Self-evaluation accuracy and satisfaction with performance: are there affective costs or benefits of positive self-evaluation bias?

Susanne Narciss, Hermann Koerndle, Markus Dresel

Angaben zur Veröffentlichung / Publication details:

Narciss, Susanne, Hermann Koerndle, and Markus Dresel. 2011. "Self-evaluation accuracy and satisfaction with performance: are there affective costs or benefits of positive self-evaluation bias?" International Journal of Educational Research 50 (4): 230–40. https://doi.org/10.1016/j.ijer.2011.08.004.

Self-evaluation accuracy and satisfaction with performance: Are there affective costs or benefits of positive self-evaluation bias?

Susanne Narciss [a,*], Hermann Koerndle [a], Markus Dresel [b]

[a] Psychology of Learning and Instruction, Technische Universitaet Dresden, Helmholtzstr. 10, 01062 Dresden, Germany
[b] Department of Psychology, University of Augsburg, Universitaetsstr. 10, 86135 Augsburg, Germany

1. Introduction

Self-evaluation plays a critical role in many domains of human functioning. This role has been examined from various perspectives using measures ranging from global self-esteem (Brown, Dutton, & Cook, 2001; Brown & Marshall, 2001), over self-evaluation of abilities or competencies in a concrete domain (e.g., perceived competence by Harter, 1985; mathematical or verbal self-concept by Marsh, 1990; see also Gresham, Lane, MacMillan, Bocian, & Ward, 2000), to measures of self-evaluation regarding a specific task or a set of tasks (initial confidence by Feather, 1969; self-efficacy by Bandura, 1977).

Self-evaluation research has firmly established that people are not very accurate in evaluating their own abilities or performance. In general, they tend to overestimate their capacities (Dunning, Heath, & Suls, 2004; Mabe & West, 1982; Stone, 2000). Even though positive self-evaluation biases are widely thought to be beneficial (Taylor & Brown, 1988, 1994), there is a growing literature discussing their potential costs (Dunning et al., 2004). Several studies address the long-term costs of positive self-evaluation biases (e.g., Baumeister, Campbell, Krueger, & Vohs, 2003; Crocker & Park, 2004; Leary, 2007; Robins & Beer, 2001). Others examine short-term costs of such biases in controlled experimental contexts (Marshall & Brown, 2006; McGraw, Mellers, & Ritov, 2004; Thiede, Anderson, & Therriault, 2003).

In instructional contexts, particularly in contexts requiring self-regulated learning, accurate or realistic self-evaluations of one's competences are considered important prerequisites for meaningful learning (Butler & Winne, 1995; Dunning et al., 2004; Stone, 2000). More specifically, metacognitive processes (e.g., planning, monitoring, assessing and reflecting upon one's learning processes and outcomes) require self-evaluation of the actual state of knowledge with regard to the learning

* Corresponding author at: Psychologie des Lehrens & Lernens, Technische Universitaet Dresden, 01062 Dresden, Germany. Tel.: +49 0351 4633 6059; fax: +49 0351 4633 7294.

E-mail addresses: susanne.narciss@tu-dresden.de (S. Narciss), hermann.koerndle@tu-dresden.de (H. Koerndle), markus.dresel@phil.uni-augsburg.de (M. Dresel).

objectives one is striving for. Empirical evidence indicating that accurate self-evaluations are critical for the metacognitive regulation of the learning process have been provided by studies such as one by Thiede et al. (2003). They found that students with greater accuracy in self-evaluating their text comprehension were able to more adequately identify the texts they needed to restudy and subsequently achieved a higher level of performance than students with lower self-evaluation accuracy. However, as in other domains of human functioning, academic self-evaluation has not been found to be very accurate, as reflected in small to moderate correlations between academic self-evaluation and actual performance (Chen, 2003; Falchikov & Boud, 1989; Hansford & Hattie, 1982; Multon, Brown, & Lent, 1991). The problem of self-evaluation inaccuracy is thought to be especially crucial for academically at-risk students, who report unrealistically high self-beliefs (Klassen, 2002; Stone & May, 2002).

2. Theoretical positions on self-evaluation bias and affect

In the case of students who tend to have positive self-evaluation biases a contested issue remains just how self-evaluation biases influence these students' affective reactions to their performance. There are two opposing theoretical positions on this issue. The first position considers overly optimistic self-evaluations as diminishing the positive affects of successful task completion, since an achievement one anticipates with confidence is experienced as less pleasurable than an unexpected success. The second position is rooted in social-cognitive approaches to human functioning (Bandura, 1997; Brown & Marshall, 2001). It suggests that positive self-evaluation biases are related to affective benefits because they endow students with the ability to promote and protect feelings of self-worth. Satisfaction with performance is widely acknowledged to be a fundamental feeling of self-worth in achievement situations (Shrauger, 1975; see also Leary, 2007; Pekrun, 2006).

2.1. *Affective costs of positive self-evaluation bias*

Theoretical evidence that positive self-evaluation biases may result in affective costs is presented in several sources: First, Carver and Scheier's control theory of self-regulation and affect (Carver & Scheier, 1990; Carver, 2003) suggests that positive affects arise when goals are attained at either a faster rate or to a higher degree than anticipated; conversely, negative affects result when goal attainment is slower than expected. In cases where goals are achieved as envisioned, there should be neither positive nor negative affects (see also Taylor, Fisher, & Ilgen, 1984). Thus, experiencing no discrepancy between one's expected rate of goal attainment or level of performance and the actual achievement may be the antecedent for being dissatisfied with one's performance. Thus, one might assume that positive biases of self-evaluation are related to the risk of experiencing less positive affects in achievement situations.

For example, a person who overestimates her level of competence in a given domain may anticipate a successful task completion, even though her competencies might not be equal to the task. She may either barely attain or, in case of overestimation, fail to attain the goals she has anticipated. Consequently, she will have fewer occasions to experience goal attainment that is faster or better than anticipated, along with the positive affects related to those experiences. In general, since increasing overestimation would reduce the number of better-than-anticipated outcomes, one would expect to find an inverse relationship between positive biases and affect, based on Carver and Scheier's control theory.

Second, Mellers's decision affect theory (Mellers, Schwartz, Ho, & Ritov, 1997; Mellers, Schwartz, & Ritov, 1999), initially developed to account for the judged pleasure of monetary outcomes, considers how discrepancies between expectations and results influence affect. According to decision affect theory, expected successes are considered less pleasurable than unanticipated ones, just as unanticipated failures are more painful than those one expects. Hence, overconfident persons should experience a lesser degree of pleasure in success and more pain in failure. McGraw et al. (2004) have tested these hypotheses in two studies involving physical skills (a basketball shooting drill). In the first investigation they measured confidence of success before, and affective reactions after, each task. Based on decision affect theory, they then computed how much better participants *would have felt* if they had accurately evaluated their performance in advance. Results revealed a negative correlation between overconfidence and the average pleasure experienced in the drill. Their findings showed that, for most participants, accurate self-evaluation would have made the task more enjoyable. In their second study, McGraw and colleagues examined how enhancing self-evaluation accuracy through a debiasing procedure would affect the pleasure of success. In comparison to the control group, the debiased group achieved greater self-evaluation accuracy and experienced more positive affects from the task.

Both of the above theories would also predict that persons with negative self-evaluation biases experience greater pleasure after success than persons with accurate or positively biased self-evaluations. This prediction is also derived from self-enhancement research, whose theorists assume that persons with negative self-evaluation biases experience higher levels of satisfaction after positive feedback or successful experiences than individuals without such biases because they have a strong need to enhance their feelings of self-worth. Evidence supporting this self-enhancing position has been presented in studies investigating the impact of initial self-evaluations on a person's reaction to external feedback or evaluations (Shrauger, 1975; Swann, Griffin, Predmore, & Gaines, 1987; Sweeney & Wells, 2006). For example, Feather (1969) examined how global and task-specific measures of initial self-evaluations (which he calls "initial confidence") affect satisfaction with performance, attributions, and task completion after success or failure working out anagrams. He found that irrespective of level of performance, unexpected success resulted in higher levels of satisfaction than expected success, even though persons with low levels of initial task-specific self-evaluation exhibited unfavorable patterns of attribution.

Such individuals attributed their successes more often to external causes (e.g., luck or an easy task), and their failures to internal causes (lack of ability or skill). By contrast, persons with high levels of initial confidence had self-serving attributions (i.e., they attributed success to ability and failure to bad luck), although they rated their satisfaction significantly lower after their successes.

2.2. *Affective benefits of positive self-evaluation bias*

The findings summarized above raise the question of whether it is really best to expect the worst. Theoretical and empirical work on self-efficacy research (Bandura, 1977, 1997), academic self-concept (Marsh, 1990; Marsh & O'Mara, 2008), and Brown's affective model of self-esteem (Brown & Marshall, 2001; Brown et al., 2001) overwhelming deny such an assumption. According to these social-cognitive approaches on human functioning, more positive self-evaluations should be related to increased positive affective reactions because people constituted in this way possess strategies to promote and protect their positive self-evaluations.

Evidence supporting this position has been found by Marshall and Brown (2006) in a pair of studies using a novel intellectual task (remote association). They first examined how emotional reactions to task performance, general feelings of happiness and sadness, as well as arousal and feelings of surprise can be predicted by prospective self-evaluations (namely, expectations of level of performance measured before task completion), performance, and task difficulty. Their results showed that high prospective self-evaluations predicted more positive affective reactions to performance outcomes than did low prospective self-evaluations. Moreover, persons who tended toward high prospective self-evaluations appeared to have more favorable emotional reactions after poor task performance than persons with low prospective self-evaluations. In their second study, the authors examined how levels of expectation and ability attributions affect emotional reactions to task performance. Their findings indicated that persons with high expectations had self-serving attribution patterns: they tended to attribute high performance to their abilities, and low performance to external causes such as task difficulty or bad luck. By contrast, persons with low expectations attributed high performance to luck or low task difficulty, and poor performance to their lack of ability. Consequently, persons with high expectations experienced more positive emotional reactions, both after successes and failures, than those with low expectations. These findings agree with Weiner's (1985, 1986) attributional theory of achievement motivation and emotion. However, they partially contradict the results of a study by Feather (1969) that revealed the same patterns of attributions, but found that persons with lower expectations experienced higher satisfaction after successes, despite their unfavorable attribution patterns.

3. Purpose and research questions

Summarizing and integrating the findings of the studies reviewed is problematic because they employ different methodologies (i.e., diverse tasks, self-evaluation measures, and measures of emotional reactions). Furthermore, various procedures for computing self-evaluation biases have been used. Whereas McGraw and colleagues computed discrepancy scores, Marshall and Brown (2006) argue that such discrepancy scores may obscure the relation between self-evaluation and performance measures, particularly if there is a risk that only one variable is relevant. Consequently, they use multiple regression analyses with interaction terms to examine whether there are affective benefits of low self-evaluations. However, in employing this procedure, they did not explicitly investigate self-evaluation biases.

Despite these limitations, one may conclude that the inverse relationship between self-evaluation (bias) and affective or emotional reactions to task performance predicted by the theories of Carver and Scheier (1990) and Mellers et al. (1997, 1999) is debatable, as the findings of Marshall and Brown (2006) have shown. The studies of the latter support predictions on the beneficial role of positive self-evaluation biases rooted in self-efficacy research (e.g., Bandura, 1997), self-concept research (e.g., Marsh & O'Mara, 2008), or Brown's affective model of self-esteem (e.g., Brown & Marshall, 2001; Brown et al., 2001).

The studies we have considered thus far employ experimental designs and mostly present tasks in one experimental session to collect data on self-evaluation and performance. Participants had little if any prior experience with these experimental tasks. It therefore, remains an open question whether the findings from Marshall and Brown (2006) gathered in an experimental setting with a novel task can be generalized to more naturalistic settings, particularly to a learning situation in which students have had prior experience with the tasks presented and do not receive immediate external feedback. Furthermore, whether the observed relationships among self-evaluations, performance, and satisfaction with performance are stable over time and across various kinds of tasks have not been examined in these studies. The relationship between accurate self-evaluation and satisfaction with performance has also received little attention in prior work.

Thus, the purpose of the present study is to examine how students with negative, positive, or accurate self-evaluation tendencies may differ in satisfaction with their performance after completing a set of arithmetic tasks. In a context with no external feedback (e.g., in self-regulated learning contexts or in test situations) students have to base their satisfaction with their performance on the internal feedback they generate during or after task processing (Butler & Winne, 1995). As the previous discussion demonstrates, student self-evaluation biases may affect the generation of internal feedback and subsequent satisfaction with their performance in different ways.

First, based on expectancy-performance discrepancy views (Carver, 2003; Carver & Scheier, 1990; Mellers et al., 1997, 1999), one might assume that students with positive self-evaluation biases will anticipate progressing at a faster pace or

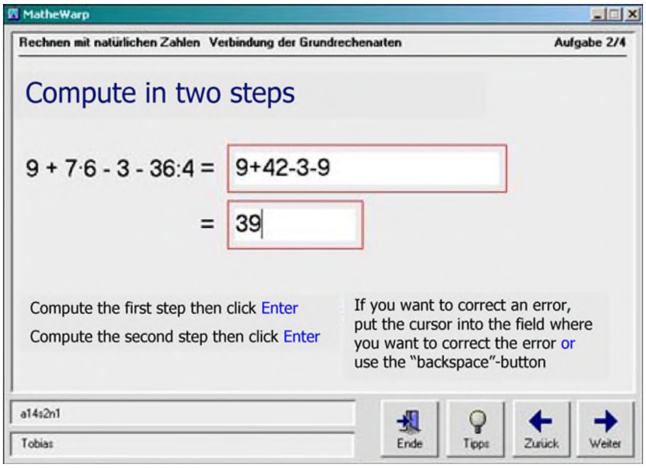

Fig. 1. Screen shot of an arithmetic exercise in MatheWarp.

achieving a higher level of performance than they are capable of. Conversely, students with negative self-evaluation biases would anticipate a lower level of performance than they can actually achieve, and they may thus experience unexpected successes. Given the same level of performance, students with negative self-evaluation biases should therefore be more satisfied than students with positive self-evaluations biases. The satisfaction of those with accurate self-evaluations would be somewhere between the two biased groups.

Second, based on self-efficacy, self-concept, and self-esteem research, one may suggest that a person's self-evaluation biases may serve as a lens for perceiving and self-assessing their actual outcomes. Students with positive self-evaluation biases may, thus, assess their performance more favorable than it actually is, whereas those with negative self-evaluation biases may err in the opposite direction. More specifically, students with negative self-evaluation biases may consider their performance poor because they believe that their competence in this domain is poor. Consequently, even if they make progress and complete tasks successfully, they may disparage or underestimate such progress. By contrast, students with positive self-evaluation biases self-assess their performance as better than it actually is because they believe they have the competence to perform well. As higher levels of performance have been found to correlate with higher levels of satisfaction (Shrauger, 1975), one would expect that, given the same level of performance, persons with positive self-evaluation biases should experience higher levels of satisfaction with their performance than those with negative self-evaluation biases. Again, those capable of accurate self-evaluation should rate their satisfaction with performance as between the two biased groups.

In order to investigate these opposing predictions, we reanalyzed the data of a study in which we had assessed self-evaluations of competence in arithmetics, performance, and satisfaction with performance before and after a four-week arithmetic training program. Participants were either given no training, or received four sessions with a computer-based arithmetic training program providing arithmetic exercises followed by feedback (MatheWarp; see Figs. 1 and 2; Dresel, 2004; Dresel & Ziegler, 2006; http://mathewarp.de). Thus, students of the training groups received arithmetic exercises and information regarding their level of performance four times, whereas students of the control group were not provided with the exercises or the external feedback.

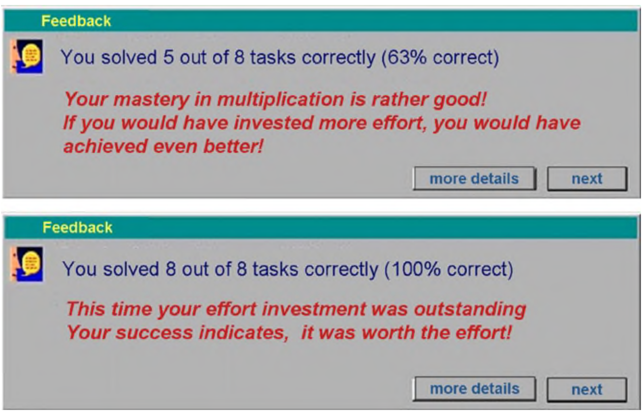

Fig. 2. Feedback samples illustrating how MatheWarp provides performance feedback with effort-attribution components.

4. Method

4.1. Participants

Sixty-seven fifth graders (32 girls and 35 boys) from two German schools participated in the study. Their ages ranged from 10 to 12 years. The academic, social, and the ethnic background of the students was very homogeneous. The two schools were of the highest academic level, called "Gymnasium" in Germany.

4.2. Design and material

In a pre-test–intervention–post-test design the intervention consisted of four weekly sessions using the MatheWarp arithmetic training program (Fig. 1), a computer-based instructional software that has been shown to increase student performance, motivation, and arithmetic self-evaluation strength (Dresel, 2004; Dresel & Ziegler, 2006; http://mathewarp.de).

MatheWarp provides learners with blocks of arithmetic exercises of three levels of difficulty and gives various types of feedback. Feedback is generated by combining (a) knowledge of performance feedback for blocks of at least eight exercises (e.g., you solved 4 of 8 tasks correctly), with (b) effort-attribution components emphasizing the relationship between effort and success, or (c) ability-attribution components emphasizing the relationship between ability and success. In the present study we used knowledge of performance feedback alone and knowledge of performance feedback in combination with effort-attribution components (see Fig. 2).

The study design consisted of three groups: (a) those with no specific training (control group, 8 males, 13 females), (b) those pursuing MatheWarp training with summative performance feedback after each block of exercises (i.e., knowledge of performance feedback (KP); MW_{KP}-group, 19 males; 6 females), and (c) those pursuing MatheWarp training with knowledge of performance feedback combined with effort-attribution components ($MW_{KP+effort}$-group, 8 males, 13 females). Arithmetic performance on a pre-test was used to assign students of the two training classes in a balanced manner to the experimental training conditions. It was not possible to implement both training- and no-training conditions in the same class because one-third of the class would have had to wait or do no arithmetic tasks while their peers were working on the computer-based training tasks. For this reason, the no-training control condition was only implemented in a third class. All three classes had different mathematics teachers.

4.3. Procedure

Each weekly training session lasted 45 min and focused either on multiplication or division exercises in oral or in written form. Students were free to work at their own pace on several blocks of exercises of varying difficulty, each consisting of at least eight problems. After completing each block, students were given summative feedback on their performance (see Fig. 2). Half of the students in each class received feedback that included effort-attribution components emphasizing the relationship between effort and success. The others only received performance feedback. All students could click on "more detail" in the feedback window to seek specific information on which problems they had solved correctly or answered incorrectly.

Self-evaluation of arithmetic competence, performance, and satisfaction with performance were measured one week prior to and one week after the training sessions in all groups, including the group that had no prior training. However, the latter group was not provided with the same instructional materials as the other students, although they had their usual mathematics classes during the four-week training period.

4.4. Measures

4.4.1. Performance

Pre- and post-training performance was assessed by giving four arithmetic tests that evaluated the multiplication and division competencies addressed in the training sessions. Each test consisted of 15 problems, for a total of 60 items (sample item: $924 \div 6 = ?$). Students had to solve each test within 6 min. The percentage of correctly solved problems in all four tests served as a measure of the acquired performance level.

4.4.2. Self-evaluation strength

Measures of self-evaluation were collected by using a procedure which combines recommendations for assessing self-efficacy (Bandura, 2006) with three perceived mathematical competence items. For each type of arithmetic exercise, students were provided with a sample set of these exercises illustrating the skills required. They were asked to examine the problems carefully, but not to solve them, and then rate their perceived capability in solving them successfully using a three-item scale (i.e., "This kind of multiplication task is very easy for me"; "I can generally solve this kind of multiplication problem very well"; "I am skilled for this kind of multiplication problem"). Students answered each of these self-evaluation items on a bipolar analog rating scale, with (1) representing "I do not agree" and (10) representing "I agree". Since, with regard to the present types of arithmetic tasks, Cronbach's alpha for the three items was $>.75$, we computed the averaged scores of these items for further data analyses. Subsequent reliability analyses revealed that these averaged self-evaluation scores had a high internal consistency over all types of arithmetic tasks in the pre- and the post-test (Cronbach's alpha was

.78 in the pre-test and .85 in the post-test). Thus, further data analyses were conducted with aggregated pre- and post-test self-evaluation scores.

4.4.3. Satisfaction with performance

After administration of the four arithmetic tests described above, students, without being given external feedback, were asked to rate satisfaction with their performance using a bipolar analog rating scale (1 = not at all satisfied; 10 = very satisfied). Cronbach's alpha for the satisfaction ratings of the pre-test was .67, and .74 for the post-test. Further data analyses were, therefore, conducted with aggregated pre- and post-test satisfaction scores.

5. Results

The results of the present study will be presented in two stages. First, in order to provide an overview of the variables affected by the training session, we will summarize absolute values and changes in (a) arithmetic performance, (b) self-evaluation strength, and (c) satisfaction with performance by students in the three experimental groups. Second, we will describe how satisfaction with performance differed in the pre- and post-tests when students had positive, negative, or no self-evaluation biases.

5.1. Preliminary analyses

Prior to performing statistical data analyses, we screened the data for outliers and normality. While performing the analyses, assumptions of the procedures were tested and met, unless otherwise noted. Furthermore, since gender-related stereotype threat effects can occur in mathematical task contexts, we ran preliminary analyses to check for any significant gender differences for the present set of variables. Since the results were negative we did not consider gender further in the analyses.

Table 1 provides an overview of the descriptive data of pre- and post-tests for (a) arithmetic performance, (b) self-evaluation strength, and (c) satisfaction with performance.

Table 1

Pre- and post-test means and standard deviations of performance, self-evaluation strength, and satisfaction with performance by bias groups and experimental conditions.

		Self-evaluation bias					
		Underestimation		Accurate		Overestimation	
		Mean	SD	Mean	SD	Mean	SD
				Total sample ($N = 67$)			
Measures		($n = 19$)		($n = 31$)		($n = 17$)	
Performance	pre-	50.26	12.28	61.61	12.09	54.71	10.85
Performance	post-	56.40	13.58	59.14	12.03	60.78	15.96
Self-evaluation	pre-	37.45	12.31	49.11	12.31	67.56	12.05
Self-evaluation	post-	30.91	14.14	50.24	10.94	73.86	15.04
Satisfaction	pre-	36.29	18.88	45.08	17.76	57.38	15.39
Satisfaction	post-	41.61	24.58	56.56	19.66	64.11	23.67
				MatheWarp + KP + effort attribution			
		($n = 10$)		($n = 10$)		($n = 1$)	
Performance	pre-	47.33	12.79	50.67	16.89	53.33	–
Performance	post-	56.67	11.99	62.67	18.19	55.00	–
Self-evaluation	pre-	35.55	13.33	46.43	16.34	81.67	–
Self-evaluation	post-	32.72	16.72	46.93	11.78	77.33	–
Satisfaction	pre-	33.58	19.36	36.03	17.89	75.25	–
Satisfaction	post-	43.87	27.00	44.08	22.50	47.50	–
				MatheWarp + KP			
		($n = 6$)		($n = 9$)		($n = 10$)	
Performance	pre-	53.33	13.58	45.56	8.25	55.67	13.31
Performance	post-	58.61	18.66	57.78	10.77	66.83	16.32
Self-evaluation	pre-	38.94	12.58	44.06	9.34	63.91	10.08
Self-evaluation	post-	27.83	12.64	51.49	12.59	78.67	15.59
Satisfaction	pre-	38.13	21.92	43.64	19.08	55.90	15.79
Satisfaction	post-	36.42	26.11	73.69	11.65	66.47	29.95
				No training			
		($n = 3$)		($n = 12$)		($n = 6$)	
Performance	pre-	53.89	8.22	56.94	7.38	53.33	7.30
Performance	post-	51.11	9.18	57.22	4.78	51.67	12.52
Self-evaluation	pre-	40.86	11.29	55.15	8.01	71.31	14.08
Self-evaluation	post-	31.06	9.78	52.06	9.11	65.28	12.20
Satisfaction	pre-	41.50	15.31	53.71	13.25	56.83	15.51
Satisfaction	post-	44.42	18.35	54.17	12.39	62.96	10.49

Our earlier analyses of this study did not encompass measures of satisfaction (Narciss, Körndle, & Dresel, 2008). Thus, we had to first examine, if levels and changes in satisfaction were influenced by the conditions of the experiment itself. In order to do so, we ran a multivariate repeated-measures analysis of variance with the between-factor experimental conditions (3) the dependent measures being performance, self-evaluation strength, and satisfaction. This MANOVA indicated that the multivariate effect of the experimental conditions approached statistical significance [Wilks Lambda = .82, $F(6, 126) = 2.01$, $p = .058$, $\eta^2 = .09$]. Furthermore, it revealed a significant multivariate effect of the repeated-measures factor [Wilks Lambda = .64, $F(3, 62) = 11.80$, $p < .001$, $\eta^2 = .36$], and a significant multivariate interaction among the experimental and repeated-measures factors [Wilks Lambda = .71, $F(6, 126) = 3.95$, $p = .001$, $\eta^2 = .16$]. Follow-up ANOVAs of these multivariate effects and analyses of contrasts provided the following results.

5.1.1. Performance

As shown in Table 1, the training groups had equivalent levels of performance and they enhanced those significantly, whereas there was no performance enhancement for the control group. In the pre-test, students of the training groups achieved a mean level of performance of about 50% in correctly solved problems ($mean_{MW\text{-}KP+effort} = 49.21$, SD = 14.34; $mean_{MW\text{-}KP} = 51.47$, SD = 12.20); the control group, however, achieved a slightly higher level of performance (mean = 56.23; SD = 7.42). In the post-test, students in the training groups performed better ($mean_{MW\text{-}KP+effort} = 59.44$, SD = 14.96; $mean_{MW\text{-}KP} = 61.23$, SD = 15.22), while the performance level of the control group remained almost constant (mean = 55.00, SD = 7.95). The follow-up ANOVA showed that this interaction is statistically significant [$F(2, 64) = 9.72$, $p < .001$, $\eta^2 = .23$], yet there was no significant main effect of the factor experimental condition.

5.1.2. Self-evaluation strength

In contrast to performance, there was no significant change in self-evaluation strength from pre- to post-test [$F(1, 64) = 0.003$, $p = .96$, $\eta^2 < .00$]. Nevertheless, we found a significant main effect of the experimental condition [$F(2, 64) = 4.21$, $p = .02$, $\eta^2 = .12$]. Additionally, the interaction of the within- and between-factor approached statistical significance [$F(2, 64) = 3.08$, $p = .053$, $\eta^2 = .09$]. The lowest level of self-evaluation strength was observed in the $MW_{KP+effort}$-group (mean 42.27, SE 3.49), and the highest in the control group (mean 55.42, SE 3.25). Self-evaluation strength of the MW_{KP}-group was midway between the scores of the two other groups (mean 53.73, SE 3.21). Post hoc comparisons with Bonferroni adjustments revealed that the difference between the control and the $MW_{KP+effort}$-group was statistically significant, while there was no statistically significant difference between the two training groups.

5.1.3. Satisfaction with performance

The follow-up ANOVA for satisfaction with performance provided a significant main effect of the within-factor [$F(1, 64) = 12.03$, $p = .001$, $\eta^2 = .16$], and a significant main effect of the factor experimental group [$F(2, 64) = 4.271$, $p = .02$, $\eta^2 = .12$]. The interaction between both factors was not statistically significant [$F(2, 64) = 2.36$, $p = .10$, $\eta^2 = .07$]. Post hoc analyses with Bonferroni-adjustments indicated that over the course of both tests the $MW_{KP+effort}$-group on average rated their satisfaction with performance significantly lower than the MW_{KP}-group (mean difference = -14.1, SE = 5.35, $p = .031$), and also lower than the control group (mean difference = -13.64, SE = 5.58, $p = .052$). The levels of satisfaction with performance did not differ for the two latter groups.

5.2. Positive, negative, or accurate self-evaluations and satisfaction with performance

We have thus far found that the training groups had equivalent performance levels and performance increases, while the training groups had varying levels of satisfaction with performance. Thus, one may conclude that the training provided had a significant impact on performance, but only marginally affected satisfaction with performance. These findings pose the question of whether individual differences in self-evaluation biases might have contributed to the differences in satisfaction with performance. The purpose of the following is to examine if there are differences in satisfaction with performance depending on whether students employ accurate or biased self-evaluations.

To investigate this issue, we classified students into three self-evaluation bias groups, using the self-criterion residual (SCR) strategy (Robins & John, 1997). First, the self-evaluation measures of the pre-test were regressed on pre-test performance. Second, the same was done with the related post-test measures. The standardized residuals we obtained correlated positively to each other ($r = .59$, $p < .001$) and to the respective satisfaction measures from the pre- and post-test (zero-order correlations coefficients ranged between .41, $p = .001$; and .43, $p < .001$).

We then used the standardized residuals obtained by these regressions to assign students to three self-evaluation bias groups. Those whose standardized residuals were equal to or above 1.00 were assigned to the "positive bias" group; those with residuals equal to or below -1.00 were assigned to the "negative bias" group. Finally, those whose standardized residuals ranged from slightly below 1.00 to just above -1.00 were placed in the "accurate" group (see also Bouffard, Lengele, & Vezeau, 2011; Gonida & Leondari, 2011). Such a procedure resulted in three groups of students for the pre-test and three for the post-test respectively. Next, we cross-tabulated the classifications for pre- and post-tests in order to identify those students with biased and accurate self-efficacy at both assessments. Students who had been classified as "accurates" in the pre- and the post-test were so-labelled ($n = 31$); those who overestimated their performance on one or both assessments were classified as overestimators ($n = 17$); and those who underestimated their performance on one or both assessments were categorized as underestimators ($n = 19$). We found no cases in which an individual's self-evaluation bias in the pre-test had been classified as positive and in the post-test as negative or vice versa.

Table 1 provides an overview on means and standard deviations for all dependent variables for all groups, and separately for each experimental group. It shows that almost half of the students were classified as "accurates". Furthermore, it reveals that there was only one student who was classified as an overestimator in the $MW_{KP+effort}$-group.

Given this distribution, and the finding that the training had no significant impact on satisfaction with performance (as reflected in the non-significant interaction between the within- and between factor), we did not include the experimental condition factor into further analyses. Thus, to investigate if there are significant differences in performance and in satisfaction with performance depending on students' self-evaluation bias, we ran a repeated measures MANOVA with the between factor self-evaluation bias (3), and the dependent measures performance and satisfaction with performance. This MANOVA yielded significant multivariate effects of the factor self-evaluation bias [Wilks Lambda = .81, $F(4, 126) = 3.53$, $p = .001$, $\eta^2 = .10$], and of the within-factor assessment [Wilks Lambda = .71, $F(2, 63) = 12.86$, $p < .001$, $\eta^2 = .29$]. There was no significant interaction of the within- and between-factor [Wilks Lambda = .97, $F(4, 126) = 34$, $p = .85$, $\eta^2 = .01$].

Follow-up ANOVAs reveal that there were significant increases from pre- to post-test in performance [$F(1, 64) = 23.73$, $p < .001$, $\eta^2 = .27$] and satisfaction with performance [$F(1, 64) = 9.99$, $p = .002$, $\eta^2 = .14$]. Furthermore, they indicate that over the course of both tests the self-evaluation groups differed significantly in their levels of satisfaction with performance [$F(2, 64) = 7.12$, $p = .002$, $\eta^2 = .18$], but not in their levels of performance [$F(2, 64) = .66$, $p = .52$, $\eta^2 = .02$]. Post hoc comparisons with Bonferroni adjustments demonstrated that students with a negative self-evaluation bias rated their satisfaction with performance significantly lower than those with a positive self-evaluation bias (mean difference = −21.81, SE = 5.81, $p = .001$), and also lower than the "accurates" did (mean difference = −11.89, SE = 5.07, $p = .066$). The difference in satisfaction with performance between the overestimators and the "accurates" was not statistically significant (mean difference = −9.91, SE = 5.25, $p = .19$).

As illustrated in Fig. 3, these differences in satisfaction with performance are apparent across all task types in the pre- as well as the post-test. Follow-up analyses for the task-specific satisfaction scores yielded a significant multivariate main effect of the between-factor self-evaluation bias [Wilks Lambda = .75, $F(8, 122) = 2.41$, $p = .02$, $\eta^2 = .14$], and significant univariate effects for three of the four task types. It should be emphasized that these differences in satisfaction occurred even though there was no significant difference in performance among the self-evaluation bias groups.

Finally, with regard to the issue of potential affective costs of positive self-evaluation biases it seems worth noting that, under the MatheWarp-training condition with simple outcome feedback, students with accurate self-evaluations had a greater increase in satisfaction with their performance than students with positively biased self-evaluations. Post hoc comparisons with Dunnett's t test taking the positive bias group as reference category revealed that this difference is statistically significant (estimated mean difference = 19.48, SE = 8.29, $p = .05$).

6. Discussion

The main objective of the present study was to determine if there are affective costs or benefits of self-evaluation biases in a mathematics education context. Our review of theoretical positions regarding this issue revealed that there exist two

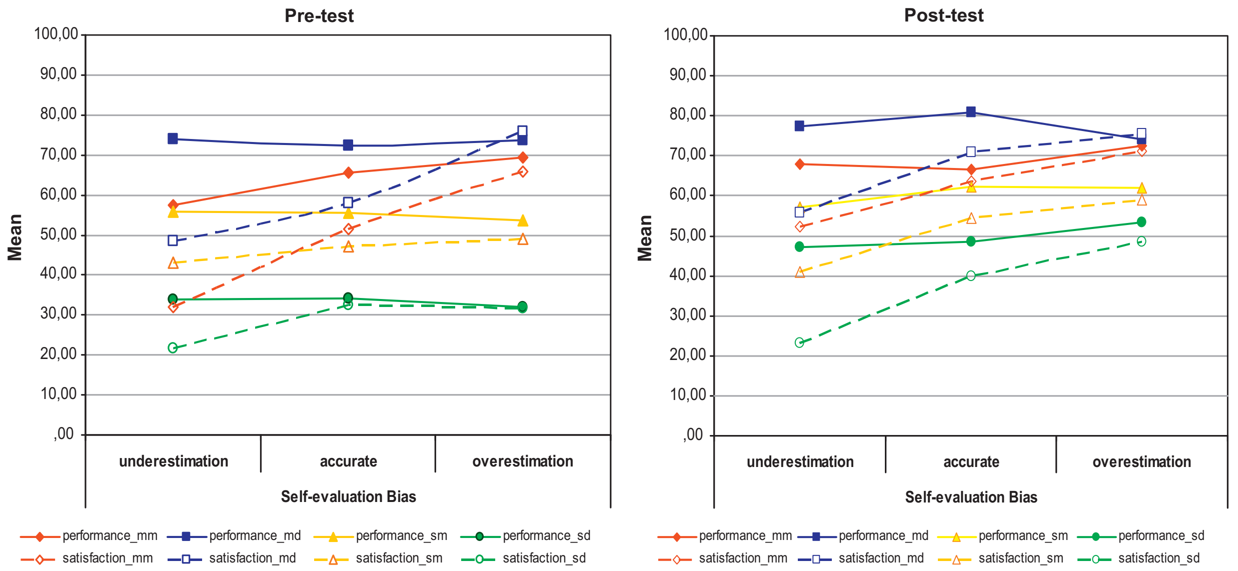

Fig. 3. Mean levels of satisfaction with performance compared to mean levels of performance in pre- and post-test by self-evaluation bias across four types of arithmetic task (mm = oral multiplication; md = oral division; sm = written multiplication; sd = written division).

opposing views. According to the first, based on expectancy-discrepancy reduction approaches to affect-regulation and control (e.g., Carver & Scheier, 1990; Carver, 2003; Mellers et al., 1997, 1999), one would expect that unanticipated successes might result in more positive satisfaction with performance than expected successes. The second position, rooted in social-cognitive approaches to human functioning (e.g., Bandura, 1997; Brown & Marshall, 2001) suggests that positive self-evaluation biases are related to affective benefits, whereas negative self-evaluation biases should be related to affective costs, since self-evaluation bias may serve as a kind of self-fulfilling prophecy. We tested these opposing predictions by reanalysing the data of a study in which self-evaluation, performance, and satisfaction with performance were measured before and after a four-week arithmetic training program for fifth-graders.

Our findings clearly support the social-cognitive view of the self-fulfilling prophecy role of self-evaluation biases (e.g., Bandura, 1997; Brown & Marshall, 2001). At the same time, they challenge the theoretical predictions derived from Carver and Scheier's control theory of self-regulation (Carver & Scheier, 1990; Carver, 2003), and from Mellers's decision-affect theory (Mellers et al., 1997, 1999). Students' self-evaluation biases in all cases were positively correlated to performance measures. Furthermore, students who had overestimated their performance in the pre- or post-test rated their satisfaction with their performance significantly higher than those who had underrated it on at least one of the latter two tests. This difference in satisfaction ratings was observed in pre- and post-tests as well as throughout four types of arithmetic tasks, even though there were no significant differences in performance among the self-evaluation bias groups.

Our results confirm the experimental findings of Marshall and Brown (2006) in a more natural setting in which our students engaged in tasks with which they had had previous experience. By showing that positive relationships between self-evaluation and satisfaction with performance do not only occur at a single point in time, but are sustained if assessed after four weeks across several types of tasks, our findings extend those prior findings. Thus, over a short period of time and with regard to a limited variety of tasks, self-evaluation biases are generally stable and pervasive. The generality, stability, and malleability of self-evaluation biases deserve further investigation through such longitudinal studies as the one conducted by Bouffard et al. (2011), or large-scale studies that collect data over several academic domains, as has been undertaken by Gonida and Leondari (2011).

With regard to affective costs of self-evaluations biases, the lowest increase in satisfaction with performance was observed for students with negative self-evaluation biases, despite their similar increase in performance. This finding is in line with previous studies indicating the costs of negative self-evaluation biases (e.g., Bouffard, Boisvert, & Vezeau, 2003; Harter, 1985; Philips, 1984, 1987). However, our findings also revealed that training participants who had accurate self-evaluations resulted in greater increases in satisfaction with performance than those with positive self-evaluation biases. Since both groups enhanced their performance equally this finding may indicate a potential affective cost of positive self-evaluation biases. The circumstances under which positive self-evaluation biases may be less beneficial than accurate self-evaluations should be examined in more detail in further studies.

6.1. Limitations and implications for future research

Several limitations may be noted in our study. First, we examined only relationships between self-evaluations and satisfaction with performance. Conceptually, there may be additional factors moderating or mediating the influence of self-evaluations and feedback on affective reactions (e.g., causal attributions, Weiner, 1985; Brown & Weiner, 1984; global self-esteem, self-motives, see the recent review by Leary, 2007). However, as mentioned in the introduction, prior studies considering these factors have yielded mixed results (compare Feather, 1969; McFarland & Ross, 1982; Marshall & Brown, 2006, regarding the role of attributions; Feather, 1969 vs. Brown et al., 2001, regarding the role of global self-esteem vs. more specific self-evaluations). Future research should therefore examine the affective benefits and costs of various self-evaluation biases within a more complete model of self-regulation.

Second, we have focused on satisfaction with performance as it has been considered a core achievement emotion related to self-worth (e.g., Brown et al., 2001; Feather, 1969; Pekrun, 2006). However, achievement-related affective reactions other than satisfaction with performance (such as shame, anger, frustration, relief, or joy) have been disregarded in our study. In what way these affects may relate to self-evaluation biases remains a topic for further investigation.

Third, in contrast to McGraw's study (McGraw et al., 2004), self-evaluation bias was not explicitly manipulated in our investigation; rather, students were classified post hoc into three self-evaluation bias groups. For such classifications we used the self-criterion residual (SCR) strategy (e.g., Robins & John, 1997) that yields sample-specific bias scores. Since the present study was not conducted with a large representative sample, the extent to which our findings can be generalized to other samples remains to be determined.

Finally, participants in the present study were all fifth graders (10–12 years old). Researchers have found that self-evaluation accuracy increases with age (e.g., Bouffard, Markovits, Vezeau, Boisvert, & Dumas, 1998; Doan et al., 2000; Stipek & MacIver, 1989). Hence, affective consequences of either biased or accurate self-evaluations may vary with a student's age. Developmental issues related to the present study would be a matter for further research.

6.2. Conclusions for instructional design and practice

Despite the limitations mentioned above, this study has implications for instructional design and educational praxis. Our findings indicate that young students who have a negative self-evaluation bias may fail to recognize when they have made good progress or achieved a satisfactory performance level. Even those who realize it may fail to increase their satisfaction with their own performance or enhance their self-evaluation strength. We even found this to be true of students who under training conditions had four opportunities to complete exercises and receive feedback on their performance. Such a finding is in line with previous research that has shown the limited effects of simple performance feedback in correcting self-evaluation biases (e.g., Fischer, 1982; Keren, 1988; Pulford & Coman, 1997; Subbotin, 1996).

However, as previous studies have mostly concentrated on outcome feedback there is little evidence whether more elaborate feedback strategies (i.e., formative or tutoring feedback, see Narciss, 2008; Shute, 2008) may help students with negative self-evaluation bias to reappraise their own progress and achievements, and in doing so modify their self-evaluation in a positive direction. Hence, future studies should develop and investigate tutoring feedback strategies which do not only facilitate the acquisition of knowledge and cognitive skills, but promote adaptive metacognitive and motivational strategies as well. Prior research on the motivational effects of various feedback types (reattribution-feedback, e.g., Schunk, 1983; Dresel & Ziegler, 2006; progress feedback, e.g., Schunk & Rice, 1993; task-related feedback, e.g. Butler & Nisan, 1986; Butler, 1987; informative tutoring feedback; e.g., Narciss, 2004), as well as recent work on formative and tutoring feedback strategies (e.g., Narciss, 2008, 2012; Shute, 2008) may inform instructional researchers in the development of such feedback strategies.

Finally, in light of our findings, it seems crucial (particularly for students with negative self-evaluation biases) that educators, teachers, and parents provide students with external feedback that elicits learning gains and emphasizes progress as well as successful attainment of goals. Such recommendations have been repeatedly suggested in recent decades (see, e.g., DeCharms, 1972; Rheinberg, 2001; and the abundant literature on achievement goal orientations; e.g., Ames & Archer, 1988). Schools of education should include explicit training in which the next generation of teachers are instructed in how to provide feedback that empowers students as self-regulated and productive lifelong learners.

Acknowledgements

The authors want to thank Manuela Lang for her valuable contributions in conducting the training and collecting the data. We also want to express our gratitude to Rob Klassen and an anonymous reviewer for their thorough and constructive feedback to an earlier draft of this paper. English editing and polishing was provided by Teddy Primack.

References

Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Student's learning strategies and motivation processes. *Journal of Educational Psychology, 80*, 260–267.

Bandura, A. (1977). Self efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191–215.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bandura, A. (2006). Guide for constructing self-efficacy scales. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307–337). Greenwich, CT: IAP.

Baumeister, R. F., Campbell, J. D., Krueger, J. I., & Vohs, K. D. (2003). Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *Psychological Science in the Public Interest, 4*, 1–44.

Bouffard, T., Boisvert, M., & Vezeau, C. (2003). The illusion of incompetence and its correlates among elementary school children and their parents. *Learning and Individual Differences, 14*, 31–46.

Bouffard, T., Lengele, A., & Vezeau, C. (2011). Stability of biases of self-evaluation and relations to well-being in elementary school children. *International Journal of Educational Research, 50*, 221–229.

Bouffard, T., Markovits, H., Vezeau, C., Boisvert, M., & Dumas, C. (1998). The relation between accuracy of self-perception and cognitive development. *British Journal of Educational Psychology, 68*, 321–330.

Brown, J. D., Dutton, K. A., & Cook, K. E. (2001). From the top down: Self-esteem and self-evaluation. *Cognition and Emotion, 15*, 615–631.

Brown, J. D., & Marshall, M. A. (2001). Self-esteem and emotion: Some thoughts about feelings. *Personality and Social Psychology Bulletin, 27*, 575–584.

Brown, J. D., & Weiner, B. (1984). Affective consequences of ability versus effort attributions: Controversies, resolutions, and quandaries. *Journal of Educational Psychology, 76*, 146–158.

Butler, R. (1987). Task-involving and ego-involving properties of evaluation: Effects of different feedback conditions on motivational perceptions, interest, and performance. *Journal of Educational Psychology, 79*, 474–482.

Butler, R., & Nisan, M. (1986). Effects of no feedback, task-related comments, and grades on intrinsic motivation and performance. *Journal of Educational Psychology, 78*, 210–216.

Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65*, 245–281.

Carver, C. S. (2003). Pleasure as a sign you can attend to something else: Placing positive feelings within a general model of affect. *Cognition & Emotion, 17*, 241–261.

Carver, C. S., & Scheier, M. F. (1990). Origins and functions of positive and negative affect: A control-process view. *Psychological Review, 97*, 19–35.

Chen, P. (2003). Exploring the accuracy and predictability of the self-efficacy beliefs of seventh-grade mathematics students. *Learning and Individual Differences, 14*, 79–92.

Crocker, J., & Park, L. E. (2004). The costly pursuit of self-esteem. *Psychological Bulletin, 130*, 392–414.

DeCharms, R. (1972). Personal causation training in the schools. *Journal of Applied Social Psychology, 2*, 95–113.

Doan, C. F., Wigfield, A., Eccles, J. S., Blumenfeld, P., Arbreton, A., & Harold, R. (2000). What am I best at? Grade and gender differences in children's beliefs about ability improvement. *Journal of Applied Developmental Psychology, 21*, 379–402.

Dresel, M. (2004). *Motivationsförderung im schulischen Kontext*. Fostering motivation in instructional contexts]. Göttingen: Hogrefe.

Dresel, M., & Ziegler, A. (2006). Langfristige Förderung von Fähigkeitsselbstkonzept und impliziter Fähigkeitstheorie durch computerbasiertes attributionales feedback [Long-term enhancement of academic self-concept and implicit ability theory through computer-based attribution feedback]. *Zeitschrift für Pädagogische Psychologie,* German Journal of Educational Psychology*20*, 49–63.

Dunning, D., Heath, C., & Suls, J. M. (2004). Flawed self-assessment: Implications for health, education, and the workplace. *Psychological Science in the Public Interest, 5*, 69–106.

Falchikov, N., & Boud, D. (1989). Student self-assessment in higher education: A meta-analysis. *Review of Educational Research, 70*, 287–322.

Feather, N. T. (1969). Attribution of responsibility and valence of success and failure in relation to initial confidence and task performance. *Journal of Personality and Social Psychology, 13*, 129–144.

Fischer, G. W. (1982). Scoring-rule feedback and the overconfidence syndrome in subjective probability forecasting. *Organizational Behavior and Human Performance, 29*, 352–369.
Gonida, E., & Leondari, A. (2011). Patterns of motivation among adolescents with biased and accurate self-efficacy beliefs. *International Journal of Educational Research, 50*, 209–220.
Gresham, F. M., Lane, K. L., MacMillan, D. L., Bocian, K. M., & Ward, S. L. (2000). Positive and negative illusory biases: Comparisons across social and academic self-concept domains. *Journal of School Psychology, 38*, 151–175.
Hansford, B. C., & Hattie, J. A. (1982). The relationship between self and achievement/performance measures. *Review of Educational Research, 52*, 123–142.
Harter, S. (1985). Competence as a dimension of self-evaluation: Toward a comprehensive model of self-worth. In R. Leary (Ed.), *The development of the self* (pp. 55–122). New York: Academic Press.
Keren, G. (1988). On the ability of monitoring non-veridical perceptions and uncertain knowledge: Some calibration studies. *Acta Psychologica, 67*, 95–119.
Klassen, R. (2002). A question of calibration: A review of the self-efficacy beliefs of students with learning disabilities. *Learning Disability Quarterly, 25*, 88–102.
Leary, M. R. (2007). Motivational and emotional aspects of the self. *Annual Review of Psychology, 58*, 317–344.
Mabe, P. A., & West, S. G. (1982). Validity of self-evaluation of ability: A review and meta-analysis. *Journal of Applied Psychology, 67*, 280–296.
Marsh, H. W. (1990). The structure of academic self-concept: The Marsh/Shavelson model. *Journal of Educational Psychology, 82*, 623–636.
Marsh, H., & O'Mara, A. (2008). Reciprocal effects between academic self-concept, self-esteem, achievement, and attainment over seven adolescent years: Unidimensional and multidimensional perspectives of self-concept. *Personality and Social Psychology Bulletin, 34*, 542–552.
Marshall, M. A., & Brown, J. D. (2006). Emotional reactions to achievement outcomes: Is it really best to expect the worst? *Cognition and Emotion, 20*, 43–63.
McFarland, C., & Ross, M. (1982). Impact of causal attributions on affective reactions to success and failure. *Journal of Personality and Social Psychology, 13*, 937–946.
McGraw, A. P., Mellers, B. A., & Ritov, I. (2004). The affective costs of overconfidence. *Journal of Behavioral Decision Making, 17*, 281–295.
Mellers, B. A., Schwartz, A., Ho, K., & Ritov, I. (1997). Decision affect theory: Emotional reactions to the outcomes of risky options. *Psychological Science, 8*, 423–429.
Mellers, B. A., Schwartz, A., & Ritov, I. (1999). Emotion-based choice. *Journal of Experimental Psychology: General, 128*, 332–345.
Multon, K. D., Brown, S. D., & Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of Counseling Psychology, 38*, 30–38.
Narciss, S. (2004). The impact of informative tutoring feedback and self-efficacy on motivation and achievement in concept learning. *Experimental Psychology, 51*, 214–228.
Narciss, S. (2008). Feedback strategies for interactive learning tasks. In J. J. G. van Merrienboer, J. M. Spector, M. D. Merrill, & M. P. Driscoll (Eds.), *Handbook of research on educational communications and technology* (3rd ed., pp. 125–144). Lawrence Erlbaum Associates: New York.
Narciss, S. (2012). Feedback strategies. In N. Seel (Ed.), *Encyclopedia of the learning sciences*. New York: Springer Science & Business Media, http://www.springer.com/education+%26+language/learning+%26+instruction/book/978-1-4419-1427-9.
Narciss, S., Körndle, H., & Dresel, M. (2008). Accuracy of self-evaluation of competence: How is it affected through feedback in a computer-based arithmetic training? In J. Zumbach, N. Schwartz, T. Seufert, & L. Kester (Eds.), *Beyond knowledge: The legacy of competence. Meaningful computer-based learning environments* (pp. 143–151). Dordrecht: Springer.
Pekrun, R. (2006). The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice. *Educational Psychology Review, 18*, 315–341.
Philips, D. (1984). The illusion of incompetence among academically competent children. *Child Development, 55*, 2000–2016.
Philips, D. (1987). Socialization of perceived academic competence among highly competent children. *Child Development, 58*, 1308–1320.
Pulford, B. D., & Coman, A. M. (1997). Overconfidence: Feedback and item difficulty effects. *Personality and Individual Differences, 23*, 125–133.
Rheinberg, F. (2001). Motivationstraining und Motivierung [Promoting and training motivation]. In D. H. Rost (Ed.), *Handwörterbuch Pädagogische Psychologie* (pp. 478–483). Handbook of educational psychologyWeinheim: Beltz, PVU.
Robins, R. W., & Beer, J. S. (2001). Positive illusions about the self: Short-term benefits and long-term costs. *Journal of Personality and Social Psychology, 80*, 340–352.
Robins, R. W., & John, O. P. (1997). The quest for self-insight: Theory and research on the accuracy of self-perceptions. In R. Hogan, J. Johnson, & S. R. Briggs (Eds.), *Handbook of personality psychology* (pp. 649–679). New York: Academic Press.
Schunk, D. H. (1983). Ability versus effort attributional feedback: Differential effects on self-efficacy and achievement. *Journal of Educational Psychology, 75*, 848–856.
Schunk, D. H., & Rice, J. M. (1993). Strategy fading and progress feedback: Effects on self-efficacy and comprehension among students receiving remedial reading services. *Journal of Special Education, 27*, 257–276.
Shrauger, J. S. (1975). Responses to evaluation as a function of initial self-perceptions. *Psychological Bulletin, 82*, 581–596.
Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research, 78*, 153–189.
Stipek, D., & MacIver, D. (1989). Developmental change in children's assessment of intellectual competence. *Child Development, 60*, 521–538.
Stone, N. J. (2000). Exploring the relationship between calibration and self-regulated learning. *Educational Psychology Review, 12*, 437–475.
Stone, N., & May, J. (2002). The accuracy of academic self-evaluations in adolescents with learning disabilities. *Journal of Learning Disabilities, 35*, 370–383.
Subbotin, V. (1996). Outcome feedback effects on under- and overconfident judgments (general knowledge tasks). *Organizational Behavior and Human Decision Processes, 66*, 268–276.
Swann, W. B., Griffin, J. J., Predmore, S. C., & Gaines, B. (1987). The cognitive-affective crossfire: When self-consistency confronts self-enhancement. *Journal of Personality and Social Psychology, 52*, 881–889.
Sweeney, P. D., & Wells, L. D. (2006). Reactions to feedback about performance: A test of three competing models. *Journal of Applied Social Psychology, 20*, 818–834.
Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin, 103*, 193–210.
Taylor, S. E., & Brown, J. D. (1994). Positive illusions and well-being revisited: Separating fact from fiction. *Psychological Bulletin, 116*, 21–27.
Taylor, M. S., Fisher, C. D., & Ilgen, D. R. (1984). Individual's reactions to performance feedback in organizations: A control theory perspective. In Rowland, K. M., & Ferris, G. R. (Eds.), *Research in personnel and human resources* (Vol. 2, pp. 81–124). Greenwich, CT: JAI Press.
Thiede, K. W., Anderson, M. C. M., & Therriault, D. (2003). Accuracy of metacognitive monitoring affects learning of texts. *Journal of Educational Psychology, 95*, 66–73.
Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92*, 548–573.
Weiner, B. (1986). *An attributional theory of motivation and emotion*. New York: Springer.