



## Trading on illusions: Unrealistic perceptions of control and trading performance

Mark Fenton-O'Creevy<sup>1\*</sup>, Nigel Nicholson<sup>2</sup>, Emma Soane<sup>2</sup> and Paul Willman<sup>3</sup>

<sup>1</sup>Open University Business School, UK

<sup>2</sup>London Business School, UK

<sup>3</sup>Saïd Business School, University of Oxford, UK

This paper examines the impact of illusory control beliefs on the performance of traders in financial instruments. The authors argue that the task and environment faced by traders are conducive to the development of illusions of control and that individual propensity to illusion of control will be (inversely) related to trader performance. Using an innovative computer task, designed to assess illusion of control in the field, data from 107 traders in four organizations showed individual differences in this bias to have a significant, inverse, association with performance, as measured by managers' ratings of trader performance and by total remuneration. The authors conclude that, at least in this context, illusion of control is maladaptive and that it is productive to take an individual difference approach to the study of such illusions. Implications for debates about the costs and benefits of positive illusions are discussed.

In this paper, we contribute to the debate about whether positive illusions are adaptive by showing that a particular positive illusion, illusion of control, may be maladaptive in a particular context: trading in financial instruments.

In the first half of the paper, we review the literature on positive illusions and control illusions. We argue that there is both a theoretical and empirical case that positive illusions, and illusion of control in particular, may be maladaptive in some circumstances. Next, we offer arguments and evidence that illusion of control may be treated as having a trait-like component and hence that individual differences in propensity to illusion of control may be meaningfully measured. Finally, we describe key aspects of the trader's task and environment and argue that these are particularly conducive to control illusions. Hence, we hypothesize that traders with high levels of propensity to illusion of control will perform less well than those with low to moderate levels.

In the second half of the paper, we report on a study of 107 traders in four investment banks in the City of London and demonstrate an inverse relationship between illusions of control and trader performance.

\*Requests for reprints should be addressed to Mark Fenton-O'Creevy, Open University Business School, Walton Hall, Milton Keynes MK7 6AA, UK (e-mail: m.p.fenton-ocreevy@open.ac.uk).

### Is high perceived control adaptive or maladaptive?

Support within the literature can be found for both these positions. On the one hand, research on self-efficacy (Bandura, 1989), internal/external locus of control, and learned helplessness (Rodin & Salovey, 1989; Thompson, 1981) shows that high perceived (internal) control predicts increased personal effectiveness and psychosocial adjustment. On the other hand, several authors have pointed out the adverse consequences of high perceived control in circumstances where control is not possible (Burger, 1989; Thompson, 1993; Thompson, Cheek, & Graham, 1988; Whyte, Saks, & Hook, 1997).

Wannon (1990) and Zuckerman, Knee, Kieffer, Rawsthorne, and Bruce (1996) have drawn an important distinction between realistic and unrealistic control beliefs. Realistic control beliefs concern circumstances where control is objectively possible. Unrealistic control beliefs concern illusory perceptions of control in circumstances where control is not objectively possible. Several studies have demonstrated discriminant validity for these two dimensions of perceived control (Knee, Zuckerman, & Kieffer, unpublished; Wannon, 1990; Zuckerman *et al.*, 1996).

An important distinction between control strategies is whether they involve primary or secondary control (Rothbaum, Weisz, & Snyder, 1982). Primary control involves attempts to control the external environment, whereas secondary control involves attempts to adapt psychologically to the external environment. This suggests that while high realistic control beliefs may be adaptive, high unrealistic control beliefs will lead individuals to persist in primary control strategies when secondary control strategies would be more adaptive.

However, some, most notably Taylor and Brown (1988), have argued that positive illusions are adaptive, as they increase motivation and persistence. This position is supported by Bandura's claim that:

optimistic self-appraisals of capability, that are not unduly disparate from what is possible, can be advantageous, whereas veridical judgments can be self-limiting. (Bandura, 1989, p. 1177)

However, we should note here Bandura's use of the qualification "not unduly disparate from what is possible". His argument is essentially concerned with the adaptive effect of optimistic beliefs about control and performance in circumstances where control is possible, rather than perceived control in circumstances where outcomes are genuinely noncontingent on an individual's behaviour. Bandura has also suggested that:

In activities where the margins of error are narrow and missteps can produce costly or injurious consequences, personal well-being is best served by highly accurate efficacy appraisal. (1997, p. 71)

There is also empirical evidence that high self-efficacy can be maladaptive in some circumstances. In a scenario-based study, Whyte *et al.* (1997) showed that participants in whom they had induced high self-efficacy were significantly more likely to escalate commitment to a failing course of action.

Taylor and Brown (1988) argue that positive illusions are adaptive, since there is evidence that they are more common in normally mentally healthy individuals than in depressed individuals. However, Pacini, Muir, and Epstein (1998) have shown that this may be because depressed people overcompensate for a tendency toward maladaptive

intuitive processing by exercising excessive rational control in trivial situations, and note that the difference with nondepressed people disappears in more consequential circumstances. Knee and Zuckerman (1998) have challenged the definition of mental health used by Taylor and Brown and argue that a lack of illusions is associated with a nondefensive personality oriented towards growth and learning and with low ego involvement in outcomes. They present evidence that self-determined individuals are less prone to these illusions.

We argue, as do Gollwitzer and Kinney (1989), that while illusory beliefs about control may promote goal-striving, they are not conducive to sound decision-making. Illusions of control may cause insensitivity to feedback, impede learning, and predispose toward greater objective risk-taking (since subjective risk will be reduced by illusion of control).

### **Illusion of control**

The predominant paradigm in research on unrealistic perceived control has been Langer's (1975) 'illusion of control'. Langer showed that people often behave as if chance events are accessible to personal control. In a series of experiments, Langer demonstrated first the prevalence of the illusion of control and second that people were more likely to behave as if they could exercise control in a chance situation where 'skill cues' were present. By skill cues, Langer meant properties of the situation more normally associated with the exercise of skill, in particular the exercise of choice, competition, familiarity with the stimulus, and involvement in decisions.

### ***Trait-like or state-like?***

Most work on the illusion of control has focused on contextual variables that induce illusion of control in a population. In this study, we seek to understand control beliefs within an individual difference framework. This section sets out our rationale for doing so. There is some precedent for an individual difference approach: for example, one study found that individual differences in illusion of control predicted individual and team differences in risk perception and behaviour in a scenario exercise. Higher illusion of control being associated with lower risk perception and greater risk-taking (Houghton, Simon, Aquino, & Goldberg, 2000).

Taylor and Amour have argued against taking an individual differences approach to such illusions. They argue that positive illusions are state-like not trait-like. They reason:

It is possible to create circumstances ... in which upwards of 94% of respondents demonstrate positive illusions. It is also possible to create circumstances in which almost no one demonstrates positive illusions (Taylor & Armor, 1996, p. 890).

We suggest that their argument is flawed and leads them to an erroneous conclusion. Both personality traits and situations that govern behaviour may vary in 'strength'. As Mischel (1968) pointed out, each can override the other according to their relative strengths. Personality is most determining of behaviour in 'weak' situations, and vice versa. That the influence of a trait on behaviour can be overridden does not constitute evidence that it does not exist.

Control illusions can be seen to have a theoretical basis in self-regulation, as cognitive modes that mediate between the individual's need for consistency and

environments that restrict opportunities for effective action. Individuals deprived of a sense of control make active efforts to restore it cognitively (Fiske & Depret, 1998). Given internal goal states embodying desires for control and faced with evidence of a lack of control, individuals may cope with the discrepancy in different ways, which tend to reflect a stable (i.e., trait-like) underlying set of coping strategies. Some may cope with the discrepancy by denial and retreat into self-protective illusion (Carver, Scheier, & Weintraub, 1989). There is also some evidence that individual propensity to control illusions may be rooted in personality: internal goal states related to control (e.g., need for control), coping strategies, and self-determination all show strong trait-like qualities. Burger (1986) and Burger and Smith (1985) showed that the illusion of control, as demonstrated by the tendency to behave in chance-based games as if they were skill-based, is associated with a high need for control (a relatively stable personality characteristic). In a study of adolescents, Flammer *et al.* (1995) found the tendency to persist with primary control strategies in the face of control failure was linked to both extraversion and neuroticism.

Several studies have found evidence for learning effects in the development of illusions of control (Alloy & Abramson, 1979; Gollwitzer & Kinney, 1989; Matute, 1995). Hence, it seems likely that an individual's learning history may also account for significant individual differences in a propensity to illusion of control. Where such learning is deep and extended, learned responses may be stable and resistant to extinction. Finally, given that illusion of control rests on a failure to distinguish between controllable and uncontrollable events, there may be a component of cognitive skill. Again, this could give rise to significant individual differences in propensity to these illusions.

Hence, while there is good evidence that illusions of control are in part determined by situational factors, there also seems to be a theoretical and empirical case for an underlying trait-like propensity to such illusions.

### ***Trading environment and illusion of control***

We argue in this section that the conditions in which traders in financial instruments do their work include situational factors that research has shown are antecedents of illusion of control. We argue that individual differences in propensity to illusions of control in effect lower the threshold at which illusions of control will appear, given these situational factors. Hence, traders are prime candidates for observing the effects of control illusions in a field setting.

Traders who deal in financial instruments may be acting on behalf of external customers, market making<sup>1</sup> or trading with the assets of the firm that employs them (proprietary trading). In each case, the trader must make decisions that involve judgment and risk. Judgments about risk are particularly sensitive to assumptions about control. For example, March and Shapira (1987) found that executives frequently downplayed the riskiness of decisions on the assumption that they could control outcomes.

#### ***The trader's task***

In efficient market theory, price changes are essentially a random walk. All new information relevant to prices is incorporated into prices instantaneously (Fama,

<sup>1</sup>Market making involves standing ready to buy or sell a particular asset at prices you have made publicly known.

1976). In practice, markets are not completely efficient, and information asymmetries exist. Traders earn rents (excess returns) by exploiting information advantages (e.g., information on asset flows within markets, privileged information on the economic basis for an asset price, proprietary databases and models). These information advantages are potentially short-lived. The very act of trading may reveal information to other parties. Others may emulate models. Others may access the same sources of information. New information may wipe out the utility of earlier information. At the same time, markets are in practice very 'noisy': there is a large amount of trading going on that is not based on information genuinely relevant to the underlying value of an asset (Black, 1986). On any individual trade, it will be difficult to tell whether an outcome (positive or negative) is the result of trading on information or of essentially unpredictable market movements.

Hence, it will often be difficult to determine whether an outcome was contingent on a trader's information and skill. At the same time, traders are highly motivated to establish causal relationships between information they hold and market movements. These circumstances are conducive to the development of illusion of control.

In interviews we carried out with traders in preparation for this study, traders frequently made unsolicited comments, which seemed suggestive of a personal illusion of control. For example, one trader commented:

You have to build a framework on how you believe the world is working . . . you have your mental picture of what is going on. When you are making money, this mental picture is being reinforced; by definition your decisions are correct.

Another claimed:

Every year my internal filtering process has improved so that now I can beat the market.

Others made comments that suggested an awareness of the danger of such illusions, for example, a trader-manager told us:

It's very easy when you're making lots of money to double up and double up and take unnecessary risk. This is just human nature. You think you've become slightly God-like and you can actually see a lot more than the market can.

### *The trader's environment*

*Stress.* Friedland, Keinen, and Regev (1992) have shown that illusion of control is increased under circumstances of stress. Trading is a highly stressful occupation in terms of workload, time pressure, visibility, and uncertainty coupled with limited control opportunities. Kahn and Cooper (1993, p. 113) found this group to suffer significantly higher levels of free-floating anxiety than the general population.

*Competition.* Langer (1975) showed competition to be an antecedent of illusion of control. The process of trading is innately competitive. The markets in which traders deal are founded on competition between market actors. Furthermore, dealing rooms are often highly competitive environments. Kahn and Cooper (1993, p. 153).

*Implemental mind set.* Gollwitzer and Kinney (1989) found illusions of control to be both more common and more severe in research when participants were induced to

adopt an implemental (focus on goals) mindset than when induced to adopt a deliberative (reflection on action–outcome contingencies) mindset. The bonus system and associated targets are designed to keep traders goal-focused. The short-term nature of information advantages also means that traders are unlikely to forgo the opportunity to trade in order to learn more about the value of information or a strategy, by observing the market.

*Choice, involvement and familiarity.* Choice, involvement, and familiarity can act as skill cues, leading to an illusion of control (Langer, 1975). Trading involves continually making choices but, more importantly, requires close focus on a particular type of instrument or market. Traders are often highly identified with the instruments or markets in their area of expertise.

### Consequences of illusion of control for traders

Since it appears that conditions exist in the trading environment that are conducive to the development of control illusions, we turn to the question of whether illusion of control is maladaptive for traders.

If a propensity for illusion of control is founded on a coping strategy that is implicitly a denial of lack of control, traders high in this propensity will ignore feedback that reflects a lack of control or interpret it in ways consistent with their high control beliefs. For example, faced with an unexpected market fall, a trader might convince themselves that the fall is only temporary and that they will eventually be proved right about the underlying trend, rather than reassessing their strategy. This effect will be enhanced where they have received early reinforcement (Burger & Smith, 1985; Langer & Roth, 1975). Under these conditions, traders will persist too long with erroneous strategies, treating noise as if it were information.

A second important component of the trader's task concerns judgments about risk. Illusions of control lead to underestimation of risk (Houghton *et al.*, 2000). Therefore, one can expect illusion of control to cause a trader to persist in primary control behaviour (seeking to control the environment) under circumstances in which secondary control behaviour (adaptation to the environment) would be more appropriate. For example, a trader may persist in a failing strategy rather than cut their losses.

Hence, we argue that traders who have a high propensity to illusory control beliefs will be less effective at analysing the markets in which they operate and less capable of effective risk management.

So we hypothesize:

H1: Traders exhibiting high levels of illusion of control will perform less effectively than traders with low to moderate levels of illusion of control.

Our arguments have focused on the impact of illusory control beliefs on risk management and market analysis. Hence, we test two sub-hypotheses.

H1a: Traders exhibiting high levels of illusion of control will perform less effectively in terms of market analysis than traders with low to moderate levels of illusion of control.

H1b: Traders exhibiting high levels of illusion of control will perform less effectively in terms of risk management than traders with low to moderate levels of illusion of control.

Market analysis and risk management are core skills for traders. To the extent that traders are less effective at analysing markets and managing risks, their profit



performance will be diminished. Hence, we can predict that traders with a high illusion of control will show a lower profit performance.

H1c: Traders exhibiting high levels of illusion of control will perform less effectively in terms of contribution to profits than traders with low to moderate levels of illusion of control.

We have argued that the effect of illusion of control on trader performance is mediated via decisions about risk and markets. To test whether any observed effect is specific to judgments about these facets of performance or is related to wider performance judgments, we also examine performance in terms of interpersonal skills.

H1d: Traders' levels of illusion of control will be unrelated to interpersonal performance.

A high proportion of trader remuneration is typically linked to long-term (1 year or more) profit performance and (to a lesser extent) to managerial judgments concerning analytical and risk-management capability. Hence, we can predict that traders with a high propensity to illusory control beliefs will have a lower average remuneration.

H1e: Traders exhibiting high levels of illusion of control will have lower total remuneration than traders with low to moderate levels of illusion of control.

## Methods

### Sample

The study sample consisted of 107 traders in four City of London investment banks (32 in firm A, 30 in firm B, 22 in firm C, and 23 in firm D). The sample was chosen in discussion with senior managers in each firm. The criteria for selection were that traders operated in markets based on equities, bonds, or derivatives of these instruments and that their trading required them to make decisions that carried some degree of risk for the firm rather than simply executing trades on behalf of customers. Each trader received a memo from their manager explaining that the firm was co-operating with the research study and encouraging them to take part. The majority (97%) agreed to participate.

All but two of the participants were male (reflecting employment patterns in this field). Thirty-six per cent had a higher degree, and the majority (66%) were educated to at least degree level. Managers and senior managers who were also active traders were included in the sample. Of the 107 participants, 52 were traders, 40 were trader managers, and 15 were senior managers. There was a wide variation in total annual remuneration (33 earned more than £500k pa, 32 between £300k and £500k, 36 between £100k and £300k, and 4 less than £100k). Participants were aged between 24 and 48 years ( $M=32.5$ ,  $SD=4.8$ ). Job tenure was between 6 months and 30 years ( $M=6.7$ ,  $SD=4.8$ ). Years of trading experience ranged from 6 months to 27 years ( $M=5.1$ ,  $SD=4.15$ ).

## Measures and procedure

### Demographic data

Participants completed a questionnaire on which they were asked to record the highest educational qualification (1=GSCE or equivalent<sup>2</sup> to 6=PhD), job level (1=trader, 2=trader manager, 3=senior manager), and trading experience (years).

<sup>2</sup>These are the minimum UK school qualifications taken at the age of 16.

### Performance

All trader managers that we interviewed believed that it is necessary to observe a trader for between one and two years before it is possible to make reliable judgments about their effectiveness. Direct measures of short-term profit performance are likely to be highly 'noisy' measures of trading performance, being affected to a great extent by factors unrelated to trader skill. Consequently, we felt it useful to gather performance data from supervisors who knew each trader and their work well. Trader managers know the profit performance of each trader in detail, but are also able to set this performance in the context of the market conditions facing that trader and judgments about the relative importance of luck and trading strategies in their success. Hence for each trader, a manager with close knowledge of their performance was asked to estimate their performance on four dimensions: contribution to trading desk profits, skill in managing risk, analytical ability and people skills. They were asked to mark the trader's position on a linear scale from zero to 100. They were informed that the scale numbers represent percentiles (e.g., to mark 60 would imply that the trader is better than 60% of traders doing similar work).

Trader remuneration is (via an annual salary and bonus-setting cycle) strongly dependent on profit performance across the year (modified by adjustments for risk and market conditions). We used total annual remuneration as a second performance measure (actual profit performance figures were too sensitive for the firms to provide). Each participant was asked their total annual remuneration including bonus.

*Illusion of control* was measured by a computer-based task, written in Visual Basic specifically for the purpose as a robust measure of individual propensity to illusory control beliefs. We chose to use a computer task for three reasons. First, after initial pilot interviews and discussion with firms, we believed that traders were unlikely to pay serious attention to a long questionnaire. The computer-based exercise would be novel and more likely to capture their attention. This proved to be the case. Second, we wanted to subject them to circumstances that mimicked trading in two important aspects: noisy feedback and decision-making under conditions of limited information. We felt this could be best achieved through a computer-based exercise. Third, illusions of control have most often been measured behaviourally in prior work, e.g., asking participants to determine the link between key presses and the onset of a light (Gollwitzer & Kinney, 1989) or termination of a noise (Matute, 1996).

After an initial interview, participants were invited to engage in a computer task, during which they were asked to make judgments of their control over changes in the value of an index. A welcome screen introduced the program and collected some personal details. The program then informed participants that they would be asked to play a game. They were told:

When the game starts you will see a chart, similar to the picture shown below. The vertical axis represents an index with values between -2000 and 2000. The horizontal axis shows time. The index starts at zero and every half second for 50 seconds the index is increased or decreased by some amount. Changes in the index are partly random, but three keys on the keyboard may have some effect on the index. The possible effects are to raise or lower the index by some amount, to increase the size of the random movements, or no effect. There is some time lag to the effects. The keys are 'Z', 'X', and 'C'. There is no advantage to pressing keys more than once in any half second. Your task is to raise the index as high as possible by the end of 50 seconds. At the end of the game the final value of the index will be added to your pool of points.

The display viewed by participants is shown in Fig. 1.



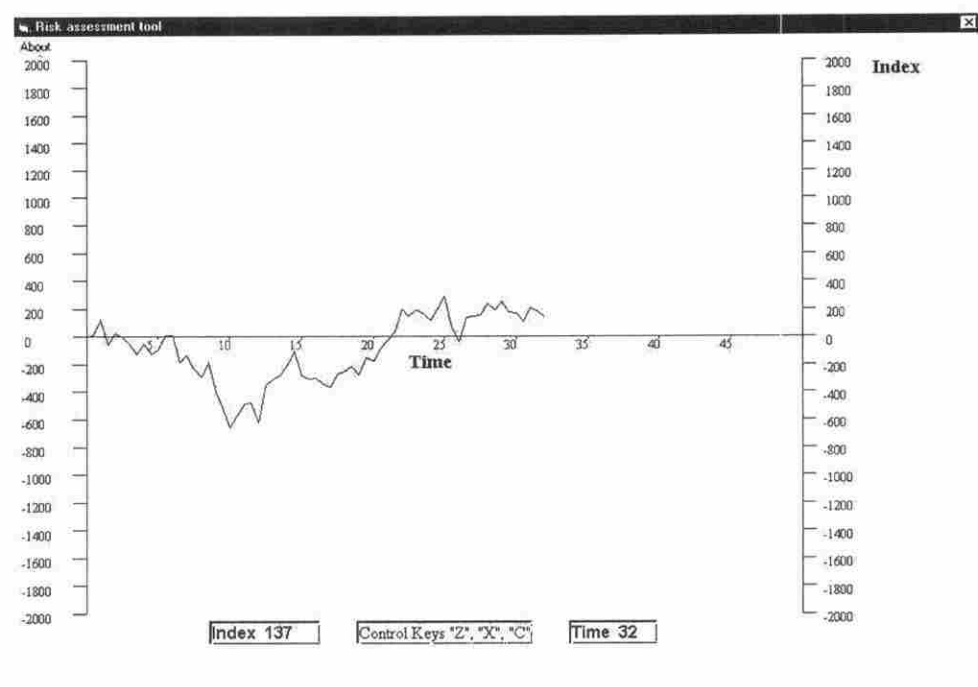


Figure 1. Computer task: screenshot of the main screen.

The program generated the index by overlaying a random walk onto an underlying rising trend (falling in run 3 and level in 4). *The keys pressed by participants had no effect on the index.*

At the end of the 50 s, participants were told their score (the level reached by the index) and asked to rate their success in increasing the index by using the keys (by setting a slider bar from 1 'not at all successful' to 100 'very successful').

The game was repeated another three times. Rounds 1 and 2 were set up to guarantee that participants experienced an increase in points. In Round 3, participants lost points, and in Round 4, participants' scores stayed constant (with some small random variation).

Movements in the index were unrelated to participants' efforts. The random element (around 10% of achieved index level) introduced some variation in outcome between candidates and hence increased measurement error. However, we chose to add in this element to reduce the possibility that participants would compare scores and establish that their actions had no effect, thus contaminating data collection from later participants.

For each round, participants' rating of their success in raising the value of the index was recorded. This gave a total of four indicators of illusion of control. Individual differences in level of illusion of control elicited by the game were taken to be a measure (with error) of an underlying individual propensity to illusion of control. Factor analysis (on a pilot sample of 130 MBA students) showed the four measures to load on a single factor (50% explained variance),  $\alpha = .68$ . Hence, a single illusion of control scale was calculated as the mean of all four indicators (trader sample  $M = 41.96$ ,  $SD = 19.38$ ,  $\alpha = .71$ ).

*Ethics of the measurement process*

In its ethical principles for conducting research with human participants, the British Psychological Society accepts that some degree of deception may be necessary in psychological research since, otherwise, participants might so modify the psychological processes being studied that the research was valueless (British Psychological Society, 2000). The guidelines distinguish between deception concerning the purpose of the research and deception concerning details of the hypotheses. In this study, participants were not told that their actions would have no effect on the index. They were told that their actions 'may' affect the index. They were informed in advance that the exercise was designed to collect information on how they make decisions and form judgments and that the study would investigate links to performance. Following the exercise, each participant was given more detailed information on the nature of the research.

**Analysis and results**

Table 1 shows first-order correlation coefficients, means, and standard deviations for all variables in the study. Each performance indicator was regressed on the illusion of control measure. Educational level, job level, and trading experience were entered as controls. Table 2 shows the results. The regression coefficient for illusion of control is significant ( $p < .05$ ) for total annual remuneration: as hypothesized, traders with a higher illusion of control earn less.

Since total annual remuneration is an absolute, rather than relative, measure, it is useful to estimate the size of effects on remuneration from the unstandardized regression coefficients. An increase of one educational level is associated with an increase in annual remuneration of £68,000. An increase in experience of one year is associated with an increase in annual remuneration of £19,000. An increase in illusion of control of one standard deviation is associated with a decrease in annual remuneration of £58,000.

For 103 traders, their performance was rated independently, by a senior manager (on profit contribution, analytical ability, risk management [ $N=93$ ] and interpersonal skills). There is a significant inverse relationship between (analytical, risk, and profit) performance and illusion of control: traders with a higher propensity to illusion of control are rated by their managers as less effective (compared with peers) at risk management, market analysis and as contributing less to desk profits. However, as hypothesized, rated people skills show no association with illusion of control.

Education, experience, and job level all show a positive association with total remuneration. Education is associated with analytical ability but not other managerial ratings of performance. Experience shows no association with managerial ratings of performance. Job level is positively related to profit contribution and people skills.

**Discussion**

The results offer support for our principal hypothesis. Illusion of control is inversely related to trader performance for all of the relevant performance measures (people skills was hypothesized not to be related to illusion of control). The association of total remuneration and managerial ratings of performance with illusion of control is particularly compelling given the robust and independent nature of these performance measures. Further, the lack of relationship between illusion of control and

**Table 1.** Zero-order correlations, means, and standard deviations

	M (SD)	1	2	3	4	5	6	7	8
1. Contribution to desk's profits	58.88 (24.17)								
2. Skill in managing risk	60.74 (22.10)	.71***							
3. Analytical ability	60.50 (22.90)	.34***	.57***						
4. People skills	52.36 (22.63)	.16	.15	.00					
5. Total annual remuneration (£k)	444.76 (258.18)	.48***	.35***	.22*	.18				
6. Highest level of education	3.66 (1.65)	.12	.15	.21*	-.10	.27**			
7. Trading experience	5.15 (4.15)	.01	-.05	.00	.06	.21*	-.30**		
8. Job level	1.66 (0.72)	.15	.08	.05	.24*	.21*	-.27**	.15	
9. Illusion of control	41.96 (19.38)	-.30**	-.32**	-.20	-.09	-.19	-.08	.12	.12

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

**Table 2.** Regressions on remuneration and self-ratings of performance

	Standardized regression coefficients				
	Total annual remuneration (N=107)	Profit contribution (N=103)	Manager ratings		
			Risk management (N=93)	Analytical ability (N=103)	People skills (N=103)
Education	.44***	.18†	.17 ns	.26*	-.04 ns
Experience	.32***	.07 ns	-.01 ns	.08 ns	.03 ns
Job level	.31***	.23*	.17 ns	.14 ns	.24*
Illusion of control	-.23*	-.33**	-.33***	-.21*	-.12 ns
R <sup>2</sup>	.30***	.16**	.15*	.10*	.07 ns

† $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

interpersonal performance provides some evidence for the discriminant validity of our results. The demonstration of differential relationships with different facets of performance increases our confidence in the specificity and validity of the findings.

To allay concern that remuneration was principally determined by managerial ratings of performance and hence confounded with them, we carried out a further regression on total remuneration but this time controlled for manager ratings of performance. Illusion of control continued to account independently for a significant proportion of variance (change in  $R^2 = .07$ ,  $p < .01$ ).

Traders with a high propensity to illusion of control exhibit a lower profit performance and earn less than those with low illusion of control. There is also support for a link between illusion of control and poor risk management and analysis.

Some cautions are necessary. While a strength of the study is that performance and illusion of control are measured using different instruments and informants, the data are not structured in a way that can demonstrate causality. Rather than illusion of control leading to poor performance, it may be that both are caused by common factors, for example a high need for control or low cognitive skill.<sup>3</sup> Alternatively, illusions of control may arise as a defensive response to poor performance. However, given that the performance ratings, as we obtained them, were not available to the traders, we favour the explanation that illusion of control leads to poor performance.

Another important caution concerns the trading conditions at the time of the study. The data were collected at a time when markets had been through a long period of consistent and sustained growth. Not only were participants trading in a bull (rising) market, but many had no experience of a bear (falling) market. It is possible that both learning and performance effects would be different in a period of market collapse. It may be possible, for example, that traders who experience considerable early negative reinforcement develop negative control illusions (learned helplessness: Seligman, 1975) rather than positive illusions. Similarly, it may be that positive control illusions are less readily sustained in the face of difficult market conditions. Alternatively, difficult conditions may cause traders to fall back on defensive coping processes,

<sup>3</sup>We are grateful to an anonymous reviewer for this suggestion.

including control illusions. Further research in bear market conditions would help resolve these issues.

## Conclusions

In this paper, we have argued that the environment and tasks faced by traders of financial instruments create conditions in which unrealistic perceptions of control may flourish. We have further argued that individuals vary in their propensity to illusions of control because of their differing personalities and developmental experiences. This study offers evidence that illusion of control is an important form of cognitive bias affecting traders and that traders with higher levels of illusion of control perform less well than those with lower levels.

These results make a contribution to two related theoretical debates. The first debate concerns whether positive illusions are beneficial or harmful (Bandura, 1989; Knee & Zuckerman, 1998; Pacini *et al.*, 1998; Taylor & Brown, 1988). This study illustrates one set of conditions in which positive illusions may be harmful to performance. The second concerns whether perceptions of high control are always adaptive. These results add to a body of evidence suggesting that high control beliefs are maladaptive in some circumstances, especially where control is unlikely or impossible (Burger, 1989; Gollwitzer & Kinney, 1989; Thompson, 1993; Thompson *et al.*, 1988; Whyte *et al.*, 1997; Zuckerman *et al.*, 1996).

The study also has implications for practice. If illusion of control is maladaptive in trading, what might be done to reduce its impact? We have presented evidence from our review of the literature that suggests that illusion of control rests on a combination of situational factors and individual predispositions, which have their roots in personality and learning.

Each of the different bases for illusion of control suggests different strategies for ameliorating the impact of illusion of control on trader behaviour.

To the extent that illusion of control is a learned behaviour, it may be possible to develop training techniques that raise awareness of its causes and help traders develop strategies for avoiding the adverse effects of illusory control beliefs, especially early in their career as traders, where early experiences and subjective interpretations of loss and gain may be formative.

As an orientation shaped by situation, it may be possible to take managerial action to reduce structures and environments conducive to illusion of control. For example, managers might, through regular reviews of trading strategies, seek to encourage a deliberative mindset. Managers might seek to encourage a collaborative rather than a competitive climate and might find ways of buffering traders from the stress of their trading roles. Given that we know most about the situational components of illusion of control, these interventions perhaps have the most promise.

Finally, given the increasing evidence for some trait-like properties of illusion of control, future research could explore the value of developing selection techniques that enable financial institutions to recruit individuals into trading jobs who are less subject to illusion of control.

Until we have more certain knowledge of the relative contribution of these factors, it cannot be ascertained what weight managers should give to each of these alternative courses of action. This study, however, shows how central illusion of control is to performance in dynamic and uncertain environments and the need for its complex origins to be understood further.

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## Appendix: Validation of the illusion of control computer task

As a check on the validity of the measure, the illusion of control computer task was administered to a separate sample of 149 postgraduate management students and executive education students. The students also completed a questionnaire designed to measure realistic and unrealistic control beliefs (Knee *et al.*, 1999; Zuckerman *et al.*, 1996). The realistic control belief scale consists of 21 items that measure perceived control over controllable events: sample item 'Couples who work at their relationship are more likely to enjoy their life together than couples who don't'. The unrealistic control beliefs scale consists of 21 items that measure perceived control over uncontrollable events: sample item 'There is no such thing as misfortune; everything that happens to us is a result of our own doing'. In their study, Zuckerman *et al.* found that students with high unrealistic control beliefs persisted longer in trying to solve an unsolvable problem, while this was not true of students with high realistic control beliefs, who were more persistent and confident in tackling 'controllable hassles' in their daily lives.

The Zuckerman *et al.* measures were chosen as a questionnaire-based measure of control beliefs with established validity, which focuses on individual differences. The separate scales for realistic and unrealistic control beliefs provided the opportunity to examine both convergent and discriminant validity: the unrealistic control beliefs scale amounts to a measure of propensity to illusory control beliefs, while the realistic control beliefs measures nonillusory control beliefs. The illusion of control measure showed a significant positive correlation with unrealistic control beliefs ( $r = .38, p < .01$ ) but no significant correlation with realistic control beliefs ( $r = -.13, ns$ ). This demonstrates both convergent validity (unrealistic control beliefs) and discriminant validity (realistic control beliefs).

Ninety-six student participants also completed the NEO-PIR big-five personality measure. As in the Flammer *et al.* (1995) study, the illusion of control measure correlated significantly with extraversion ( $r = .21, p < .05$ ). There was no correlation with the other four factors. Examining relationships with the subfacets of extraversion showed a significant correlation with two of the subfacets, activity ( $r = .21, p < .05$ ) and sensation-seeking ( $r = .32, p < .01$ ). The association with extraversion (a trait) offers some support for our measure as a trait-like propensity. The particular association (activity and sensation-seeking) could perhaps reflect a greater tendency to adopt an implemental rather than deliberative mindset (Gollwitzer & Kinney, 1989), thus increasing susceptibility to situational factors associated with illusion of control.

