Running Head: Efficacy Feedback

Literature Review

The effect of efficacy feedback on the self-efficacy, arousal, and performance of introverts and extraverts

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The Effect of Efficacy Feedback on the Self-Efficacy, Arousal, and Performance of Introverts and Extraverts

The concept of self-efficacy is a major area of research in psychology, with much of this research aimed at learning how self-efficacy affects performance. High levels of self-efficacy are associated with increases in performance and low levels with decreases in performance and increases in physiological arousal (Bandura, 1983; Bandura & Cervone, 1983; Bandura, Cioffi, Taylor, & Brouillard, 1988; Bandura, 1989; Bouffard-Bouchard, 1993; Ozer & Bandura, 1990; Sanna & Pusecker, 1994). Owing to this observed relationship, researchers often try to increase self-efficacy expectancies using some form of feedback procedure (Bouffard-Bouchard, 1993; Lan & Gill, 1983; Sanna & Pusecker, 1994; Waldersee, 1994; Wiedenfeld et al., 1990). In this paper, feedback given to individuals with the objective of increasing or decreasing their self-efficacy expectancies and, thus, increasing or decreasing performance is operationalized as <u>efficacy feedback.</u> There is ample evidence which strongly suggests that inducing higher task-confidence, through efficacy feedback, produces successive improvements in task performance and gradually

increases ratings of self-efficacy (Bandura, 1989; Bouffard-Bouchard, 1993).

Manipulating self-efficacy expectancies through efficacy feedback may be a successful method for increasing task performance; however, the correlations between reported self-efficacy and actual post manipulation performance usually vary between .40 and .63 (Bouffard-Bouchard, 1993; Ozer & Bandura, 1990; Sanna & Pusecker, 1994). These correlations are low to moderate in magnitude, suggesting that a sizeable proportion (60-84%) of the variance in performance is unexplained by self-efficacy.

One factor that may moderate the effects of self-efficacy feedback on performance is arousal induced by such feedback. Since arousal has been linked to performance both directly and indirectly (through individual differences in pre-existing states of optimal arousal), its moderating role deserves careful analysis.

Self-Efficacy Expectancies

Self-efficacy can be defined as personal judgements of one's ability to successfully complete a specific task (e.g., Bandura, 1983). Self-efficacy expectancies are positively related to task

performance, with higher perceived self-efficacy associated with increased performance (e.g., Bandura, 1983): the more efficacious, or confident, people perceive themselves to be at carrying out a task, the more likely they are to initiate and persist with performance of that task. Moreover, increasing a subject's confidence in his or her ability to complete a task produces improvements in performance and increases in ratings of self-efficacy (Bandura, 1989). Subjects who are given negative feedback set lower goals and report lower self-efficacy (Baron, 1988). Thus, the relationship between self-efficacy and performance is positive, with higher reported self-efficacy associated with higher performance (Bandura & Cervone, 1983).

In contrast, an opposite relationship may exist between self-efficacy and arousal, particularly when subjects perform tasks that are inherently threatening or fear inducing (Lan & Gill, 1984; Bandura et al., 1988; Ozer & Bandura, 1990; Yancey, Humphrey, & Neal, 1992). Participants who report low levels of self-efficacy show increased levels of autonomic arousal, plasma cortisol secretion, and report higher levels of subjective distress as measured with an anxiety inventory (Lan & Gill, 1984; Wiedenfeld et. al, 1990;

Waldersee, 1994; Yancey et. al, 1992) Uncertainty of our ability to accomplish a task is linked to appraisals of stress that we cannot sufficiently cope with; thus, the less confident we are in being able to accomplish a task the more aroused we become and the poorer we may perform (Lan & Gill, 1984). Therefore, there is a link between self-efficacy expectancies, arousal and, hence, performance. As we shall see, there are substantial differences between introverts and extraverts regarding how they react to stimulation, and in how much arousal they require to perform effectively and efficiently.

Optimum Levels of Arousal: Individual Differences

Research regarding the relationship between performance and arousal has generally indicated that both very high and very low levels of physiological arousal are associated with low levels of performance, while moderate levels of arousal are associated with higher levels of performance. The level of arousal at which individuals perform most effectively and efficiently is termed the optimal level of arousal (Geen, 1984; Demojà, Reitano, Caracciolo, 1985; Trouvé & Libukman, 1992). This conforms to the inverted "U" shaped relationship hypothesized by arousal theorists

which states that the optimal level of arousal associated with maximum performance on a task is intermediate across the range of possible arousal levels (Bullock & Gilliland, 1993; Trouvé & Libukman, 1992).

The personality trait of introversion/extraversion has been operationalized in physiological terms; specifically in terms of optimal levels of arousal (Geen, 1984). Such optimal levels of arousal have been hypothesized to moderate one's reaction to stimulation (Stelmack, 1990). During baseline (i.e., non-stimulation) conditions, there are no differences in arousal between introverts and extraverts; however, there is considerable evidence to suggest arousal differences in response to stimulation (e.g., caffeine or nicotine) between these groups. These chemicals have the effect of increasing introverted participants' sensitivity to experimental stimulation (i.e., moderate intensity 500 hz tones). Introverts respond as if the stimulation is more intense when their resting arousal levels are increased using caffeine and nicotine; thus, introverts exhibit greater electrodermal (skin conductance) and electrocortical (EEG) responses to stimulation when compared to extraverts (Geen, 1984;

Stelmack, 1990). (See **Figure 1**) Extraverts typically require higher levels of stimulation to perform efficiently, whereas introverts require lower levels of stimulation (Geen, 1984). Therefore, when introverts and extraverts are exposed to equal amounts of stimulation, increased arousal levels, in introverts, result in <u>decreases</u> in performance (Geen, 1984; Stelmack, 1990; Trouvé & Libukman, 1992).

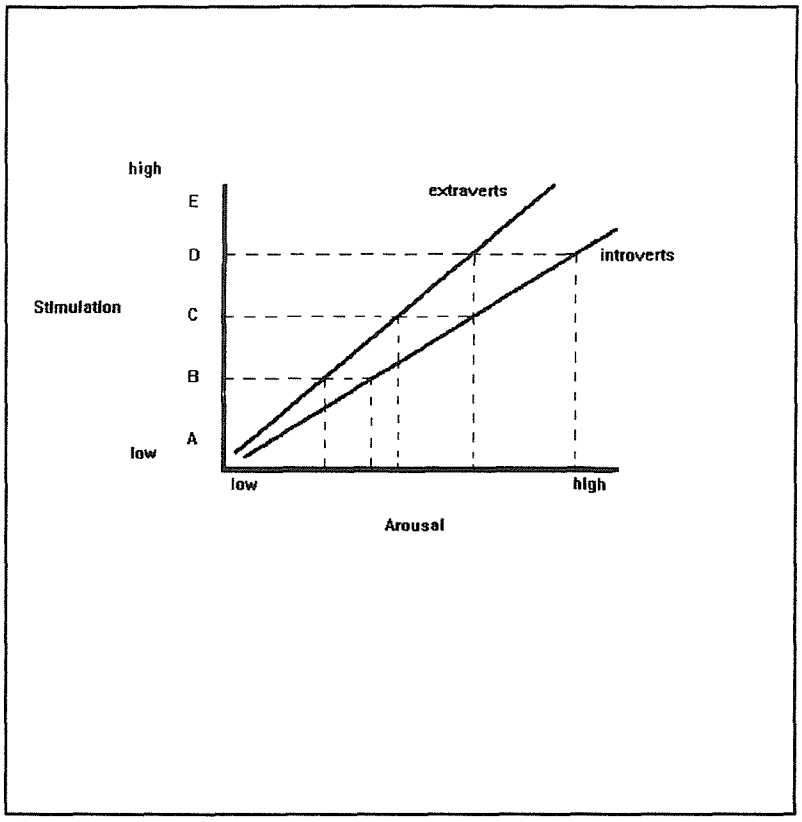

Figure 1 Hypothesized relation of stimulation and arousal in introverts and extraverts.

Thus, because introverts are more sensitive to auditory or pharmacological stimulation, they may also be more sensitive than extraverts to other forms of stimulation (e.g., efficacy feedback); hence, these

profound differences may moderate how individuals react to manipulations of their self-efficacy expectancies, which in turn may affect their subjective self-efficacy, arousal levels, and peformance.

Conclusion

Manipulating self-efficacy expectancies, through efficacy feedback, appears to be a successful method for increasing task performance; however, the correlations between reported self-efficacy and actual post-manipulation performance are low to moderate (Bouffard-Bouchard, 1993; Ozer & Bandura, 1990; Sanna & Pusecker, 1994); thus, there is much variability that is unexplained by self-efficacy. Simply reporting a high level of self-efficacy does not translate into superior performance. One factor that may moderate the effects of self-efficacy feedback on performance is arousal induced by such feedback and, since arousal has been linked to performance both directly and indirectly, its moderating role deserves careful analysis.

The personality trait of introversion/extraversion has been operationalized in terms of optimal levels of arousal. Although they do not differ from extraverts in resting arousal levels, introverted individuals become

more aroused than extraverts when given the same amount of stimulation which, in turn, affects their performance on cognitive tasks (Stelmack, 1990; Trouvé & Libukman, 1992). These higher arousal levels, in introverts, result in decreases in performance. Introverts may also be more sensitive than extraverts to efficacy feedback; hence, these differences may moderate how individuals react to manipulations of their self-efficacy expectancies, which in turn may affect their subjective self-efficacy, arousal levels, and performance.

Higher self-efficacy expectancies may not always enhance performance equally in all individuals because of differences in reactivity to stimulation. Generally, expectancy theorists assume that high levels of self-efficacy yield higher levels of motivation, which in turn transfers into improved performance (Yancey et al., 1992, 283-84). Past research shows that high self-efficacy expectancies do not always result in superior performance in all individuals. These data may reflect a lack of control for individual differences in personality, namely, introversion/extraversion. As we have seen, introverts and extraverts differ in how they react to stimulation; hence, these individual differences may mediate the effects of efficacy

feedback on self-efficacy expectancies and, thus, on arousal and performance. Therefore, increasing self-efficacy may not be the best strategy to use for enhancing performance in all individuals. Precisely how individual differences in introversion-extraversion mediate responses to efficacy-feedback is a fruitful avenue for further research.

References

Bandura, A. (1983). Self-efficacy determinants of anticipated fears and calamities. Journal of Personality and Social Psychology, 45, 464-469.

Bandura, A., Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. Journal of Personality and Social Psychology, 45, 1017-1028.

Bandura, A., Cioffi, D., Taylor, C. B., Brouillard, M. E. (1988). Perceived self-efficacy in coping with cognitive stressors and opioid activation. Journal of Personality and Social Psychology, 55, 479-488.

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. Developmental Psychology, 25, 729-735.

Baron, R. A. (1988). Negative effects of destructive criticism: impact on conflict, self-efficacy and task performance. Journal of Applied Psychology, 73, 199-207.

Bouffard-Bouchard, T. (1993). Influence of self-efficacy on performance in a cognitive task. The Journal of Social Psychology, 130, 353-363.

Bullock, W. A., Gilliland, K. (1993). Eysenck's arousal theory of introversion-extraversion: a converging measures investigation. Journal of Personality and Social Psychology, 64, 113-123.

Demojà, C. A., Reitano, M., Caracciolo, E. (1985). General arousal and performance. Perceptual and Motor Skills, 61, 747-753.

Geen, R. G. (1984). Preferred stimulation levels in introverts: effects on arousal and performance. Journal of Personality and Social Psychology, 46, 1303-1312.

Gellatly, I. A., Meyer, J. P. (1992). The effect of goal difficulty on physiological arousal, cognition, and task performance. Journal of Applied Psychology, 77, 694-704.

Lan, L. Y., Gill, D. L. (1984). The relationships among self-efficacy, stress responses, and a cognitive feedback manipulation. Journal of Sport Psychology, 6, 227-239.

Matthews, G., Jones, D. M., Chamberlain, A. G. (1989). Interactive effects of extraversion and arousal on attentional task performance: multiple resources or encoding processes? Journal of Personality and Social Psychology, 56, 629-639.

Ozer, E. M., Bandura, A. (1990). Mechanisms governing empowerment effects: a self-efficacy analysis. Journal of Personality and Social Psychology, 58, 472-486.

Sanna, L. J., Pusecker, P. A. (1994). Self-efficacy, valence of self-evaluation, and performance. Personality and Social Psychology Bulletin, 20, 82-92.

Stelmack, R. M. (1990). Biological bases of extraversion: psychophysiological evidence. Journal of Personality, 58.

Trouvé, R. J., Libukman, T. M. (1992). Eyewitness performance of personality types as a function of induced arousal. American Journal of Psychology, 105, 417-433.

Waldersee, R. (1994). Self-efficacy and performance as a function of feedback sign and anxiety: a service experiment. Journal of Applied Behavioral Science, 30, 346-356.

Wiedenfeld, S. A., Bandura, A., Levine, S., O'leary, A., Brown, S., & Raska, K. (1990). Impact of perceived self-efficacy in coping with stressors on components of the immune system. Journal of Personality and Social Psychology, 59, 1082-1094.

Yancey, G. B., Humphrey, E., Neal, K. (1992). How perceived incentive, task confidence, and arousal influence performance. Perceptual and Motor Skills, 74, 279-285.

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Research has suggested that introverts and extraverts differ in their responses to performance feedback. The present study examined the effect of feedback on the arousal, self-efficacy, and performance of introverts and extraverts on a short-term memory task. Subjects were randomly assigned to one of three performance feedback conditions: positive, negative, or no-feedback control. On post-test, introverts performed significantly better than extraverts under the negative performance feedback condition. These findings suggest that individual differences in introversion-extraversion may mediate the effects of feedback on performance, and that receiving negative feedback may improve the performance of some individuals.

The concept of self-efficacy is a major area of research in psychology, with much of this research aimed at learning how self-efficacy affects performance. High levels of self-efficacy are associated with increases in performance and low levels with decreases in performance and increases in physiological arousal (Bandura, 1983; Ozer & Bandura, 1990). There is ample evidence which strongly suggests that inducing higher task confidence, through efficacy feedback, produces successive improvements in task performance and gradually increases ratings of self-efficacy (Bandura, 1989; Bouffard-Bouchard, 1993).

Manipulating self-efficacy expectancies, through efficacy feedback, appears to be a successful method for increasing task performance; however, the correlations between reported self-efficacy and actual post manipulation performance usually vary between .40 and .63 (Bouffard-Bouchard, 1993; Ozer & Bandura, 1990; Sanna & Pusecker, 1994). These correlations are low to moderate in magnitude, suggesting that a sizable proportion (60-84%) of variance in performance is unexplained by self-efficacy.

One factor that may moderate the effects of self-efficacy feedback on performance is arousal induced by such feedback. Since arousal has been linked to performance both directly and indirectly (through individual differences in

pre-existing states of optimal arousal), its moderating role deserves careful analysis.

The personality trait of introversion/extraversion, has been operationalized in physiological terms; specifically in terms of optimal levels of arousal (i.e., the level of arousal at which subjects perform most effectively and efficiently). Such optimal levels of arousal have been hypothesized to moderate one's reaction to stimulation (Stelmack, 1990). Although they do not differ from extraverts in resting arousal levels, introverted individuals become more aroused than extraverts when given the same amount of stimulation (i.e., noise, caffeine, or nicotine) which, in turn, affects their performance on cognitive tasks (Stelmack, 1990; Trouvé & Libukman, 1992). More specifically, when introverts and extraverts are exposed to equal amounts of stimulation, arousal levels increase more in introverts. These higher arousal levels in introverts result in <u>decreases</u> in performance. Thus, because introverts are more sensitive to auditory or pharmacological stimulation, they may also be more sensitive, than extraverts, to other forms of stimulation (e.g., efficacy feedback); hence, these profound differences may moderate how individuals react to manipulations of their self-efficacy expectancies, which in turn may affect their subjective self-efficacy, arousal levels, and performance.

Higher self-efficacy expectancies may not always enhance performance equally in all individuals because of differences in reactivity to stimulation. For example, decreasing self-efficacy serves to increase arousal in most individuals (Bandura, 1983). However, for extraverts such additional arousal serves to bring them to their optimal level of arousal; hence, we would expect them to perform well at this level when compared to introverts. On the other hand, for introverts, such additional arousal serves to bring such subjects beyond their optimal level of arousal; thus, we would expect them to perform less-well, especially when compared to extraverts. In contrast, increasing self-efficacy serves to decrease arousal in most individuals (Bandura, 1983). For extraverts, this leaves them below their optimum level; hence, we would expect them to perform less-well than introverts exposed to the same efficacy feedback.

The present study sought to determine the effect of efficacy feedback on the self-efficacy, arousal, and performance of introverts and extraverts. Past research (e.g., Yancey, Humphrey, & Neal, 1992) shows that high self-efficacy expectancies do not always result in superior performance in all individuals. These data may reflect a lack of control for individual differences in personality, namely, introversion/extraversion.

It was hypothesized that 1) introverts would show greater increases in self-efficacy, greater decreases in arousal, and greater increases in performance than extraverts when given positive efficacy feedback; 2) introverts would show greater decreases in self-efficacy, greater increases in arousal, and greater decreases in performance than extraverts when given negative efficacy feedback; 3) that introverts and extraverts would not differ significantly in levels of self-efficacy, arousal, or performance in the control condition.

Method

Participants

Participants were 17 male and 31 female undergraduates 19-47 years of age drawn from a larger population of students who had completed the Eysenck Personality Inventory, Form A (EPI; Eysenck & Eysenck, 1964). Twenty-four participants who fell in the upper 25% of the distribution of scores on the extraversion dimension of the EPI were selected, and 24 participants who fell in the lower 25% of the distribution were selected. These two groups comprised the extravert and introvert groups, respectively.

Apparatus

Physiological arousal was measured using a Homecare Clinic's "Digital Blood Pressure & Pulse Monitor". This unit measures

systolic and diastolic blood pressure and pulse automatically and displays the results on a Liquid Crystal Display screen. Systolic and diastolic blood pressure readings were combined and converted into mean arterial pressure using the formula [Pmean = Pdia + 1/3(Psys - Pdia)] to control for heightened blood pressure in response to the measurement itself (Benjamins, Schuurs, Asscheman, Hoogstraten, 1990).

The experimental task was controlled by an IBM-compatible personal computer, which was also used to record baseline and post-test measures of subjective arousal and self-efficacy. A program written by the experimenter in Microsoft's Qbasic programming language was used to collect data. The program consisted of the state section of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970), two self-report questionnaires consistent with those used by self-efficacy researchers (Lust, Celuch, & Showers, 1993; Ozer & Bandura, 1990), and a digit-span task. The digit-span task required participants to recall series of digits ranging in length from 5 to 9 digits. The computer randomly generated the digits and displayed them for preset times in a 2cm x 6cm rectangular box at the center of the computer screen. Four sets of 5, 6, 7, 8, and 9 digit numbers were presented with each set being displayed for progressively shorter times. For the 5 and 6 digit

numbers, the presentations lasted for 1, .5, .25, and .1 seconds. For the seven digit numbers, presentations lasted for 1.5, .75, .5, and .25 seconds. Presentations of the eight digit numbers lasted for 2, 1, .5, and .25 seconds. For the nine digit numbers, presentations lasted for 3, 2, 1, and .5 seconds. After presentation of each set, participants were allowed as much time as they needed to respond before moving on to the next set. Participants entered their responses on the computer keyboard, which were then were compared to the actual digits displayed. The computer converted the participants' scores into percentages, and stored them in a data file on a floppy disk.

Once baseline measures were collected, participants were exposed to one of three conditions preselected by the experimenter: positive efficacy feedback, negative efficacy feedback, or no feedback control. The computer administered the feedback by a text message flashed on the monitor. This feedback in no way reflected the participants' true performance. The manipulation was designed to influence expectancies, arousal, and performance and did not reflect how participants were really performing. In the positive efficacy feedback condition participants were shown the statement:

> Your score indicates that you are performing
> at the 80th percentile of University Students
> between 20 and 35 years of age.
> This means that 80% of the people tested performed
> less well at this task than you did.

In the negative feedback condition participants were shown the statement:

> Your score indicates that you are performing
> at the 20th percentile of University Students
> between 20 and 35 years of age.
> This means that 80% of the people tested performed
> better at this task than you did.

In the control condition participants were not informed about how they were performing.

Procedure

Testing went on over a three-week period and participants were briefed and tested individually. Testing sessions lasted on average 15 minutes with a range of 10-20 minutes. Prior to testing, participants were randomly assigned in blocks to one of three conditions: 1) positive efficacy feedback, 2) negative efficacy feedback, or 3) no feedback control. On arrival for testing, the experimenter

used a printed form to brief the participant about the nature of the research. Once the form was read, the experimenter had the participant sit in front of the computer and took blood pressure and pulse readings. Individuals were then informed that mid-way through the program they would be prompted to call for the experimenter, at which point the experimenter would return and take their blood pressure and pulse again. The experimenter then left the room and allowed the participant to begin the computer program. Before the digit-span section of the computer program began to run, the participant completed the computerized version of the state section of the STAI and the two self-efficacy scales. The digit-span task ran next. Once the first part of the program was completed, the participant was exposed to either of the two efficacy feedback conditions or the control condition. Next, the computer program prompted the participant to inform the experimenter that he or she had completed the first section of the program, at which point the experimenter returned, took measures of blood pressure and pulse, and asked the participant to finish the program. In the second part of the program the STAI, efficacy scales, and digit-span task were readministered. Once the participant finished the second section, the experimenter returned and informed him or her that they would be debriefed once all data were collected.

Results

Performance

An alpha level of .05 was used for all statistical tests. Analyses of covariance between pre-test and post-test performance indicated that there was no main effect of treatment on performance, $F(2, 41) = .70$, $p = .503$, nor was there a main effect of introversion-extraversion on performance, $F(1, 41) = .43$, $p = .516$. There was, however, a significant interaction between treatment and introversion-extraversion, $F(2, 41) = 3.66$, $p = .035$. Although it was not in the predicted direction, introverts differed significantly from extraverts in how they performed in response to negative efficacy feedback, $F(1, 14) = 4.56$, $p = .05$. It was hypothesized that introverts' performance would get significantly worse than extraverts' when given negative efficacy feedback. In the negative efficacy feedback condition introverts' performance increased by $M = 3.05$ points from baseline, while extraverts' performance decreased by $M = -2.2$ points from baseline (See **Table 1**). There were no statistically significant differences between introverts and extraverts in the positive efficacy feedback condition or in the control condition. Looking within groups, extraverts did not differ significantly in performance from one another regardless of type of treatment, $F(2, 21) = .81$, $p = .458$. Introverts did differ

Table 1

Performance for Introverts and Extraverts by Condition

	Introverts			Extraverts		
Condition	M	SD	n	M	SD	n
Negative	3.05	3.17	8	-2.21	6.20	8
Positive	1.80	3.50	8	.67	4.97	8
Control	-2.64	4.30	8	.82	4.84	8
Total	.74	4.32	24	-.24	5.33	24

signicantly in performance from one another depending on the type of efficacy feedback they were given, $F(2, 21) = 5.26$, $p = .014$. Post Hoc analysis using Tukey's pairwise comparisons (critical value = 3.56) indicated that introverts in the control condition, $M = -2.643$ differed significantly from introverts in the negative efficacy feedback condition, $M = 3.054$, and positive efficacy feedback condition, $M = 1.803$.

Arousal

Blood Pressure - Analyses of covariance between pre-test and post-test blood pressure indicated that there was no main

effect of treatment on blood pressure, $F(2, 40) = .38$, $p = .685$, nor was there a main effect of Introversion-extraversion on blood pressure, $F(1, 40) = .10$, $p = .759$. There were no significant interactions between treatment and introversion-extraversion on blood pressure, $F(2, 40) = 1.78$, $p = .181$.

Pulse - Analyses of covariance between pre-test and post-test pulse indicated that there was no main effect of treatment on pulse, $F(2, 40) = 1.28$, $p = .289$, nor was there a main effect of introversion-extraversion on pulse, $F(1, 40) = .01$, $p = .913$. There were no significant interactions between treatment and introversion-extraversion on pulse, $F(2, 40) = .55$, $p = .580$.

STAI - Analyses of covariance between pre-test and post-test STAI responses indicated that there was no main effect of treatment on the STAI, $F(2, 41) = 1.59$, $p = .217$, nor were there any significant interactions between treatment and introversion-extraversion on the STAI, $F(2, 41) = .07$, $p = .929$. However, there was a main effect of introversion-extraversion on STAI responses across conditions, $F(1, 41) = 4.85$, $p = .033$. Introverts increased by $M = 2.76$ from baseline while extraverts decreased by $M = -2.46$ from baseline (See **Table 2**). Although the differences between conditions were not significant they were in the hypothesized direction under the negative efficacy feedback

Table 2

STAI Difference scores for Introverts and Extraverts by Condition

	Introverts			Extraverts		
Condition	M	SD	n	M	SD	n
Negative	6.51	8.1	8	.41	8.2	8
Positive	2.36	8.9	8	-2.9	8.96	8
Control	-.59	10.1	8	-4.9	9.6	8
Total	2.76	9.2	24	-2.46	8.83	24

condition (introverts M = 6.5, extraverts, M = .4), but not in the positive efficacy feedback condition (introverts M = 2.4, extraverts M = -2.9), which was opposite to what was hypothesized. In the control condition, extraverts were less aroused, M = -4.89, than introverts, M = -.59, although it was hypothesized that their arousal levels would be the same.

Self-Efficacy

Self-Efficacy - An analysis of covariance on pre-test and post-test self-efficacy scores indicated that there was no

main effect of treatment on self-efficacy, $F(2, 41) = 2.92$, $p = .065$. There was no significant main effect of introversion-extraversion on self-efficacy, $F(1, 41) = .49$, $p = .490$, and there were no significant interactions between treatment and introversion-extraversion on self-efficacy, $F(2, 41) = .13$, $p = .880$. Although differences in self-efficacy were not significant between conditions, they were in the hypothesized direction in the negative feedback condition but not in the positive feedback condition (See **Table 3**).

Table 3

Self-Efficacy Scores for Introverts and Extraverts by Condition

	Introverts			Extraverts		
Condition	M	SD	n	M	SD	n
Negative	-7.43	15.13	8	-3.6	12.73	8
Positive	2.67	7.25	8	7.62	13.82	8
Control	.13	14.73	8	.54	8.63	8
Total	-1.54	13.1	24	1.52	12.35	24

A stepwise regression analysis of self-efficacy, STAI, pulse, and blood pressure on performance under the two feedback conditions was performed. This determined that very little of the variance in performance is explained by self-efficacy, physiological arousal, or subjective arousal. The results are presented in **Table 4**.

Table 4

Summary of Stepwise Regression Analysis for Variables Predicting Introverts' and Extraverts' Performance on a Digit-Span Task (N = 48)

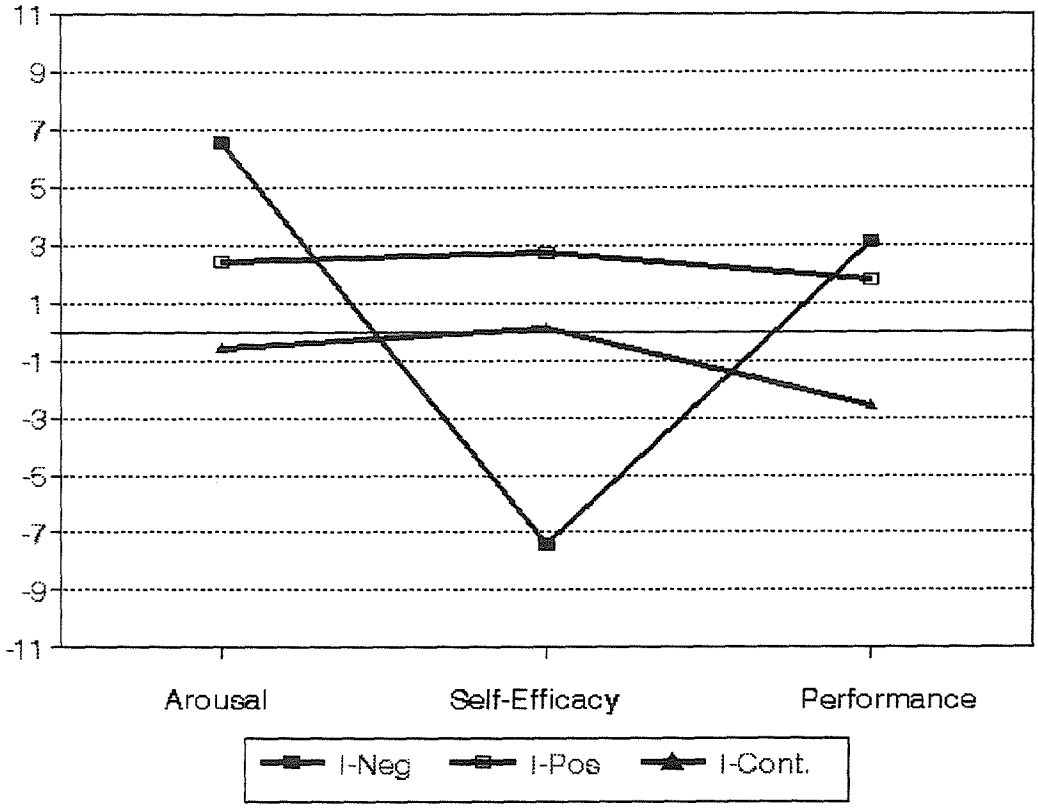
Vars	R-sq	Adj. R-sq	C-p	s	SELF-E	STAI	PULSE	BP
1	1.9	0.0	-0.4	4.8531	X			
1	1.3	0.0	-0.2	4.8688		X		
2	3.1	0.0	1.2	4.9059	X		X	
2	2.8	0.0	1.3	4.9135		X	X	
3	3.6	0.0	3.1	4.9801	X	X	X	
3	3.4	0.0	3.1	4.9838	X		X	X
4	4.0	0.0	5.0	5.0614	X	X	X	X

Discussion

The results of the study did not support the hypothesis that introverts would show greater increases in self-efficacy, greater decreases in arousal, and greater

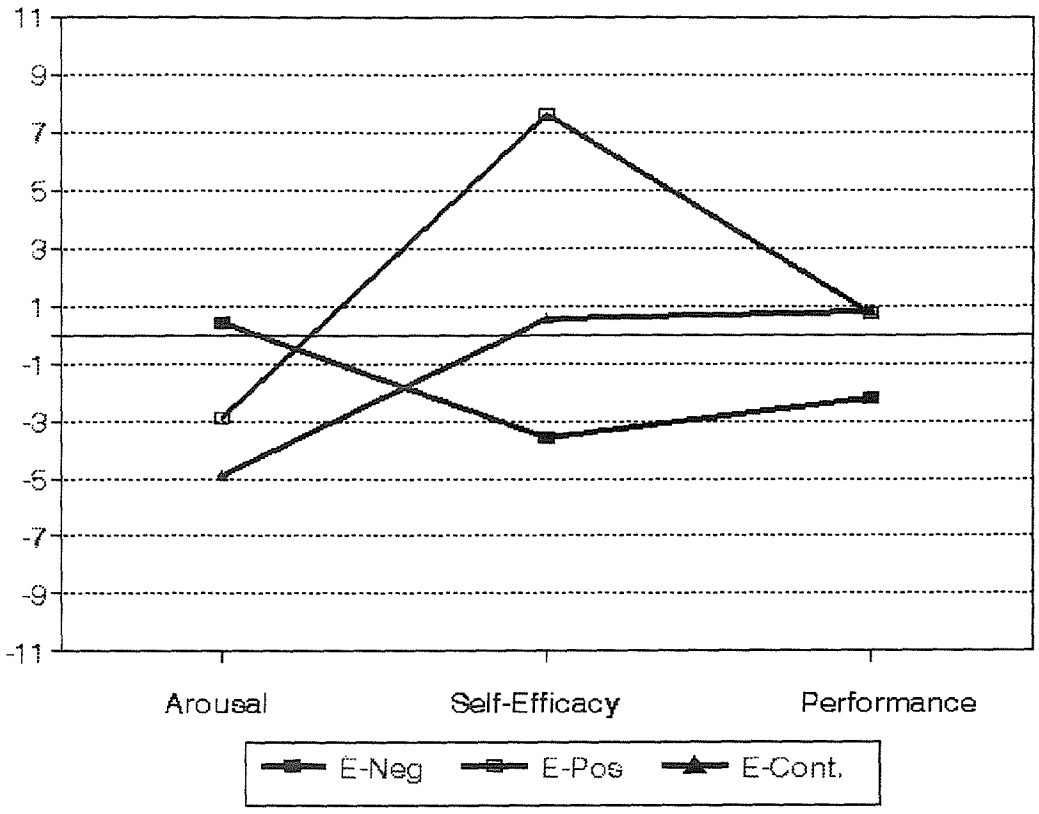
increases in performance when compared to extraverts under the positive efficacy feedback condition. Nor did they support the hypothesis that introverts would show greater decreases in self-efficacy, increases in arousal, and decreases in performance under the negative efficacy feedback condition. Introverts and extraverts did differ in performance in the negative efficacy feedback condition, with introverts improving significantly compared to extraverts. These findings are surprising, but they are best understood using the inverted "U" arousal/performance paradigm. A major assumption of this study was that introverts and extraverts would not differ in arousal, self-efficacy, and performance in the control condition; however, they did differ in subjective arousal levels and performance although it was not a significant difference. If we scrutinize the arousal-performance relationship using the control condition as a guide, the unusual findings become less unusal. For example, in the control condition introverts may have been below their optimal level of arousal, which may explain why they performed worse when compared to introverts in the two feedback conditions (See **Figure 1**). Thus, negative feedback increased arousal levels in introverts, which brought them to a more optimal level and, consequently, increased their performance. When introverts were given positive feedback, this also increased

Figure 1. Relationship between arousal, self-efficacy, and performance across conditions in introverted participants.



arousal levels but not as much as in the negative feedback condition, so introverts performed better but not as well as those in the negative feedback condition. Extraverts, on the other hand, may have been more optimally aroused in the control condition than introverts, which led to a slight improvement in performance from baseline (See **Figure 2**). Negative feedback may have increased their arousal levels,

Figure 2. Relationship between arousal, self-efficacy, and performance across conditions in extraverted participants.



which led to a substantive decrease in performance. Positive feedback seems to have slightly increased arousal levels, which had a negligible effect on performance compared to controls.

The findings are inconclusive because of a major shortcoming of this study, that is, a lack of statistical power due to small sample size. With only $\underline{n}$ = 8 per cell the effect of feedback on self-efficacy and arousal may be too

weak to show significance, although these measures did change in the hypothesized direction under the negative efficacy feedback condition. More could be said about these relationships with a larger sample size. Given the significant interaction between introversion-extraversion and feedback on performance with such a small sample, an extension of this study may be warranted.

References

Bandura, A. (1983). Self-efficacy determinants of anticipated fears and calamities. Journal of Personality and Social Psychology, 45, 464-469.

Bandura, A., & Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. Journal of Personality and Social Psychology, 45, 1017-1028.

Bandura, A., Cioffi, D., Taylor, C. B., & Brouillard, M. E. (1988). Perceived self-efficacy in coping with cognitive stressors and opioid activation. Journal of Personality and Social Psychology, 55, 479-488.

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. Developmental Psychology, 25, 729-735.

Baron, R. A. (1988). Negative effects of destructive criticism: impact on conflict, self-efficacy and task performance. Journal of Applied Psychology, 73, 199-207.

Benjamins, C., Schuurs, A. H. B., Asscheman, H., & Hoogstraten, J. (1990). Anxiety and blood pressure prior to dental. Psychological Reports, 67, 371-377.

Bouffard-Bouchard, T. (1993). Influence of self-efficacy on performance in a cognitive task. The Journal of Social Psychology, 130, 353-363.

Bullock, W. A., & Gilliland, K. (1993). Eysenck's arousal theory of introversion-extraversion: a converging measures investigation. Journal of Personality and Social Psychology, 64, 113-123.

Demojà, C. A., Reitano, M., & Caracciolo, E. (1985). General arousal and performance. Perceptual and Motor Skills, 61, 747-753.

Eysenck, H. J., & Eysenck, S. B. G. (1964). The Eysenck Personality Inventory. San Diego, CA: Educational and Industrial Testing Service.

Geen, R. G. (1984). Preferred stimulation levels in introverts: effects on arousal and performance. Journal of Personality and Social Psychology, 46, 1303-1312.

Gellatly, I. A., & Meyer, J. P. (1992). The effect of goal difficulty on physiological arousal, cognition, and task performance. Journal of Applied Psychology, 77, 694-704.

Lan, L. Y., & Gill, D. L. (1984). The relationships among self-efficacy, stress responses, and a cognitive feedback manipulation. Journal of Sport Psychology, 6, 227-239.

Lust, J. A., Celuch, K. G., & Showers, L. S. (1993). A note on issues concerning the measurement of self-efficacy. Journal of Applied Social Psychology, 23, 1426-1434.

Matthews, G., Jones, D. M., & Chamberlain, A. G. (1989). Interactive effects of extraversion and arousal on attentional task performance: multiple resources or encoding processes? Journal of Personality and Social Psychology, 56, 629-639.

Ozer, E. M., & Bandura, A. (1990). Mechanisms governing empowerment effects: a self-efficacy analysis. Journal of Personality and Social Psychology, 58, 472-486.

Sanna, L. J., & Pusecker, P. A. (1994). Self-efficacy, valence of self-evaluation, and performance. Personality and Social Psychology Bulletin, 20, 82-92.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). Manual for the State-Trait Anxiety Inventory. Palo Alto, CA: Consulting Psychologists Press.

Stelmack, R. M. (1990). Biological bases of extraversion: psychophysiological evidence. Journal of Personality, 58.

Trouvé, R. J., & Libukman, T. M. (1992). Eyewitness performance of personality types as a function of induced arousal. American Journal of Psychology, 105, 417-433.

Waldersee, R. (1994). Self-efficacy and performance as a function of feedback sign and anxiety: a service experiment. Journal of Applied Behavioral Science, 30, 346-356.

Wiedenfeld, S. A., Bandura, A., Levine, S., O'leary, A., Brown, S., & Raska, K. (1990). Impact of perceived self-efficacy in coping with stressors on components of the immune system. Journal of Personality and Social Psychology, 59, 1082-1094.

Yancey, G. B., Humphrey, E., & Neal, K. (1992). How perceived incentive, task confidence, and arousal influence performance. Perceptual and Motor Skills, 74, 279-285.