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## Hedonic Intensity of Disappointment and Elation

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**ABSTRACT.** This research is an investigation of the hedonic intensities of elation and disappointment following the outcomes of risky gambles using two principles: *disappointment aversion* and the *principle of limited emotion processing*. Disappointment aversion implies a stronger impact of disappointment compared with elation; the principle of limited emotion processing predicts a smaller impact of elation if it occurs with a real gain, and a smaller impact of disappointment if it occurs with a real loss. Both principles support each other in the gain domain but operate against each other in the loss domain. It was predicted that disappointment would outweigh elation in the gain domain. For the loss domain, this question was left open to empirical scrutiny. Participants were provided with hypothetical gambles and were required to imagine having won, not won, lost, or not lost, money. Results supported the prediction for the gain domain; mixed results emerged for the loss domain. The model adds to the understanding of the cognitive and emotional processes following the outcomes of risky events.

**Key words:** affect, decision making, disappointment, emotions

EMOTIONS are the spices of our daily lives. They evaluate our ongoing actions, color our choices, and give us feedback on whether the decisions we have made have turned out favorably or not. Emotions warn us when it is time to give up an unrealistic expectation, or they enhance our belief that clinging to an illusion will bring desired results; and whenever there is a confrontation between expectations and real-life events, the emotions of elation and disappointment serve as checks. Specifically, disappointment is supposed to arise if expectations have not

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been met. Whether the beloved flame does not yield to one's overtures or the lottery ticket turns out to be a miss, disappointment is likely to follow. But when our overtures succeed or the lottery ticket turns out to be worth \$10,000, expectations have been met and elation may occur.

Several authors (Bell, 1985; Loomes & Sugden; 1986; Mellers, Schwartz, Ho, & Ritov, 1997; Mellers, Schwartz, & Ritov, 1999) have incorporated disappointment and elation into a theory of choice, and these emotions are postulated to follow the verification or falsification of an expectation (see also Van Dijk, Zeelenberg, & Van der Pligt, 1999; Zeelenberg, Van Dijk, Manstead, & Van der Pligt, 1998; Zeelenberg, Van Dijk, Van der Pligt, Manstead, Van Empelen, & Reinderman, 1998). If a lottery ticket turns out to be a miss, one's hopes to win were wrong and disappointment will follow because a big win was not obtained. However, if the ticket turns out to be a hit, expectations did come true and elation may be overwhelming.

With the lottery example, we tacitly assumed that the person did not have to pay for the ticket. Therefore, frustration (regret) about having paid the costs for a useless lottery ticket, or joy (rejoicing) about having fortunately bought a winning ticket, can be neglected. Hence, disappointment theories capture only affective reactions within one risky event and neglect comparisons to other alternatives. Moreover, the lottery example points to another relevant issue for the question under investigation. Assuming that the ticket was free, not winning implies that the person's status quo has not changed. Consequently, disappointment is the only emotion following disillusioned hopes. After winning, however, two emotions are likely to occur: The person may be happy about the real money won and may also feel elated about having avoided the zero outcome. In sum, in the gain domain, in which a person can either only win or not win, elation is accompanied by the joy about having won real money, whereas disappointment is the only emotion arising after not having won.

This pattern changes for the loss domain, in which a person can either only lose or not lose. If influenza is going to affect a large proportion of the population, elation is likely if you are still healthy after the wave is over. At this point, elation is the only emotion to occur. However, if the flu has affected you, in addition to the pain coming from the flu itself, you may be disappointed because you are not healthy during the time spent in bed. Again, ignoring regret effects implies that comparisons with other healthy people are negligible.

Analogously, imagine a gamble in which one can lose money with some probability and nothing otherwise. Not losing implies that the status quo has not changed. Hence, elation is the only emotion following the outcome of the gamble. Two emotions are likely to occur after losing: frustration about the real money lost and disappointment about not having obtained the zero outcome. For the loss domain these considerations therefore suggest an opposite pattern compared with the gain domain. Taken together, in the gain domain no more than disappointment occurs, whereas elation is accompanied by the joy about

a heightened status quo. In contrast, in the loss domain only elation occurs, whereas disappointment is accompanied by the frustration about a reduced status quo.

### *Two Guiding Principles*

If we elaborate further on disappointment and elation, the question of the relative strengths of both emotions arises. A few researchers have addressed this question and the picture offered is mixed. Some found a stronger influence of disappointment compared with elation (Inman, Dyer, & Jia, 1997; Mellers et al., 1997, 1999, Experiments 1 and 3), but other data showed no difference (Mellers et al., 1999, Experiment 2). It seems, however, that more results tend to support disappointment over elation.

On a more general level, the picture is less ambiguous. Much research within psychology corroborates a stronger influence of negative compared to positive emotions (for a review, see Taylor, 1991). When people form impressions of others, negative information is usually more heavily weighted than positive (e.g., Anderson, 1965). Negative events evoke more causal attributions than positive events (e.g., Weiner, 1986); negative mood causes more systematic elaboration of complex messages than positive mood (e.g., Bless, Bohner, Schwarz, & Strack, 1990; Schwarz, 1990); and a specific money amount causes more displeasure when lost than pleasure when gained (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992)—that is, financial losses loom larger than financial gains.

Based on this evidence, we assume in this article a stronger impact of disappointment compared with elation. In comparison to loss aversion (Kahneman & Tversky, 1979), we refer to the supposed higher impact of disappointment compared with elation as *disappointment aversion*. However, another principle may be able to dilute or even reverse disappointment aversion in a predicted way.

To predict hedonic intensities, we suggest the *principle of limited emotion processing*. This principle stands in direct analogy to the well known finding that individuals possess limited cognitive information processing capacity (Simon, 1957). For example, a person's short-term memory usually embraces information chunks only at a specific point of time (Miller, 1956). Additional incoming information is likely to displace older information chunks. We suggest, however, that this mechanism also lends itself to the processing of emotional experiences. If different emotions compete for attention, they must share limited processing capacity. As a consequence, their hedonic intensities will be reduced.

For example, achievement motivation is usually thought of as two separate tendencies, namely, hope for success and fear of failure (Atkinson, 1957). In this model both tendencies are assumed to sum up to 1, that is, the higher one tendency, the lower the other, and vice versa. In sum, the principle of limited emotion processing postulates limited processing capacity. If several emotions arise simultaneously, they have to share this limited capacity. Although the sum of the

intensities is constant, the more emotions that arise, the lower the hedonic intensity of each single emotion.

To summarize: As argued here, after a person has not won, only disappointment occurs, whereas after winning, both elation and joy about a heightened status quo are likely. Disappointment aversion additionally implies a stronger impact of disappointment than of elation. Hence, disappointment aversion and the principle of limited emotion processing support each other in the gain domain, and disappointment is unequivocally predicted to loom larger than elation.

In the loss domain, after one has not lost, just elation occurs, whereas after losing, both disappointment and frustration about a reduced status quo are likely. Disappointment aversion again implies that disappointment outweighs elation. Disappointment aversion and the principle of limited emotion processing operate in opposite directions. Although disappointment may loom larger than elation, the simultaneous occurrence of disappointment with another emotion may dampen its intensity. Therefore it remains an empirical issue whether the supposed stronger impact of disappointment may compensate for its reduced impact resulting from the co-occurrence with frustration. Taken together, whereas in the gain domain disappointment is predicted to outweigh elation, in the loss domain the relative strengths of both emotions remain an empirical question.

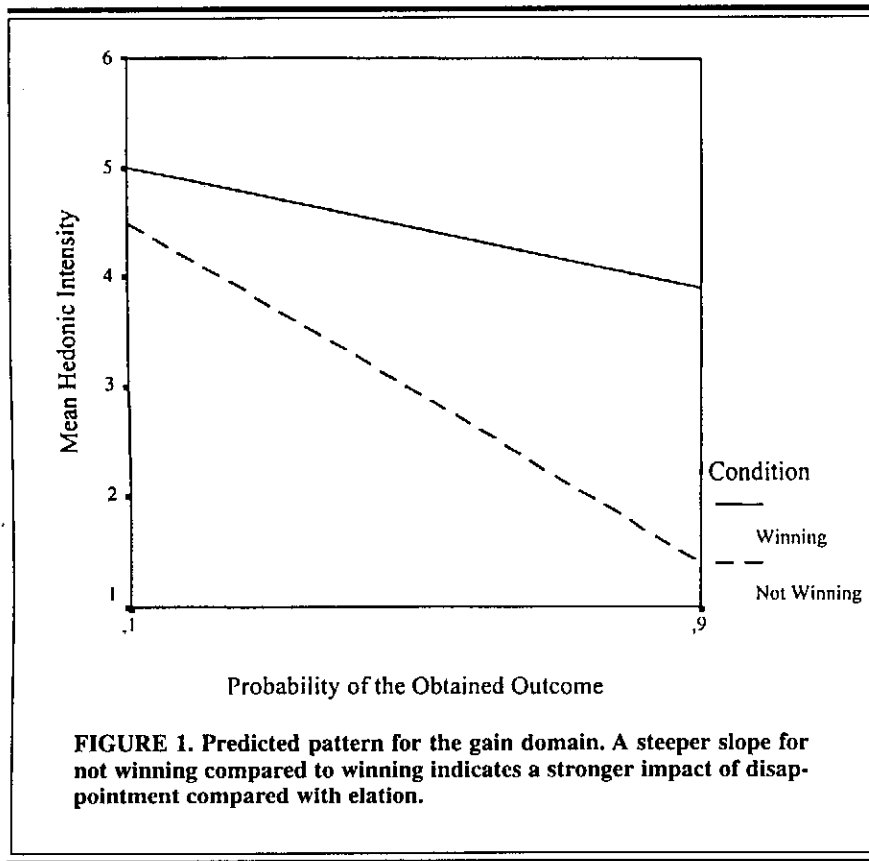
In our present research, we examined the hedonic intensities of elation and disappointment for both the gain and the loss domains. For the gain domain, we predicted a stronger intensity of disappointment than for elation; for the loss domain, this question was left to empirical scrutiny because of the reasoning outlined earlier. In our experiments, participants were provided with hypothetical gambles; they were requested (a) to imagine having won, not won, lost, or not lost the gamble and (b) to state the quality and hedonic intensity of the emotion experienced. Experiments 1 and 2 served as the groundwork, and Experiment 3 was a close replication.

### *Experiments*

We performed three experiments to test our predictions. All the experiments used a 2 (objective probability)  $\times$  2 (change vs. status quo)  $\times$  2 (winning vs. losing) factorial design. Figure 1 summarizes the prediction for the gain domain.

In Figure 1, disappointment outweighs elation because the slope for not winning is steeper than the slope for winning. The same holds true for the loss domain. Disappointment will outweigh elation if the slope for losing is steeper than the slope for not losing. Both criteria allow direct tests of the hypotheses postulated. The remainder of this section describes the rationale for these test criteria in more detail. (Readers less interested in these technical details may skip to the next subsection without loss of continuity.)

From a formal point of view, several theories have addressed disappointment and elation (Bell, 1985; Loomes & Sugden, 1986; Mellers et al., 1999). In order



to derive test criteria for testing the impact of disappointment compared to elation, consider a gamble with two outcomes  $x$  and  $y$ , where  $x > y$  and  $x$  occurs. The person is elated and the emotional response  $R_x$  associated with the larger outcome  $x$  is then

$$R_x = u_x + e|(u_x - u_y)|s(1 - p_x), \tag{1}$$

where  $u_x$  and  $u_y$  are the utilities of the obtained and unobtained outcomes, respectively (see also Brandstätter, Kühberger, & Schneider, 2000). The elation function  $e$  captures the comparison in utilities between the obtained outcome  $u_x$  and the unobtained outcome  $u_y$ . Elation will be higher if the obtained outcome  $x$  is much better than the unobtained outcome  $y$ ;  $s$  is a monotone, nonlinear surprise function defined on  $(1 - p_x)$ . The lower the objective probability  $p_x$  to obtain outcome  $x$ , the more surprising  $x$  is and the higher the hedonic intensity experienced. For a simple gamble where you can win  $\$x$  with probability  $p_x$  and nothing otherwise ( $y = 0, u_y = 0$ ), Equation 1 is reduced to the form shown in the first row of Table 1.

Analogously, if the smaller outcome  $y$  occurs, the person is disappointed and the emotional response  $R_y$  equals

$$R_y = u_y + d|(u_y - u_x)|s(p_x). \tag{2}$$

The worse the obtained outcome  $y$  compared with the unobtained and better outcome  $x$ , the higher disappointment will be. Also, the higher the probability of winning  $x$  has been, the higher the disappointment will be. The function  $d$  is the disappointment function. The second row of Table 1 depicts predicted disappointment for a simple gamble offering  $\$x$  with  $p_x$  and nothing otherwise. In Table 1, hedonic intensities are assumed to be positive numbers so that disappointment  $d(u_x)$  is assumed to be positive too. The third and fourth rows of Table 1 analogously depict disappointment and elation for a gamble where one can lose  $\$(-x)$  with  $p_{(-x)}$  and nothing otherwise. Again, hedonic intensities are assumed to be positive so that  $u_{(-x)}, d(u_{(-x)})$ , and  $e(u_{(-x)})$  are also assumed to be positive.

If disappointment outweighs elation, then  $d > e$ ; otherwise  $d < e$ . But how can the magnitudes of  $d$  and  $e$  be tested? To derive a test criterion for comparing  $d$  and  $e$ , we start by looking at the gain domain.

Figure 1 depicts a  $2 \times 2$  analysis of variance design with hedonic intensity as the dependent variable, winning versus not winning as the first factor, and probability as the second factor. Imagine further that the two objective probabilities  $p_{x1}$  and  $p_{x2}$  sum up to 1—for example .1 and .9.

According to the first row of Table 1, after winning, total hedonic intensity is  $R_x = u_x + e(u_x)s(1 - p_x)$ . After not winning, total hedonic intensity is  $R_y = d(u_x)s(p_x)$  (see second row of Table 1). Both  $R_x$  and  $R_y$  are assumed to be positive. Hence, a main effect between winning and not winning is expected, because winners derive additional utility ( $u_x$ ) from their real win  $x$ . More important, however, are the slopes for winning and not winning.

According to the first row of Table 1, for elation, the weight to capture surprise is  $s(1 - p_x)$ . For any two arbitrary objective probabilities that sum up to 1,

**TABLE 1**  
Predicted Hedonic Intensities Following the Outcomes of Risky Gambles

Outcome	Hedonic intensity for the real payoff	Total hedonic intensity
Winning	$u_x$	$u_x + e(u_x)s(1 - p_x)$
Not winning	0	$d(u_x)s(p_x)$
Losing	$u_{(-x)}$	$u_{(-x)} + d(u_{(-x)})s[1 - p_{(-x)}]$
Not losing	0	$e(u_{(-x)})s[p_{(-x)}]$

*Note.* All utilities  $u$ ,  $d$ , and  $e$  express hedonic intensities and are therefore positive numbers;  $u$  = utility function;  $e$  = elation function;  $d$  = disappointment function;  $s$  = monotone surprise function.

that is,  $p_x$  and  $(1 - p_x)$ , the weights for surprise then are  $s(1 - p_x)$  and  $s(p_x)$ . Analogously, according to the second row of Table 1, for disappointment, the weight to capture surprise is  $s(p_x)$ . The corresponding weights for surprise are then  $s(p_x)$  and  $s(1 - p_x)$ .

The magnitude of the difference for the winning condition,  $s(1 - p_x)$  minus  $s(p_x)$ , is the same as the magnitude of the difference for the not winning condition,  $s(p_x)$  minus  $s(1 - p_x)$ . Therefore, for the winning and the not winning conditions the slopes are expected to be equal but of different orientations. The problem of different orientations can easily be resolved if one exchanges the probability levels on the  $x$  axis for the not winning condition ( $p$  then represents the probability of the obtained outcome). Consequently, probability has an influence on the slopes, but this influence is the same for the winning and not winning conditions. That is, as long as the objective probabilities within each condition sum up to 1, probability may not be able to discriminate between the slopes for the winning and not winning conditions.

The first two rows of Table 1 also reveal that the utility of the gain  $u_x$  is the same for winning and not winning, and  $u_x$  therefore also has no influence on the difference between the slopes.

However, if disappointment looms larger than elation,  $d$  is expected to be larger than  $e$ . If so, the slope for the not winning condition is expected to be steeper than the slope for the winning condition. Taken together, objective probabilities and the utility for the gain  $x$  are not able to yield different slopes for the winning and not winning conditions. If disappointment looms larger than elation ( $d > e$ ), the slope for not winning is expected to be steeper than the slope for winning. A comparison of the slopes therefore offers a direct test of our prediction, which postulates disappointment to outweigh elation in the gain domain.

The same logic holds true for the loss domain, in which a person can lose or not lose money. If disappointment looms larger than elation, the slope for losses is expected to be steeper than the slope for non-losses. By using this method we can test the impact of disappointment compared with elation for the loss domain.

## Method

To test the hedonic intensities of disappointment and elation, we used hypothetical scenarios in which participants were requested to state the imagined hedonic intensities of the feelings they experienced. This procedure has been shown to be valid, and correlations between imagined feelings of hypothetical outcomes and experienced feelings of real outcomes have been found to range between .96 and .98 (Mellers et al., 1999). In this study, to measure hedonic intensities we provided participants with winning and losing gambles in which they could win or lose money with probability  $p$  and nothing otherwise.

## Participants

One hundred sixty-nine students from the University of Linz (71 women, 98 men,  $M = 23.5$  years,  $SD = 3.7$ ) participated in Experiment 1; 200 students (103 women, 97 men,  $M = 21.9$  years,  $SD = 2.1$ ) in Experiment 2; and 125 students (76 women, 49 men,  $M = 22.4$  years,  $SD = 2.6$ ) in Experiment 3. In all three experiments, participants were randomly assigned to one of eight conditions.

## Design and Procedure

Experiment 1 was a  $2$  (change vs. status quo)  $\times 2$  (gain domain vs. loss domain)  $\times 2$  ( $p = .1$  or  $.9$ ) between-subjects design. Each participant was presented with just one gamble described by a probability for a gain or loss and the outcome obtained (change vs. status quo). Experiment 2 was a replication of Experiment 1 and therefore identical to Experiment 1.

Participants imagined drawing from an urn containing 10 balls and having won or not won ATS 1,000 (\$75) in the gain condition, or lost or not lost ATS 1,000 in the loss condition. To avoid framing and salience effects, we stipulated both possible outcomes (change and status quo). Participants were first asked to freely describe their emotions after the draw and then to provide the intensity of these emotions on a Likert-type scale ranging from *no emotion* (0) to *very intense emotion* (7); the latter constituted the key dependent variable. The scenario for the gain condition read:

Imagine you draw a ball from an urn with 10 balls. The urn contains 9 red and 1 blue ball. If you draw a red ball you win ATS 1,000. If you draw a blue ball you win nothing. Now imagine you have drawn a blue ball. As a result, you have not won. Please describe your feeling. Then indicate on the scale below, how intense this feeling is.

In the loss condition, participants could either lose or not lose.

Contrary to Experiments 1 and 2, in Experiment 3 we used a mixed factorial design with probability as a within-subject factor. In addition, Experiment 3 differed from Experiments 1 and 2 in three other respects: Participants could (a) win or lose ATS 1,500; (b) probability levels were .05 and .95; and (c) participants provided the intensity of their emotions on a scale ranging from *no emotion* (0) to *very intense emotion* (11).

## Results

We assumed that disappointment aversion and the principle of limited emotion processing would influence the hedonic intensities of elation and disappointment. Both tendencies are supposed to support each other in the gain domain. Hence, in the gain domain, disappointment was unequivocally predict-

ed to loom larger than elation. In the loss domain, both tendencies were predicted to operate in opposite directions. The question of the relative intensities of both emotions is therefore left to empirical investigation in the loss domain. Technically, disappointment exceeds elation if the slope for disappointment is steeper than the slope for elation (not winning versus winning, losing versus not losing).

The results in fact supported our prediction (see Table 2). In the gain domain, all three experiments corroborated a stronger impact of disappointment compared with elation. In each experiment the slope for disappointment (not winning) was steeper than the slope for elation (winning).

For the loss domain we found mixed results (see Table 3). Whereas Experiments 1 and 3 supported disappointment over elation, Experiment 2 offered the reverse picture. Contrary to Experiments 1 and 3, in Experiment 2 the slope for not losing was steeper than the slope for losing, indicating a stronger impact of elation compared with disappointment.

In Experiment 1,  $F(1, 161) = 3.6$ ,  $p = .06$ , and in Experiment 3,  $F(1, 483) = 5.5$ ,  $p = .02$ , the three-way interactions were significant. Experiment 2 revealed a significant two-way interaction,  $F(1, 192) = 6.1$ ,  $p < .05$ , pointing to a more pronounced influence of winning versus not winning and losing versus not losing.

#### Quality of Affective Experiences

Although operational definitions for disappointment and elation were used, the design also allowed us to check for the specific quality of the emotions experienced. Recall that participants first stated the quality of the emotion they experienced

**TABLE 2**  
Hedonic Intensities for Experiments 1–3 to the Outcomes of Risky Gambles for the Gain Domain

Outcome	Probability of obtained outcome				Slope
	$p = .1 (.05)$		$p = .9 (.95)$		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Experiment 1					
Winning	5.0	1.7	3.9	1.7	1.1
Not winning	3.8	1.9	1.8	1.5	2.0
Experiment 2					
Winning	5.1	1.4	4.9	1.7	0.2
Not winning	4.0	2.2	2.6	1.7	1.4
Experiment 3					
Winning	8.9	2.7	5.6	3.0	3.3
Not winning	7.2	3.5	2.6	3.0	4.6

Note. In Experiments 1 and 2 probabilities are .1 and .9; in Experiment 3, .05 and .95.

**TABLE 3**  
Hedonic Intensities for Experiments 1–3 to the Outcomes of Risky Gambles for the Loss Domain

Outcome	Probability of obtained outcome				Slope
	$p = .1 (.05)$		$p = .9 (.95)$		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Experiment 1					
Losing	6.0	1.3	3.8	2.0	2.2
Not losing	5.6	1.7	4.5	1.5	1.1
Experiment 2					
Losing	4.9	2.0	4.9	1.9	0.0
Not losing	5.2	1.9	3.8	1.9	1.4
Experiment 3					
Losing	9.3	2.6	4.0	3.3	5.3
Not losing	8.6	3.1	4.5	3.0	4.1

Note. In Experiments 1 and 2 probabilities are .1 and .9; in Experiment 3, .05 and .95.

and were then asked to provide its hedonic intensity. For reasons of convenience, we pooled the data of all three experiments. The principle of limited emotion processing predicts disappointment and elation as most prevalent after non-gains and non-losses, respectively. Results showed this pattern precisely. After having not won, participants most often felt disappointed (50% of all responses), indifferent (23%), and angry (18%). After having not lost, participants primarily felt elated (49% of all responses) and happy (24%).

In contrast, after gains, people overwhelmingly felt happy (68%) and, to a much lesser degree, satisfied (13%). After losses people most often were angry (49%) and disappointed (25%). Although non-gains and losses elicited negative emotions, the quality of the emotions experienced differed: Not having won elicited disappointment, but losing primarily elicited anger. A similar pattern held true for positive emotions: Not having lost elicited elation, but winning evoked happiness.

#### Discussion

We investigated hedonic intensities of elation and disappointment following the outcomes of risky gambles. In three experiments, using both between- and within-subjects designs, we obtained different results for gains and losses. In the gain domain, disappointment aversion and the principle of limited emotion processing supported each other. As predicted, disappointment always outweighed elation. Individuals were more disappointed after having not won than they were elated after having won. Disappointment aversion further predicted risk aversion in the gain domain.

Risk aversion implies that individuals choose a sure gain, compared with a simple risky gamble ( $x, p$ ) of equal expected value, in which they can win \$ $x$  with probability  $p$  and nothing otherwise. Because disappointment looms larger than elation, the risky gamble becomes less attractive, which favors choosing the sure gain. In accordance, risk aversion is the usual finding obtained from the gain domain (see Kahneman & Tversky, 1979).

Our results and theoretical reasoning also offer a rationale for the findings of Van Dijk and Van der Pligt (1997). In a series of experiments, these authors investigated gambles in which participants could win \$ $x$  with probability  $p$  and \$ $y$  otherwise. Their results, obtained from the gain domain, divulged an impact of probability on disappointment but not on elation. However, Van Dijk and Van der Pligt offered no psychological interpretation for this finding. As we have argued here, a steeper slope for disappointment than for elation implies a stronger impact of disappointment compared with elation. In sum, the findings herein support Van Dijk and Van der Pligt's results and, additionally, offer a theoretical interpretation for their, and our, results.

We also investigated hedonic intensities pertaining to losses. In the loss domain, disappointment aversion and the principle of limited emotion processing operated in opposite directions because disappointment co-occurred with the frustration of having lost real money. Not unsurprisingly, unstable results emerged. Two experiments supported a stronger impact of disappointment aversion; one experiment revealed the opposite pattern. As yet, it is unclear when disappointment aversion will outweigh the principle of limited emotion processing and vice versa. Possibly, subtle experimental cues, sample characteristics, or other factors may influence the relative strengths of the two principles postulated.

In line with our results, a generally stronger impact of disappointment compared with elation would not support risk seeking, the usual finding obtained for losses. If decision makers can choose between a risky gamble in which they can lose \$ $x$  with probability  $p$  and nothing otherwise, or a sure loss of equal expected value, decision makers are usually risk seeking and opt for the risky gamble. Disappointment aversion, on the other hand, implies that decision makers are more disappointed after having lost than they are elated after having not lost. If so, the risky gamble becomes less attractive compared with the sure loss, and decision makers are predicted to take the risky gamble less often.

Such a finding, however, would be at odds with the usual finding that decision makers are risk seeking in the loss domain. Taken together, many studies revealed persons to be risk averse in the gain domain, but risk seeking in the loss domain. Disappointment aversion would generally decrease the attractiveness of a risky gamble. In this case, disappointment aversion would support risk aversion in the gain domain but is at odds with risk seeking in the loss domain. However, if the principle of limited emotion processing dampens disappointment aversion in the loss domain, risk seeking will become more likely. Accordingly, the prin-

ciple of limited emotion processing could explain why persons are still risk seeking in the loss domain although disappointment may, in principle, outweigh elation. These considerations do not exclude other causes influencing risky behavior, like the shape of the utility function (see Kahneman & Tversky, 1979).

### *Disappointment Theory Revisited*

Our theory and findings suggest a refinement of disappointment theory. Suppose a gamble has the outcomes  $x$  and  $y$ , and  $x$  occurs. The emotional response to outcome  $x$  is expressed as

$$R_x = w_1 u_x + w_2 d(u_x - u_y) s(1 - p_x) \quad (3)$$

and  $w_1 + w_2 = 1$ .

Equation 3 contains the extra weights  $w_1$  and  $w_2$ ;  $w_1$  is attached to the utility of the real payoff  $x$ , and  $w_2$  is attached to the difference between the utilities between the obtained outcome  $x$  and the unobtained outcome  $y$  ( $u_x - u_y$ ). This difference is multiplied by the degree of surprise [ $s(1 - p_x)$ ] of the obtained outcome  $x$ , where  $s$  is a surprise function. The condition that the weights  $w_1$  and  $w_2$  sum up to 1 captures the principle of limited emotion processing: the more money gained or lost, the smaller disappointment and elation turn out to be. Alternatively, winning or losing little money enhances disappointment or elation.

Future research on disappointment theory may profit from investigating disappointment and elation separately in the gain and loss domains. Exact measurement of the weights  $w_1$  and  $w_2$  could further enhance our knowledge of the underlying psychological processes. The role of both emotions with respect to decision making also seems to be a fruitful avenue for future research. In line with other research like that on regret and rejoicing, our experiments go beyond a purely cognitive-rational paradigm and shed increasingly more light on the specific emotional processes pertaining to decision making.

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## Dimensions and Aspects of Longing: Age and Gender Differences in Swedish 9-, 12-, and 15-Year-Old Children

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**ABSTRACT.** Longing can be defined as a secondary emotion, as a blend of the primary emotions of love and sadness. There are several possible dimensions and aspects of longing (O. Holm, 1999). Both age and gender differences are well documented in earlier research on other emotions. In the present investigation, 122 girls and 120 boys, ages 9, 12, and 15 years, in compulsory school in Sweden, answered a questionnaire about dimensions and aspects of their own longing. The results showed both age and gender differences. Girls, especially in the 15-year-old group, experienced longing significantly more than boys. The results were interpreted as generally in accordance with what is known from earlier research on other emotions.

**Key words:** depression, desire, emotion blends, happiness, longing, sadness, yearning

IN RESEARCH ON EMOTIONS, some, such as love and sadness, have attracted the interest of several investigators and theorists, and others have received almost no attention at all. Longing is one of these unnoticed emotions. Although most human beings have experienced longing, it is seldom mentioned in the scientific emotion literature. In everyday language the word is well known and understood, and if one listens to the lyrics of popular music, for example, one often hears the expression of longing for someone or something that isn't present at the moment.

Longing can be considered a blend of love and sadness (Shaver, Schwartz, Kirson, & O'Connor, 1987), and its synonym, yearning, was described by Kemper (1987) as a blend of depression and happiness. Longing was defined by Holm (1999) as a blend of love and sadness, sometimes with some other emotion involved. It is possible that the kinship with such powerful emotions as love, happiness, sadness, and depression has led to the relative neglect of longing in scientific research.

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