (e.g., Anderson & Sullivan, 1993; Kahneman & Tversky, 1979). LeClerc, Schmitt, and Dubé (1995) also found asymmetric effects with respect to the value of time in hypothetical situations. Expectations may further depend on the consumer's experience with the service and situational circumstances, for example, busyness and time of day. However, rather than expectations, it may be people's aspirations that serve as reference points in evaluating outcomes. For example, one may expect to wait for 1 min, although one would find a 3-min wait still acceptable. In this case, a 2-min wait would result in dissatisfaction if it were to be compared with one's expectation but it would result in satisfaction if it were to be compared with one's aspiration or acceptable wait length. In accordance with this idea, we expected waiting times that were longer than what people found acceptable to be evaluated lower compared with waiting times that were shorter than the acceptable waiting time. Both Houston, Bettencourt, and Wenger (1998) and Pruyn and Smidts (1998) considered the difference between acceptable waiting time and perceived waiting time (i.e., disconfirmation). However, neither of these studies considered the asymmetry of positive and negative differences. Because we considered both acceptable and perceived waiting times in logarithmic form, Hypothesis 5 (H5) is stated as follows:

H5: The effect of a negative difference between (the logarithms of) acceptable and perceived waiting time on wait evaluation will be larger in an absolute sense than the effect of a positive difference.

Cost of waiting and wait evaluation. We assumed that the cost of waiting would have similar effects on consumer behavior as search costs (cf. Ratchford, 1982). That is, a higher monetary waiting cost should result in a lower willingness to wait (e.g., Urbany, 1986). Houston et al. (1998) reported that waiting costs negatively affected consumer wait evaluations. Hence, because the cost of waiting generally increased with wait duration, monetary waiting costs moderated the effect of perceived waiting time on wait evaluations. This led to Hypothesis 6 (H6):

H6: Monetary waiting costs will increase the negative effect of perceived duration on wait evaluation.

Evaluation Model Equation 2 relates the evaluation of individual i (u_i) to perceived waiting time (ψ_i,) and the difference between the logarithms of acceptable waiting time (ζ_i) and perceived time. The dummy (τ_i) equals 1 if acceptable time exceeds perceived waiting time (positive disconfirmation) and is 0 elsewhere (negative disconfirmation). The dummy captures a constant effect of positive disconfirmation (Galanter, 1990). In addition to a constant effect of positive disconfirmation, the magnitude of disconfirmation affects wait evaluation. In line with H5, the effect of the difference between (the logarithms of) acceptable and perceived time is asymmetric for positive and negative disconfirmation.[1] Hence, these differences have different coefficients in each case. Furthermore, to allow for marginally decreasing evaluations, a single-logarithmic specification is used (Tversky & Kahneman, 1991). Because evaluations were measured on category rating scales, a single-logarithmic rather than a double-logarithmic specification was preferred:[2]

[1]Had the effect been expected to be symmetric, either β_4 or β_5 against the term in parentheses and without any τs for dummy variables would have sufficed.

[2]Stevens (1957) assumed that the JNDs increased with the size of the sensation, which resulted in the power law. However, when evaluations are measured on a category rating scale, the power law may not hold. In particular, because people will maximize the information value of their ratings, the intervals between scale points will be perceived as equally spaced on the scale range (Buyze, 1982; Van Praag & Frijters, 1999). In this case, the JNDs are independent of the size of the sensation. Hence, a single-logarithmic specification was adopted here.

$$u_i = \alpha_2 + \beta_2 \ln\psi_i + \beta_3\tau_i + \beta_4\tau_i(\ln\zeta_i - \ln\psi_i) + \beta_5 (1 - \tau_i)(\ln\zeta_i - \ln\psi_i) + \varepsilon_{2i} \quad (2)$$

The β coefficients capture the effect sizes of the variables, α_2 is a constant term, and ε_{2i} is a normal error term. The fillers and waiting costs affected the shape of these coefficients according to the hypotheses. In our analyses, we estimated the main effects of fillers and waiting costs first. The interaction effects of perceived waiting time with both fillers and waiting costs was estimated in a different analysis.

EXPERIMENTS

Overview of Experiments

Two experiments were conducted to test the hypotheses. H1, H5, and H6 were tested in Experiment 1. H2, H3, H4, and again H5 were tested in Experiment 2. Hence, Experiment 2 mainly focused on the effect of waiting-time fillers. Both experiments took place in several medium and large cities in The Netherlands in a field laboratory setting. A quota sampling procedure was used in both experiments. In a busy shopping area, participants who had some experience with information requests by telephone were asked to join the researcher in a mobile office, to call a phone number, and then to request an information brochure from a financial institution. The participants were told that they would receive a monetary reward of Dfl 5 (Dutch guilders; approximately $2). After completing the task, respondents were presented with a questionnaire about their perception of wait duration and evaluation of the wait. The experiment lasted about 15 min on average.

The measures of perceived waiting time, acceptable waiting time, and evaluation of the wait are described in the Appendix and were the same across the two experiments. The six wait evaluation items were adapted from Hui and Tse (1996). The specific procedures and the results of the two experiments are discussed separately.

Experiment 1

Procedures. The first study included 179 participants. A 6 × 2 complete factorial design was employed, including 10-, 20-, 30-, 60-, 120-, and 180-sec waits and either a toll-free 800 number or a 900 number that cost Dfl 1 (approximately $0.40) per minute. Participants in the 900 condition were told that their promised monetary reward would be reduced by the telephone rate. A manipulation check with our participants showed that 88% of participants in the 800 condition agreed with the statement that the (zero) cost was in line with the service provided, whereas only 21% of the participants calling the 900 number did so ($p < .05$).

The coefficient alpha of the evaluation scale was .90, which is considered reliable (Nunnally, 1978). Results of an exploratory factor analysis provided evidence for a unidimensional scale with roughly equal component scores. Hence, the scores of the multiple-item scales were summed to form a wait evaluation index.

Estimation. Ordinary Least Squares (OLS) was used to estimate equations (1) and (2). In the first instance, all experimental conditions were pooled. To control for the effect of monetary costs, a dummy for the type of number called was included (toll number = 1 if the participant called a toll number; 0 if the participant called a toll-free number). In the second instance, the moderating effect of waiting costs was tested with the Chow test (Pindyck & Rubinfeld, 1998), after (2) was estimated separately for the toll-free condition and the toll condition.

Results. Table 2 shows the average perceived waiting times and wait evaluations in each waiting-time condition. It appeared that waiting times up to 30 sec were overestimated by about 100%. For longer waits, the overestimation appeared to be relatively small. Furthermore, waits were evaluated as more negative the longer the waiting time. The main effects of wait duration on both perceived waiting time, $F(5, 169) = 75.76$,

TABLE 2
Perceived Waiting Times and Wait Evaluations by Objective Waiting Time of Experiment 1

	Perceived Waiting Time (sec)						*Wait Evaluation*					
	Toll-Free Condition		*Toll Condition*		*Total*		*Toll-Free Condition*		*Toll Condition*		*Total*	
Objective Waiting Time (sec)	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
10	28.57	4.67	20.93	4.37	24.75	3.22	5.80	0.28	5.51	0.37	5.65	0.23
20	39.17	8.63	35.36	5.89	37.12	5.00	5.35	0.32	6.11	0.24	5.76	0.21
30	55.33	10.10	64.33	9.13	59.83	6.74	5.41	0.42	4.85	0.40	5.13	0.29
60	93.57	11.64	94.00	10.90	93.79	7.82	4.79	0.49	4.08	0.36	4.42	0.30
120	143.93	17.12	171.18	59.78	158.41	11.21	3.79	0.46	2.88	0.46	3.31	0.33
180	212.00	14.71	248.00	23.87	230.00	14.17	2.87	0.45	3.15	0.51	3.01	0.33
Total	98.22	8.62	108.81	10.01	103.67	6.63	4.63	0.20	4.37	0.20	4.49	0.14

Note. Columns 2, 4, and 6 show the average perceived waiting time per condition. Columns 8, 10, and 12 show the average wait evaluation per condition on the six 7-point scales listed in the Appendix.

$p < .01$, and wait evaluation, $F(5, 169) = 16.10$, $p < .01$, were significant. Neither the main effects of toll versus toll-free numbers nor the interaction effects were significant.

H1 implies that perceived waiting time is a double-logarithmic rather than a linear function of objective time. However, one cannot compare the fits of two such models (e.g., one linear, one double logarithmic) on some statistical basis (e.g., R^2s or Akaike criterion) because the dependent variables are different. In particular, the distributions of linear perceived and objective time variables will be skewed, whereas their logarithmic transformations will be distributed more symmetrically. With a Box–Cox transformation, the double-logarithmic equation can be compared with the double-linear equation. The Box–Cox transformation amounts to dividing each dependent variable by its geometric mean, estimating the two equations again, and choosing on the basis of smallest residual variance (Maddala, 1977). The residual variance of the double-logarithmic specification was 53.33, whereas for the double-linear specification, it was 89.92. Because the residual variance of the double-logarithmic specification was the smallest, this specification was preferred.

The estimation results of equation (1) are shown in the first two numeric columns of Table 3. The regression coefficient for waiting time was 0.84, indicating a marginally decreasing psychophysical function for time; that is, as time increased, estimated waiting time increased, but in log scale, so the rate of increase became smaller with time. The size of the coefficient is crucial for the shape of the psychophysical function. In fact, a coefficient equal to 1 implies a linear relation between perceived and objective time. A Wald test for restricting the waiting-time coefficient to 1 yielded a chi-square of 14.16 ($p < .01$), implying rejection of this restriction (Davidson & MacKinnon, 1993). Hence, we found support for H1. Notice that because the coefficient could be interpreted as an elasticity, it appeared that a 100% increase in objective duration corresponded to an 84% increase in subjective waiting time.

The estimated coefficients of equation (2) are reported in the last two numeric columns of Table 3. Perceived waiting time was not significantly related to wait evaluation directly ($p > .10$). However, when perceived time was taken as the deviation from the reference point (acceptable time), it turned out to be significant. Relatively negative outcomes (logarithm of actual perceived time larger than the logarithm of acceptable time) had a large negative effect on wait evaluations (–1.07, $p < .01$), whereas relatively positive outcomes had a smaller, positive effect (0.40, $p < .05$). The absolute effect of relatively negative outcomes appeared to be significantly larger, $\chi^2(1, N = 166) = 5.11$, $p < .05$, than for relatively positive outcomes, supporting H5.[3]

In examining the moderating effect of monetary waiting costs, we found significant differences between the model for the toll-free condition and the model for the toll condition, $F(3, 160) = 2.78$, $p < .05$. With regard to the coefficients, the effect of perceived waiting time in the toll condition (–0.37) was significantly larger in magnitude than in the toll-free condition (0.14; $t[164] = 2.37$, $p < .01$, not reported in Table 3). Also, the effect of positive disconfirmation was larger in the toll condition than in the toll-free condition (1.10 vs. 0.00; $t[164] = 3.04$, $p < .01$). These findings both support H6.

Experiment 2

Procedure. In the second experiment, 236 consumers participated. This study employed a 3 × 4 complete factorial design, including 40-, 80-, and 120-sec waits, and several fillers of the waiting time (a music theme from *Titanic* by Celine Dion, wait duration information, queue information, and absolute silence). Only a toll-free 800 number was provided.

The wait duration information differed for different wait lengths but otherwise remained constant. For 40-sec waits, participants repeatedly (at fixed time points during the wait) heard a message that the average waiting time was about 1 min. For 80- and 120-sec waits, the announced average waiting times were 2 and 3 min, respectively. The announced waiting times were higher than the actual waiting time to avoid indiscriminate or automatic recall of the information provided, which would have resulted in obviously correct perceived waiting-time estimates.

The queue information was adjusted to the remaining actual length of the wait. At the beginning of the wait, participants were told that they were *n*th in line. At variable time points during the wait, *n* was reduced. At the beginning of the 40-, 80-, and 120-sec waits, *n* was 3, 6, and 9, respectively.

The wait evaluation scale was again reliable with a coefficient alpha of .90. Also, a factor analysis provided evidence for a unidimensional scale.

Estimation. OLS regression was used again to estimate both equaitons (1) and (2). In the first instance, all experimental conditions were pooled, and dummies were included to assess the main effects of the different fillers on subjective waiting time. In the second instance, to assess the moderating effect of the fillers, we used the dummies in interaction with perceived waiting time, in line with our hypotheses.

Results. The results of Experiment 2 showed overestimation of telephone waiting times (Table 4, first eight numeric columns). Information about the expected waiting time tended to reduce the overestimation effect. An analysis of variance (ANOVA) showed a large main effect of objective

[3]These findings are in agreement with Galanter's (1990) results. He found exponents of –0.55 and 0.45, respectively, for monetary losses and gains. Furthermore, the dummy for positive outcomes had a positive coefficient, which is consistent with Galanter's finding of a higher constant term for monetary gains than for losses.

TABLE 3
Regressions of Subjective Waiting Time and Wait Evaluation of Experiment 1

	Subjective Waiting Time[a]		*Wait Evaluation*[b]	
	Coefficient	*t*	*Coefficient*	*t*
Constant	1.00	5.23**	4.40	8.23**
Log of objective waiting time	0.84	19.74**		
Toll number (dummy for Experimental condition)	0.01	0.13		
Log of perceived waiting time			–0.12	1.04
Acceptable waiting time higher than perceived waiting time (dummy)			0.81	2.85**
Positive difference between log of acceptable waiting time and log of perceived wait			0.40	1.99*
Negative difference between log of acceptable waiting time and log of perceived wait			–1.07	6.28**

[a]Model evaluation: adjusted $R^2 = .69$; $F = 198$, $p < .01$. [b]Model evaluation: adjusted $R^2 = .60$; $F = 60$, $p < .01$.
$*p < .05$. $**p < .01$.

TABLE 4
Perceived Duration and Wait Evaluation by Filling of the Waiting Time and Actual Duration

	Perceived Waiting Time by Condition (sec)								*Evaluation of Waiting Time by Condition (Ratings)*							
	40		*80*		*120*		*Total*		*40*		*80*		*120*		*Total*	
Method of Filling the Waiting Time	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
No filling (silence)	83	10	153	15	207	30	147	13	4.14	0.31	3.15	0.25	2.83	0.31	3.38	0.18
Music	75	15	139	23	195	16	137	12	4.39	0.35	3.72	0.38	3.29	0.36	3.79	0.21
Queue information	87	11	123	67	207	19	139	11	4.90	0.31	3.65	0.36	2.91	0.30	3.82	0.21
Information about expected waiting time	67	8	120	16	140	13	109	8	4.53	0.29	3.37	0.30	3.28	0.38	3.73	0.20
Total	78	6	133	9	187	10	133	6	4.49	0.16	3.47	0.16	3.08	0.17	3.68	0.10

Note. Columns 2, 4, and 6 show the average perceived waiting time per condition. Columns 12, 14, and 16 show the average wait evaluation per condition on the six 7-point scales listed in the Appendix.

time, $F(2, 223) = 43$, $p < .01$; a small effect of waiting-time fillers, $F(3, 223) = 3.00$, $p < .05$; and no interaction effect.

Table 5 shows the results of the double-logarithmic regression of perceived waiting time on objective waiting time and waiting-time fillers. The coefficient of objective waiting time was 0.84, which was identical with the result obtained in Experiment 1. A Wald test for the restriction of this coefficient to 1 yielded a chi-square of 4.57 ($p < .05$), implying the rejection of this restriction. Information about expected waiting time was the only waiting-time filler that significantly reduced perceived waiting time. Hence, H2 was partially supported.

The last eight columns of Table 4 show the evaluations of waiting times filled in different ways. An ANOVA resulted in a significant main effect of objective waiting time, $F(2, 224) = 20.09$, $p < .01$; no significant effect of fillers, $F(3, 224) = 1.23$, $p > .10$; and no significant interaction effect, $F(6, 224) = 1.46$, $p > .10$.

The last two columns of Table 5 show the effects of waiting-time fillers and other variables on the evaluation of the wait. In addition to a significant negative effect of perceived waiting time on wait evaluation, the asymmetric effect of perceived waiting time, taken as the deviation from acceptable waiting time, was replicated. The absolute coefficient of negative disconfirmation was larger (0.73) than the effect of positive disconfirmation (0.59). However, this result was not statistically significant, $\chi^2(1, N = 232) = 0.10$, $p > .10$. Hence, H5 was not supported in Experiment 2.

Table 5 also shows the main effects of waiting-time fillers on wait evaluation. Music had a significant positive effect on wait evaluation; the other two fillers were not significant. Rather than main effects, our hypotheses pertained to moderating effects of the fillers, which are reported in Table 6.

Table 6 shows significant interaction effects of perceived duration with both information on wait duration and queue information. For both types of information, the constant terms were significantly higher than zero, and the interaction effect of wait duration information with perceived duration on wait evaluation was significantly more negative than for the no-filling condition. The interaction effect of queue information with perceived duration was only significant at the .10 level. Thus, H3 was only partially supported. That is, wait duration information increased the negative effect of perceived duration on wait evaluation. For music, the constant term was slightly higher, whereas the effect of perceived duration was almost equal to that in the no-filling condition. That is, music had an almost constant effect of slightly improving the wait evaluation. Thus, H4 was not supported.

The moderating effects of the fillers on wait evaluations are shown graphically in Figure 1. Figure 1 shows how the fillers influenced the effect of perceived waiting time on wait

TABLE 5
Regressions of Subjective Waiting Time and Wait Evaluation of Experiment 2

	Subjective Waiting Time[a]		*Wait Evaluation*[b]	
	Coefficient	*t*	*Coefficient*	*t*
Constant	1.22	3.68**	5.42	7.47**
Log of objective waiting time	0.84	11.24**		
Log of perceived waiting time			–0.43	2.99**
Acceptable waiting time higher than perceived waiting time (dummy)			0.31	0.96
Positive difference between log of acceptable waiting time and log of perceived wait			0.59	2.06*
Negative difference between log of acceptable waiting time and log of perceived wait			0.73	4.06**
Music during waiting (dummy for experimental condition)	–0.08	0.88	0.47	2.03*
Queuing information (dummy for experimental condition	–0.01	0.12	0.34	1.56
Information about expected waiting time (dummy for experimental condition)	–0.27	2.85**	0.15	0.70

[a]Model evaluation: adjusted $R^2 = .38$; $F = 35$, $p < .01$. [b]Model evaluation: adjusted $R^2 = .44$; $F = 24$, $p < .01$.
$*p < .05$. $**p < .01$.

TABLE 6
Regression Results for Different Waiting Conditions in Experiment 2

	Coefficient	*t*
Constant	3.95	2.95**
Log of perceived waiting time	–0.12	0.44
Acceptable waiting time higher than perceived waiting time (dummy)	0.36	1.09
Positive difference between log of acceptable waiting time and log of perceived wait	0.50	1.70
Negative difference between log of acceptable waiting time and log of perceived wait	0.72**	3.89**
Duration information (dummy for experimental condition)	3.51	2.22*
Queue information (dummy for experimental condition)	2.89	1.86
Music (dummy for experimental condition)	1.16	0.68
Duration Information × Log of Perceived Waiting Time	–0.72	2.17*
Queue Information × Log of Perceived Waiting Time	–0.54	1.67
Music × Log of Perceived Waiting Time	–0.14	0.39

Note. Model evaluation: adjusted $R^2 = .45$; $F = 17.81$, $p < .01$.
$*p < .05$. $**p < .01$.

evaluation, given the effects of disconfirmation. It appears that the slopes of the regression lines for music and the no-filling condition were almost zero, indicating a constant effect of perceived waiting time on wait evaluation. However, for the two information conditions, the slopes were both negative, indicating that information moderated the effect of perceived waiting time on wait evaluation; that is, it increased the negative effect.

DISCUSSION, LIMITATIONS, AND FUTURE RESEARCH

Discussion

The correct specification of perceived waiting time is important, for both research and marketing practice. For research, the true differences between the effects of different fillers on the perception of waiting time may be wrongly detected when the empirical model for time perception is misspecified. For practice, it makes a difference whether the marginal perception of time is increasing or decreasing. In both experiments, the marginal perception decreased with a coefficient of 0.84. Hence, efforts to reduce nominal waiting time will have a marginally increasing effect on length perception. That is, any further decrease of nominal waiting will be perceived as larger than the previous decrease of the same size.

Furthermore, fillers of the waiting time had different effects on time perception and wait evaluation. Information about the expected waiting time reduced the overestimation effect. Because perceived waiting time had a negative effect on wait evaluation, the indirect effect of duration information on wait evaluation was positive. However, there might be possible negative side effects of fillers. Both queue information and duration information increased the negative effect of perceived waiting time on wait evaluation. On average, however, the effect of information on wait evaluation did not differ from the control condition. As Figure 1 shows, the effect of information was relatively positive for waiting times shorter than 20 sec. However, for waiting times longer than 90 sec, the effect of information became more negative than the control condition.

With regard to the effect of music, the possibility of duration neglect was investigated. No strong evidence was found for duration neglect, as music did not reduce the negative effect of perceived

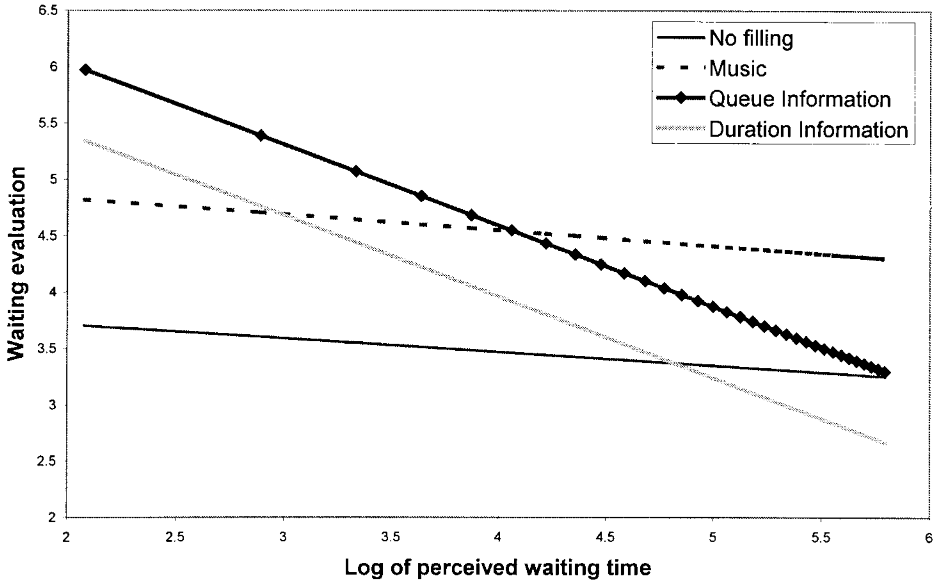

FIGURE 1 Moderating effects of fillers on wait evaluation

waiting time on wait evaluation. However, apart from duration effects, the distribution of experiences during the wait might affect wait evaluations. In particular, a peak-and-end rule for wait evaluations might be assumed (Kahneman, 1994). The peak-and-end rule assumes that people evaluate their experiences on the basis of both the most extreme and the final episodes. A happy ending of the waiting time, for example, a very nice musical theme, may lead to even better wait evaluations, even if it takes a few extra seconds to listen to this happy end. Also, the end of the waiting time itself may cause a happy ending, although alternatively one might consider this the beginning of a new episode (service time).

Finally, the monetary costs of waiting increased the negative effect of perceived waiting time on wait evaluations. If consumers have to pay for waiting, they will be less willing to wait. This result is consistent with Rappoport and Taylor (1997), who found negative own-price elasticities with respect to the total toll minutes called. That is, demand for toll calls is negatively related to price.

Research Limitations

Our study was limited to the context of telephone communication, where waiting times usually are short compared with, for example, waiting times in hospitals (e.g., Pruyn & Smidts, 1998). Hence, our study might be extended to other waiting contexts. This would also provide a test of whether psychophysical relations also hold for longer waiting times (i.e., 10–20 min).

Future Research

The following issues for further research may be considered. First, research might focus on actual behavior. By using data from telephone companies, researchers may investigate behavioral responses, such as quitting, in a real-life setting. In real life, involvement will be higher than in an experiment, possibly resulting in more dramatic effects, for example, with respect to price. One anonymous referee suggested studying a reverse cost effect, that is, providing participants with money if the wait exceeds the expected time. This seems to be an interesting extension of waiting-time guarantees (Kumar et al., 1997).

Second, future research might study the effect of filler combinations, for example, music combined with duration information, and new types of fillers, for example, commercials or comic pieces. Also, freedom of choosing the type of filler should result in information about consumer preferences with respect to filler types. Third, although we did not find duration neglect for waits filled with music, it might be worthwhile to study the effect of the distribution of experiences during the wait.

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APPENDIX

Questions

1. Perceived waiting time. "About how long do you think you had to wait from the moment you heard that all operators were busy until the moment you were being served by the operator (waiting time in seconds)?"

2. Acceptable waiting time. "How long do you think is the maximum acceptable waiting time for calling the Plus Bank in order to obtain the Saving Plus information leaflet (in seconds)?"

3. Wait evaluation. "Now I ask you to describe your feelings concerning the waiting time you have faced. Please use the 1–7 scale on the card. Giving a higher mark indicates your opinion that the word stated on the right-hand side of the scale is a better description of your feelings concerning your wait on the phone."

Annoying	1 2 3 4 5 6 7	Pleasant
Boring	1 2 3 4 5 6 7	Varied
Unsatisfactory	1 2 3 4 5 6 7	Satisfactory
Irritating	1 2 3 4 5 6 7	Not irritating
Long	1 2 3 4 5 6 7	Short
Unacceptable	1 2 3 4 5 6 7	Acceptable

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