



## MATCH–MISMATCH OF FEAR, PANIC AND PERFORMANCE

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**Summary**—The present study tested predictions derived from Rachman's match–mismatch theory of fear. Students ( $N = 117$ ) displaying claustrophobic fear made predictions of fear, panic and performance prior to exposure to a claustrophobic chamber. Subjects were then classified into groups (i.e. matchers, overpredictors, underpredictors) based on the congruence between their anticipated phobic reactions and their actual reactions during exposure. The effects of match–mismatch status on predictions of fear, panic and performance on a subsequent exposure trial were examined. Results provided further evidence that phobic *Ss* are frequently inaccurate in predicting their phobic reactions during exposure. Consistent with previous findings, *Ss* who overpredicted fear, panic or performance tended to lower their predictions on a subsequent exposure trial, whereas *Ss* who underpredicted fear, panic or performance showed heightened predictions upon subsequent exposure. Contrary to previous findings, *Ss* were more likely to underpredict rather than overpredict their phobic reactions. Our findings are in accord with those of Rachman indicating that the magnitude of mismatch between predicted and actual fear/panic is more influential in determining subsequent *predictions* of fear/panic than it is in determining *Ss'* *actual* fear/panic. Moreover, this asymmetry was observed when the mismatch paradigm was applied to phobic behavior (i.e. tendency to escape).

### INTRODUCTION

Rachman and colleagues (see Rachman & Bichard, 1988, for a review) have proposed that the congruence between expected fear/panic and actual fear/panic may play a prominent role in the maintenance of phobias. This assertion is consistent with Gray's (1982) formulation that mismatches between expected and actual events is sufficient for activating the Behavioral Inhibition System (BIS) thus leading to fearful response "outputs" (i.e. avoidance, increased arousal, attentional vigilance). Moreover, the mismatch formulation is consistent with animal studies suggesting that unpredictable aversive events cause more distress and functional impairment than aversive events that are predictable (Mineka & Kihlstrom, 1978; Mineka & Henderson, 1985).

The experimental paradigm used by Rachman to examine fear match–mismatch entails pre exposure predictions of fear level and probability of panicking, followed by *in vivo* exposure to the phobic situation for a predetermined length of time, recording of maximum amount of fear and the occurrence of panic, and reprediction for the next exposure trial. Subjects are then classified into one of several match–mismatch groups (i.e. match, underprediction, overprediction) based on the congruence between their predicted and actual fear or panic.

Studies employing the match–mismatch paradigm have found a consistent tendency of anxious/phobic subjects to overpredict fear/panic. This overprediction bias has been observed across several anxious populations including snake phobics, claustrophobics, and panic disorder patients (Rachman & Lopatka, 1986a, b; Rachman & Lopatka, 1986c; Rachman, Levitt & Lopatka, 1988). In addition to observing a general fear/panic overprediction bias, Rachman and colleagues have examined the effects of match–mismatch patterns on subsequent fear predictions. A consistent pattern emerged across studies whereby exposure trials in which fear was underestimated or panic was unexpected tended to be followed by increases in predicted fear and panic. Arntz and van den Hout (1988) observed similar patterns when the unexpected emotional reaction was induced through a series of unpredictable shocks. These findings are in accord with evidence that judgments of the probability of panicking (in contrast to actual panic frequency or intensity) strongly predict behavioral avoidance in agoraphobic subjects (Craske, Rapee & Barlow, 1988; Telch, Brouillard,

Telch, Agras & Taylor, 1989). Conversely, accurate predictions or overpredictions tended to be followed by reductions in subsequent fear/panic predictions (Rachman & Bichard, 1988).

The present study sought to address several unresolved questions stemming from the Rachman *et al.* research. First, we sought to examine the generalizability of the match/mismatch formulation to conditions that more closely resemble phobic avoidance under natural conditions. Rachman and colleagues have typically controlled the length of time subjects stay in the presence of the phobic object/situation (*Ss* are informed that they may leave at any time, but are strongly encouraged to stay until the experimenter returns). Since pretrial estimations are anchored to a specified exposure duration, examination of the effects of match–mismatch patterns on active avoidance/escape tendencies is precluded. Given that overprediction of fear may contribute to phobia maintenance by increasing defensive behaviors, we examined match–mismatch patterns under conditions where *Ss*' duration of exposure was allowed to vary and their pretrial estimations were anchored to their own predicted lengths of stay in the phobic situation.

Second, this allowed us to examine the extent to which discrepancies between expected and actual performance influence active avoidance (escape) tendencies upon re-exposure to the phobic situation. Finally, the studies by Rachman and colleagues were conducted with relatively small samples and exposure trials as the unit of analysis. This presents some difficulty for interpretation, due to the confounding of between-*S* effects with exposure trials. Therefore, a large sample size was employed to allow between-*Ss* analyses, thus providing a more stringent test of the theory. Three specific predictions from Rachman's earlier work were examined: (a) claustrophobic *Ss* would display a general tendency to *overestimate* their fear/panic, and *underestimate* their behavioral approach; (b) *Ss* who underestimated their fear/panic/performance would show an increase in predicted fear/panic/performance on the subsequent trial, whereas *Ss* who overestimated their fear/panic/performance would show a decrease in predicted fear/panic/performance on the subsequent trial; and (c) the degree of congruence between *Ss*' expected and actual fear/panic/performance levels would predict their subsequent fear/panic/performance expectancy, but not their actual fear/panic/performance (assymetry hypothesis).

## METHOD

### *Subjects*

Students displaying a marked fear of claustrophobic situations ( $N = 117$ ) were selected from a large pool ( $N = 2650$ ) of introductory psychology students at the University of Texas at Austin. Selection was based on a response of 3 (moderate fear) or higher to each of two screening questions using a 5-point Likert scale (none, mild, moderate, severe, extreme) to rate (a) overall fear of enclosed spaces and (b) fear associated with entering a very small, pitch-dark, narrow closet and remaining there for several minutes. Of those screened, 205 students met the claustrophobic fear criterion and were contacted by telephone to determine their willingness to participate. Ninety-four women and 23 men agreed to participate. The sample was predominantly white (97%) and had a mean age of 18.9 ( $SD = 1.9$ ). At entry, the men and women did not differ with respect to mean scores on state anxiety (men = 44.30; women = 44.87), trait anxiety (men = 44.26, women = 42.11), or anxiety sensitivity (men = 23.65, women = 23.59).

### *Measures*

#### *Prediction indices prior to exposure*

Several measures were constructed to assess *Ss*' appraisal of predicted fear level and panic likelihood.

*Predicted fear.* Subjects rated on a 0 (no fear) to 100 (extreme fear) Likert scale their anticipated maximum level of fear while entering and remaining in the experimental chamber for the duration indicated by their predicted performance rating.

*Predicted panic.* Subjects rated on a 0 (no chance of panic) to 100 (definitely would panic) Likert scale their likelihood of panicking while in the experimental chamber for the duration indicated by their predicted performance rating.

### *Post-exposure measures*

Immediately following each of the two exposure trials, *Ss* completed a post exposure questionnaire designed to measure *Ss*' actual performance, fear, and panic while in the chamber. These measures are described below.

*Actual performance.* The duration (sec) of stay in the chamber, recorded for each *S*, served as the behavioral index of performance. For each trial, *Ss* were allowed to stay in the chamber a maximum of 120 sec, however *Ss* were not made aware of the exposure duration limit.

*Reported fear.* Subjects rated on a 0 (none) to 100 (very severe) their maximum level of fear while in the chamber.

*Reported panic.* Subjects indicated (yes or no) whether they experienced a panic attack while in the chamber. A panic was defined as a sudden spike of extreme fear and bodily discomfort.

*Reported panic symptoms.* Subjects were presented with 15 symptoms, 13 of which were taken from the list of panic symptoms in DSM-III-R (APA, 1987) and an additional two symptoms (sweet taste in mouth, and itchiness on the bottom of feet) to control for response bias. Subjects were instructed to rate on a 0 (none) to 3 (severe) scale, each symptom during their most recent stay in the chamber.

*Heart rate.* Subjects' heart rate was monitored continuously using an ambulatory heart rate monitor (UNIQ Heartwatch Model 8799, Computer Instruments Corp.). The unit consists of an electrode belt worn around the chest which transmits heart rate signals to a wrist receiver that depicts and stores the heart rate data. The unit also has a built-in event marker which was used to indicate when the *Ss* entered and exited the experimental chamber. Heart rate readings were sampled every 15 sec during the course of the study. Subjects' baseline heart rate was indexed by averaging the *Ss*' heart rate over a 5 min period prior to the first exposure trial. During exposure to the experimental chamber, *Ss*' heart rate was averaged to produce one index for each of the two exposure trials. A final post exposure heart rate index was calculated by averaging the *S*'s heart rate data over the 5 min period following the second exposure trial.

### *Procedure*

After completing informed consent procedures, the heart rate unit was placed on the *S* by a female undergraduate research assistant. Subjects were instructed to sit quietly for 5 min while their resting heart rate was being collected. Next, *Ss* completed a claustrophobia history questionnaire after which the experimenter partially opened the door of the experimental chamber (approx. 30°) and instructed the *S* to look inside. The following instructions were given:

"During this experiment you will be asked to enter this dark narrow corridor several times. The door will remain unlocked, and you are free to leave the room at any time. However, we would like you to remain in the corridor as long as you can. I will return and open the door to let you know when the trial has ended. On each trial, there will be a questionnaire for you to complete before you enter the room and another questionnaire for you to complete when you leave the room."

The door of the chamber was then shut and the *S* was instructed to complete the pre-exposure questionnaire consisting of measures of predicted fear, and predicted likelihood of panicking. These measures required less than 5 min to complete. Upon completion of the pre-exposure questionnaire, the experimenter instructed the *S* to enter the chamber and walk to the very end without stopping or looking back.

The experimental chamber consisted of a long narrow observation corridor measuring 11.40 m (length), 0.57 m (width) and 2.29 m (height). As the *S* actually walked into the chamber, the experimenter pressed the marker button on the heart-rate unit to indicate the beginning of the exposure trial. Upon reaching the back wall, the *S* was instructed to remain there as long as possible and was reminded that the exit door was unlocked. Instructions outlining specific exit procedures were also provided. Subjects were told that once they left the back wall, they were to continue without stopping to the exit door and leave, even if upon approaching the exit door their discomfort/anxiety was reduced to a manageable level. Moreover, *Ss* were reminded that if they did not exit on their own before the end of the trial, the experimenter would open the door to

signal the end of the trial. Subjects were not provided information concerning the length of the exposure trials. If the *S* exited the chamber prior to the 2-min period, the experimenter depressed the marker button of the heart-rate unit to indicate the end of the exposure trial.

If the *S* remained in the chamber for the full 2 min, the experimenter opened the door and instructed the *S* to exit. The time of exposure in sec was recorded by a research assistant. Immediately after exiting, the *S* completed the post exposure questionnaire to assess fear level, report of bodily symptoms and panic occurrence while in the chamber. This identical procedure was repeated for Trial 2. At the completion of the post exposure questionnaire for Trial 2, *Ss* sat quietly for 5 min to allow assessment of post exposure heart rate.

### STATISTICAL ANALYSES

Subjects were categorized into one of several groups based on the congruence between their *predicted* and *actual* fear, panic and performance on Trial 1. For the domains of fear and performance, three classification groupings were constructed. *Underpredictors* were defined as *Ss* whose actual fear/performance on Trial 1 exceeded their predicted fear/performance by more than 10%;\* *overpredictors* were defined as *Ss* whose predicted fear/performance on Trial 1 exceeded their actual fear/performance by more than 10%; *matchers* were defined as *Ss* whose actual and predicted fear/performance fell within 10% of each other.

A separate four-level panic match-mismatch categorization was developed based on the congruence between *Ss*' predicted panic likelihood (i.e. panic expectancy) prior to exposure and actual panic occurrence during the exposure trial. *Underpredictors* were defined as *Ss* displaying low Trial 1 panic expectancy ratings (i.e. less than 50 on a 100-point scale) but who subsequently reported a panic attack during exposure on Trial 1. *Overpredictors* were defined as *Ss* who predicted a high likelihood of panic (i.e. panic expectancy rating of 50 or above) but who did not actually panic during exposure to the chamber. *Matchers—Panic* were those *Ss* who predicted they would panic and subsequently panicked. *Matchers—No Panic* were those *Ss* who reported low panic expectancy on Trial 1 and who did not panic.

Since it is possible that overprediction and underprediction might have different effects on subsequent fear/performance or fear/performance expectancy, separate indices were created.† Multiple regression and partial correlation analyses were conducted in order to examine the relationship between the magnitude of over- or under-prediction on Trial 1 and subsequent responding on Trial 2.

Due to the dichotomous nature of our panic index, logistic regression was used to examine the effects of over- and under-prediction on subsequent panic occurrence.

Table 1. Accuracy of *Ss*' appraisals of fear, panic and behavioral approach across two exposure trials

Domain	Underpredictors		Matchers		Overpredictors	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Fear						
Trial 1	33	28.2	69	59.0	15	12.8
Trial 2	17	14.5	78	66.7	22	18.8
Panic						
Trial 1	25	21.4	81	69.2	11	9.4
Trial 2	12	10.3	83	70.9	22	18.8
Behavioral approach						
Trial 1	54	46.1	56	47.9	7	6.0
Trial 2	44	37.9	67	57.8	5	4.3

\*The 10% criterion was based on the maximum possible score for each measure which resulted in a fear discrepancy of greater than 10 points on a 100-point scale and a performance discrepancy of greater than 12 sec.

†A fear overprediction index was computed by subtracting Trial 1 actual fear from Trial 1 fear expectancy (all negative numbers were coded as zero). Similarly, a fear underprediction index was computed by subtracting Trial 1 fear expectancy from Trial 1 actual fear (all negative numbers were coded as zero). Similarly, over- and under-prediction indices for performance were constructed by subtracting *Ss*' actual performance (length of stay in the chamber) from their predicted performance. Over- and under-prediction indices for panic were constructed by subtracting either 100 (occurrence of panic) or 0 (no occurrence of panic) from *Ss*' Trial 1 panic expectancy rating.

## RESULTS

Accuracy estimates of *Ss*' predictions of fear, panic and performance are presented in Table 1. Collapsing across domains, 58% of the *Ss* were accurate in predicting their behavioral and emotional response to the chamber during Trial 1. Correct predictions increased to 63.3% of the sample for Trial 2. As can be seen in Table 1, the accuracy of *Ss*' predictions varied as a function of the domain assessed. In both trials, *Ss*' achieved the highest level of accuracy in predicting panic, and were the least accurate in their predictions of performance.

### *Match–mismatch on predicted vs actual fear*

On Trial 1, 12.8% of the *Ss* overpredicted their fear, 59.0% were classified as matchers and 28.2% underpredicted their fear. On Trial 2, the percentage of overpredictors increased to 19.7%, matchers increased to 65.8%, and underpredictors decreased to 14.5%. Changes in fear predictions across trials for each of the three fear match–mismatch groups are shown in Fig. 1.

### *Effects of fear match–mismatch on subsequent fear*

Each fear discrepancy index on Trial 1 was entered with Trial 1 subjective fear as independent variables with Trial 2 fear as the dependent variable. As expected, Trial 1 subjective fear ratings accounted for a significant proportion of the variance in Trial 2 fear ( $R^2 = 0.55$ ). Consistent with prediction 3, *Ss*' fear during exposure was not significantly influenced by the match between *Ss*' actual and predicted fear from the previous trial. Specifically, neither the magnitude of fear overprediction nor fear underprediction on Trial 1 significantly predicted subjective fear on Trial 2 after controlling for Trial 1 fear.

### *Effects of fear match–mismatch on subsequent fear expectancy*

Consistent with prediction 3, fear expectancy was significantly influenced by the match between *Ss*' actual and predicted fear on the previous trial. Specifically, the level of fear overprediction on Trial 1 was negatively associated with Trial 2 fear expectancy even after controlling for Trial 1 fear expectancy (par  $R = -0.39$ ,  $P < 0.01$ ), whereas the magnitude of fear underprediction on Trial 1, was positively associated with subsequent fear expectancy even after controlling for Trial 1 fear expectancy (par  $R = 0.43$ ,  $P < 0.01$ ). See Table 2.

### *Match–mismatch on predicted vs actual panic*

On Trial 1, 43 (36.8%) of the *Ss* reported a panic attack, defined as a sudden surge of extreme fear with at least four of the DSM-III-R panic symptoms. Twenty-seven *Ss* (23.1%) reported a panic attack on Trial 2. Twenty-three *Ss* (19.7%) reported panic on both exposure trials, and 47 *Ss* (40.2%) reported a panic on at least one of the two exposure trials.

On Trial 1, 9.4% of the *Ss* overpredicted panic, 21.4% underpredicted panic, 53.9% accurately predicted no panic and 15.4% accurately predicted panic. On Trial 2, the percentage of *Ss* who overpredicted their panic increased to 18.8%; the percentage who underpredicted decreased to 10.3%; the percentage who accurately predicted no panic increased to 58.1%; and the percentage who accurately predicted panic decreased to 12.8%. Changes in panic predictions for each of the four panic match–mismatch groups are shown in Fig. 1.

### *Effects of panic match–mismatch on subsequent panic*

Consistent with prediction 3, neither the magnitude of panic overprediction nor the magnitude of panic underprediction was significantly related to Trial 2 Panic. The occurrence of panic on Trial 1 was positively associated with panic on Trial 2, even after controlling for over and underprediction (par  $R = 0.43$ ,  $P < 0.01$ ).

### *Effects of panic match–mismatch on subsequent panic expectancy*

The effects of panic match–mismatch on subsequent panic expectancy mirrored those found for fear match–mismatch. Consistent with prediction 3, panic expectancy was significantly influenced by the match between *Ss*' actual and predicted panic on the previous trial. Specifically, the magnitude of panic overprediction was negatively associated with Trial 2 panic expectancy even

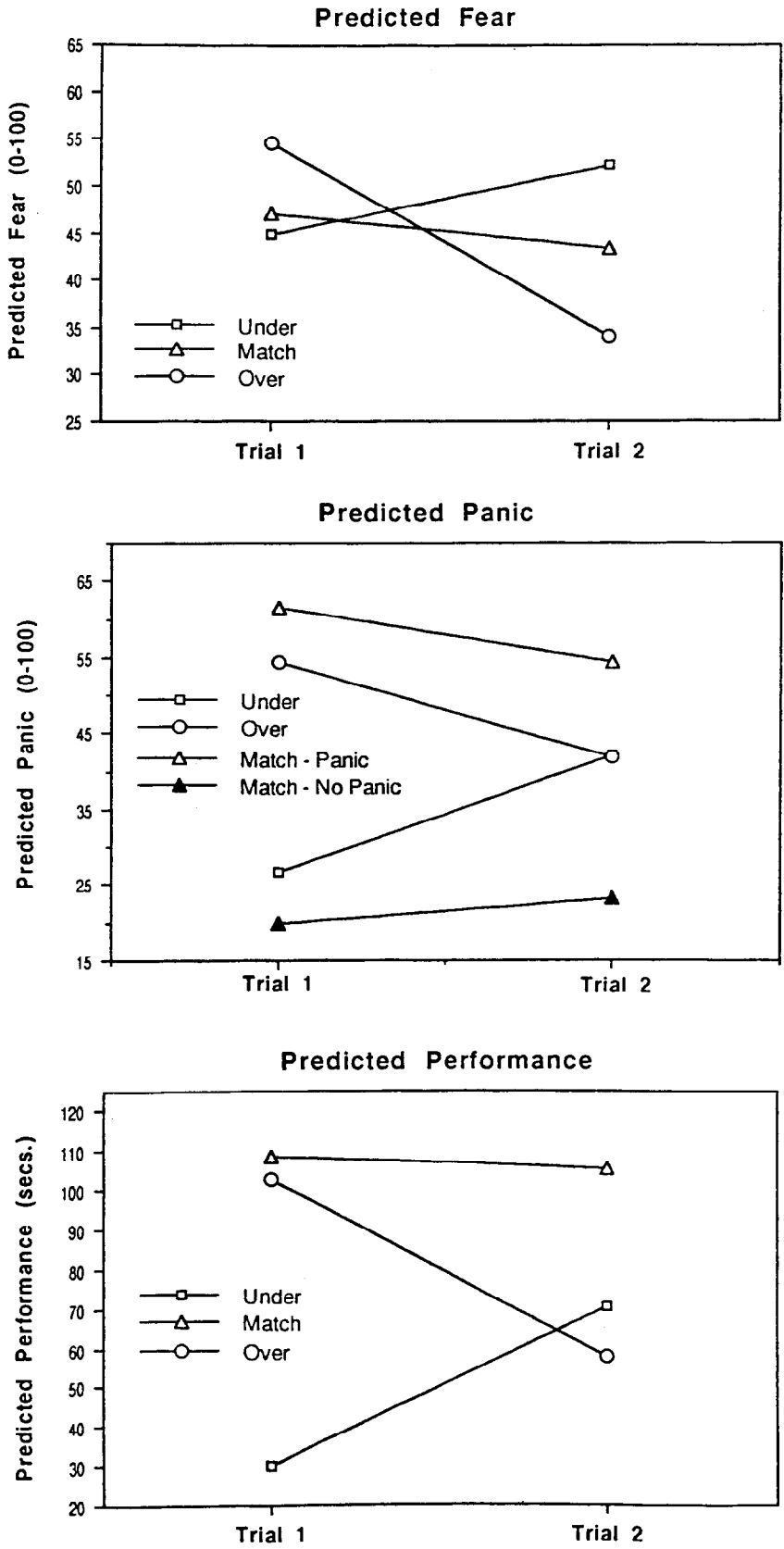


Fig. 1. Changes in predictions of fear, panic and performance from Trial 1 to Trial 2.

Table 2. Measures of association (simple and adjusted) between Time 1 match-mismatch and Time 2 subjective fear, behavioral performance and panic

	Time 2 criterion					
	Fear		Performance		Panic	
	Zero-order	Partial	Zero-order	Partial	Simple $V_c$	Adj. $V_c$
Time 1 predictors						
Corresponding Time 1 variable	0.74***	0.72***	0.88***	0.87***	0.47***	0.07
Corresponding overprediction index (overall regression)	-0.28**	0.09	-0.30***	0.11	0.44***	0.05
	$(R^2 = 0.55***)$		$(R^2 = 0.78***)$		$(total V_c^2 = 0.61***)$	
Corresponding Time 1 variable	0.74***	0.70***	0.88***	0.70***	0.47***	0.34***
Corresponding underprediction index (overall regression)	0.38***	-0.15	0.16	-0.10	0.44***	0.03
	$(R^2 = 0.56***)$		$(R^2 = 0.78***)$		$(total V_c^2 = 0.61***)$	

Table entries reflect the associations between variables in the same domain. Specifically, 0.74 is the simple correlation between subjective fear at Time 1 and subjective fear at Time 2; 0.72 is the partial correlation between subjective fear at Time 1 and subjective fear at Time 2, controlling for the Time 1 fear overprediction; -0.28 is the simple correlation between the Time 1 fear overprediction and subjective fear at Time 2; 0.09 is the partial correlation between the Time 1 fear overprediction and subjective fear at Time 2, controlling for subjective fear at Time 1; 0.88 is the simple order correlation between performance at Time 1 and performance at Time 2; 0.87 is the partial correlation between performance at Time 1 and performance at Time 2, controlling for the Time 1 performance overprediction etc.

\* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ .

after controlling for Trial 1 panic expectancy (par  $R = -0.31$ ,  $P < 0.01$ ). In contrast, the magnitude of panic underprediction on Trial 1, was no longer significantly associated with Trial 2 panic expectancy once Trial 1 panic expectancy was entered into the model (par  $R = 0.15$ ,  $P > 0.10$ ).

#### Match-mismatch on predicted vs actual behavioral approach

On Trial 1, 6.0% of the Ss on Trial 1 were classified as overpredictors, 46.2% were classified as underpredictors and 47.9% were classified as matchers. For Trial 2, 4.3% of the Ss were classified as overpredictors, 37.9% were classified as underpredictors, and 57.8% were classified as matchers. Changes in performance predictions for each of the three performance match-mismatch groups are depicted in Fig. 1.

#### Effects of performance match-mismatch status on subsequent behavioral approach

As expected, Trial 1 behavioral approach accounted for a significant proportion of the variance in Trial 2 behavioral approach even after controlling for the level of Trial 1 performance overprediction (par  $R = 0.87$ ) or level of Trial 1 performance underprediction (par  $R = 0.70$ ). Consistent with prediction 3, Ss' behavioral approach on Trial 2 was not significantly influenced by the match between Ss' actual and predicted performance from the previous trial. Specifically, neither the magnitude of performance overprediction nor performance underprediction on Trial 1 significantly predicted behavioral approach on Trial 2.

Table 3. Measures of association (simple and adjusted) between Time 1 match-mismatch and Time 2 expectancies of fear, behavioral performance and panic

	Time 2 criterion					
	Expected fear		Expected performance		Expected panic	
	Zero-order	Partial	Zero-order	Partial	Zero-order	Partial
Time 1 predictors						
Corresponding Time 1 variable	0.59***	0.66***	0.62***	0.66***	0.48***	0.29***
Corresponding overprediction index (overall regression)	-0.16	-0.39***	-0.13	-0.29**	-0.50***	-0.31***
	$(R^2 = 0.45***)$		$(R^2 = 0.44***)$		$(R^2 = 0.31***)$	
Corresponding Time 1 variable	0.59***	0.66***	0.62***	0.68***	0.48***	0.29**
Corresponding underprediction index (overall regression)	0.27**	0.43***	-0.29**	0.44***	0.42***	0.15
	$(R^2 = 0.47***)$		$(R^2 = 0.51***)$		$(R^2 = 0.20***)$	

Table entries reflect the associations between variables in the same domain. Specifically, 0.59 is the simple correlation between expected fear at Time 1 and expected fear at Time 2; 0.66 is the partial correlation between expected fear at Time 1 and expected fear at Time 2, controlling for the Time 1 fear overprediction; -0.16 is the simple correlation between the Time 1 fear overprediction and expected fear at Time 2; -0.39 is the partial correlation between the Time 1 fear overprediction and expected fear at Time 2, controlling for expected fear at Time 1; 0.62 is the simple correlation between expected performance at Time 1 and expected performance at Time 2; 0.66 is the partial correlation between expected performance at Time 1 and expected performance at Time 2, controlling for the Time 1 performance overprediction etc.

\* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ .

*Effects of performance match–mismatch status on subsequent performance expectancy*

The effects of performance match–mismatch on subsequent performance expectancy mirrored those found for fear and panic match–mismatch. Consistent with prediction 3, performance expectancy was significantly influenced by the match between *Ss*' actual and predicted performance on the previous trial. Specifically, the level of performance overprediction on Trial 1 was negatively associated with Trial 2 performance expectancy after controlling for Trial 1 performance expectancy (par  $R = -0.29$ ,  $P < 0.01$ ). Similarly, the level of performance underprediction on Trial 1 was positively associated with Trial 2 performance expectancy once Trial 1 behavioral approach was entered into the model (par  $R = 0.44$ ,  $P < 0.001$ ).

## DISCUSSION

Our results provide further evidence that phobic *Ss* are not always accurate in predicting their response to feared stimuli. When collapsing across the three domains of fear, panic and performance (behavioral approach), approx. 40% of the *Ss* inaccurately predicted their response to the phobic situation. Of the three domains assessed, *Ss*' predictions were most accurate for panic and least accurate for behavioral approach. The pattern of mismatches varied as a function of the particular response domain. In the case of fear and performance, mismatches were more frequently underestimates than overestimates. The tendency to underestimate behavioral approach was particularly strong and accounted for the majority of the mismatches in this domain. This finding is consistent with previous work showing that phobics tend to err on the side of making overly conservative appraisals of performance capabilities related to approaching phobic stimuli (Telch, Bandura, Vinceguerra, Agras & Stout, 1982).

In the case of panic, the pattern of mismatches was strongly influenced by trial, with a greater tendency for *Ss* to underestimate panic on Trial 1 and overestimate it on Trial 2. The switch from under to overprediction of panic from Trials 1 to 2 was primarily due to two factors. First, consistent with previous findings, *Ss* who unexpectedly panicked on Trial 1 tended to alter their Trial 2 panic predictions in accordance with their new panic information. Second, almost 40% of those who accurately predicted panic on Trial 1 did not panic on Trial 2, which contributed further to overprediction of Trial 2 panic. The greater accuracy for panic prediction vs fear prediction is consistent with previous findings (Rachman *et al.*, 1988). However, it is possible that the superior accuracy for panic prediction is an artifact of the different criteria used to define panic mismatches vs fear mismatches. Also, *Ss* may find it easier to predict a discrete episode of panic compared to a continuous dimension like fear.

The present findings invite comparison with those of Rachman and colleagues. Our results mirror those of Rachman and colleagues concerning the consequences of matches and mismatches on subsequent predictions of fear and panic. Consistent with prediction 2, *Ss* who underpredicted their fear or panic on Trial 1 displayed the expected increase in predicted fear or panic on Trial 2. Conversely, *Ss* who overpredicted their fear or panic on Trial 1 showed a decrease in their predictions of fear or panic on the subsequent exposure trial. And, consistent with prediction, *Ss* who were accurate in predicting their fear or panic tended to show no significant change in their predictions on the next exposure trial. Finally, our results reinforce previous findings of Rachman and his colleagues showing that regardless of *Ss*' accuracy in prediction, actual fear and panic decrease with repeated exposures.

Contrary to prediction (prediction 1), our *Ss* did not show a fear overprediction bias. Whereas the series of studies by Rachman *et al.* found a pervasive overprediction bias (39–60% for claustrophobics), we found no such pattern. On the contrary, overpredictions were infrequent (1.8–18.8%), and a more consistent pattern of underpredictions emerged. What might account for our failure to confirm the overprediction of fear observed in previous work? First, the nature of the claustrophobic test chambers differed markedly between the two sites. During exposure, *Ss* in the Rachman studies stood directly by the door of a small cabinet, thus having quick access to safety. Our *Ss*, on the other hand, were required to stand at the back of a long, dark, narrow chamber 11.40 m away from a closed door. Perhaps the differences in proximity to perceived safety contributed to a different profile of mismatches. Under conditions where perceived ease of escape



is high (i.e. safety cue present), *Ss* may show less of a fear response than expected (fear/panic overprediction), especially if the safety cue is not salient to the *Ss* at the time they make their response predictions. Conversely, under conditions where perceived ease of escape is low (safety cue absent), *Ss* may display a more heightened fear/panic response than expected (fear/panic underprediction), especially if the absence of the safety cue is not salient to the *Ss* at the time they make their response predictions.

Differences in the perceived predictability of the exposure task cannot be ruled out as a factor accounting for our failure to find an overprediction bias. Whereas Rachman *et al.* informed *Ss* as to the approximate duration of each exposure trial (2–5 min), we, on the other hand, provided *Ss* no information concerning the duration of exposure. A heightened sense of unpredictability might be expected to increase fear levels during exposure and thus contribute to fear/panic underprediction. Studies which directly manipulate proximity to safety cues and predictability of the feared stimulus within a match-mismatch paradigm are needed to confirm these possible explanations. Nevertheless, our findings suggest that the tendency to overpredict fear may not be a universal feature of phobic *Ss* and points toward the need to clarify the conditions under which overprediction vs underprediction are likely to occur.

The match-mismatch formulation predicts that the congruence between *Ss*' actual and predicted fear contributes more to subsequent *predictions* of fear than to *actual* fear (assymetry hypothesis). We subjected this hypothesis to a stringent test by examining whether the following two conditions were met: (a) the degree of mismatch between *Ss*' Trial 1 predicted and actual fear accounts for unique variance in their Trial 2 predicted fear even after controlling for predicted fear at Trial 1; and (b) the degree of mismatch between *Ss*' Trial 1 predicted and actual fear does *not* account for unique variance in Trial 2 actual fear/panic after controlling for Trial 1 fear. Our results were quite consistent with this assymetry hypothesis in showing that both of the above conditions were met. As predicted, neither type of mismatch (i.e. underprediction or overprediction) added significantly to the prediction of subsequent fear; whereas the magnitude of both underprediction and overprediction accounted for unique variance in subsequent fear predictions, after controlling for predicted fear on Trial 1. A similar assymetry emerged in the domains of panic and behavioral approach. The one exception occurred for the underprediction of panic. This anomaly may be due to the infrequency of panic underprediction (21.4%) on Trial 1.

Given the evidence that fear, panic and performance expectancies may motivate avoidance (Craske *et al.*, 1988; Telch *et al.*, 1989; Valentiner, Telch, Ilai & Hehmsoth, 1993; Williams, Kinney & Falbo, 1989), the tendency to overpredict fear and panic and underpredict behavioral performance, may play a role in the maintenance of phobic reactions by promoting avoidance thereby reducing opportunities for threat disconfirmation. In general our findings suggest that inaccurate appraisals of fear, panic or performance have a unique influence on subsequent appraisals. One implication of these findings is that psychological treatments should strive to provide patients the greatest possible disconfirmation of their threat-relevant appraisals. The engineering of "therapeutic mismatches" may prove to be an even more potent fear-reduction strategy than exposure alone.

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