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THE RELATIONSHIPS AMONG PERFORMANCE ON A PROTOTYPE INDICATOR OF PERCEPTUAL DEFENCE/VIGILANCE, PERSONALITY, AND EXTRASENSORY PERCEPTION

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Summary—Two experiments compare performance on a prototype indicator of perceptual defence/vigilance with performance on other related measures of individual differences. On the basis of theoretical expectations and empirical findings, participants' performance on the prototype indicator of perceptual defence/vigilance was predicted to relate to the personality factor of Neuroticism, and to performance on a forced-choice ESP task. In both experiments, perceptual defence/vigilance related as predicted to these measures: defensive participants had higher Neuroticism scores, and lower ESP scores than vigilant participants. Defensive participants also consistently showed fewer signs of mental health than vigilant participants on an exploratory self-report indicator of mental health. It is concluded that the prototype measure shows some promise as a measure of perceptual defence/vigilance, and that with further development it might have a future role in the enhancement of human performance under stress.

INTRODUCTION

The ability to respond quickly and appropriately to signs of threat or danger is essential for many occupations. Military jet pilots, police personnel, air traffic controllers, public transport drivers, even laboratory inspectors of potentially malignant cell samples, must all be able to respond readily to signs of danger, even when under considerable stress. The inappropriate reaction could be costly, both in terms of money and lives. One factor that may interfere with the ready response to such danger signs has been referred to commonly as defensiveness.

'Defensiveness' can be defined in several ways. The concept has its origins in psychoanalytic theory, in which the 'ego' uses defence mechanisms to defend itself against anxiety (Freud, 1915/1966). In contrast, focusing more on the process of defences than on the goal of defences, is the cognitive approach which conceptualizes defence as the cognitive reappraisal of threatening situations, leading to a reduction of subjective threat (e.g. Lazarus & Folkman, 1984). Most conceptualizations of defensiveness do, however, share the general notion of the delayed or distorted perception of potentially threatening information. There exist several 'paper and pencil' techniques purporting to measure the unconscious mechanisms of defensiveness that may affect perception and performance under stress or threat; for instance, the Repression-Sensitization Scale (Byrne, 1961), the Defence Mechanism Inventory (Gleser & Ihilevich, 1969; Ihilevich & Gleser, 1986), and the Defence Preference Inquiry (Blum, 1949). However, such measures may be criticized because of the difficulty of tapping unconscious processes through verbal or conscious reports (Nisbett & Wilson, 1977), they may be susceptible to response bias or even to deliberate modelling of responses by intelligent or sophisticated respondents (Cooper, 1982), and their reliability and validity has been questioned (e.g, Joy, 1963; Kline, 1981). For example, Holmes and McCaul (1989) argued that the Repression-Sensitization Scale was logically flawed because it asks about the presence of symptoms: sensitizors acknowledge a high number of symptoms, repressors do not acknowledge many symptoms; however this scale cannot distinguish those who deny their symptoms from those who genuinely have no symptoms to report.

Rather than dismiss such paper-and-pencil measures outright, Olff (1991) suggested that these might be measuring 'secondary defence', involving 'self-observable cognitive, emotional and behavioural manifestations of defensive processes' (p. 176). She acknowledged, however, that because these measures depended upon self-observation, reflection and report, it would be logical to assume that some distortion would be introduced in the *S*'s responses, due to defensive operations

and to social desirability factors. For example, in their study of coping styles and health, Olff, Brosschot and Godaert (1993) found that individuals who coped with stressors with a cognitive approach involving a positive response outcome expectancy tended to report positive health as measured by low levels of health complaints and low number of days of sickleave; however, the interpretation of this trend was clouded by the possibility that *S*s with high cognitive defence were not really healthier, they were simply denying any indications of health problems.

An alternative approach to the use of paper-and-pencil measures of defence is to explore individuals' *unconscious* reactions to threat; by definition, such reactions are outside of the individuals' conscious awareness and, therefore, control. Olff suggested that such measures would be of 'primary defence', 'where the operation of defences is more directly observed instead of inferred from self-reflections' (p. 176). Whereas secondary defences concern self-observations on behaviour that has occurred previously in potentially threatening situations, primary defence is conceived as a more perceptual process, activated by the actual potentially threatening stimulus. The advantage of such primary measures is that the *S* is unlikely to be aware of the nature and purpose of the test and social desirability interferes less with test responses. In Scandinavia, one such measure, the Defence Mechanism Test (DMT), has been developed as a selection measure for the Swedish armed forces (Kragh, 1970). Olff (1991) found virtually no correlation between DMT scores and performance on various paper-and-pencil measures of defence; she felt this confirmed her notion that the DMT was measuring primary defence and the paper-and-pencil tests were measuring secondary defence.

The DMT has shown accuracy in identifying those military pilots who are likely to crash their jets (Neuman, 1978) and it also appears to be able to predict susceptibility to stress in other practical settings such as deep sea diving and military parachuting (Vaernes, 1982; Vaernes & Darragh, 1982; Cooper, 1988a). It is a projective psychological test that briefly and repeatedly exposes individuals to threatening visual stimuli using a tachistoscope, gradually lengthening the exposures; the viewer tries to describe what they saw at each stimulus exposure, and these descriptions are later scored for the presence of signs of defence mechanisms by a trained judge. It is thought that the threatening nature of the stimuli evokes unconscious defensive reactions in the viewer, revealed in various distortions and inaccuracies in the viewer's description of the stimuli (Kragh & Smith, 1970). Though the DMT is little-known outside of Scandinavia, evaluations of it have been conducted in Britain: Kline (1987) criticized the theoretical basis of the test, arguing that, as a measure of defence mechanisms, the test has face validity only; this argument was countered by Cooper (1988b); both Cooper and Kline agree, however, that the validity of the test in practical and clinical applications is impressive (Cooper & Kline, 1986).

The DMT appears to be a test with important practical applications; why, then, is it not more widely used? One reason may be because of practical difficulties of test administration and scoring. The test is time-consuming to administer and score: each *S* gives a series of unique descriptions to a number of stimulus exposures; each of these descriptions must then be rated by an experienced judge according to a complex scoring system. Three months' intensive training is required in order to learn the basic administration and scoring procedure. Because of the projective nature of the test, the scoring system is to some extent subjective, and judges may need several years' experience of scoring before they can do so reliably and validly (Kragh, 1970) [Cooper & Kline (1989) have proposed an 'objectively scored' version of the DMT, using a technique known as G-analysis, but this scoring scheme has not yet become widely used (Olff, 1991)]. In addition, although an English translation of the scoring system is now available (Kragh, 1985), many of the key works detailing the theoretical rationale and the development of the test are in Swedish. When these difficulties are taken together with the fact that a recent comprehensive survey of the usage of the DMT in Europe (Olff, 1991) found considerable discrepancies among researchers in the DMT methodology they use (for example, in which stimulus pictures were used, in the number of stimulus exposures, and in the mode of *S*s' responses), one begins to understand why replication and extension of DMT research has been limited.

The DMT is based on the notion of defence mechanisms as conceptualized within the Freudian tradition. Defensiveness may, however, be conceptualized in other ways, though retaining the basic feature of delayed or distorted perception of potentially threatening information. Within the preconscious processing paradigm, there has been considerable exploration of perceptual defence and vigilance (Dixon, 1981). Here, individuals are exposed to neutral and emotional stimuli in conditions intended to preclude awareness of the nature of these stimuli (e.g. extremely brief stimulus exposures,

or extremely low intensity stimulus exposures). Care must be taken to ensure stimulus presentation is sufficiently weak to eliminate the possibility that the viewer may be responding to partial visual or auditory cues of the stimulus nature (e.g. Merikle & Cheesman, 1987). Also, one must control for the possibility of response bias (where, for instance, a participant might hesitate over saying a taboo word out loud, or where a participant is more likely to say a word because it is frequently encountered) (e.g. Broadbent, 1967). The level of stimulus duration or intensity at which the viewer becomes aware of the stimulus is measured and is found to fluctuate depending on the nature of the stimulus (i.e. whether it is emotional or neutral) (Brown, 1961). Individuals who take longer to report awareness of emotional compared to neutral stimuli are known as 'perceptually defensive', while those who tend to respond more rapidly to emotional stimuli than to neutral stimuli are known as 'perceptually vigilant'. Thus the defensive individual appears to be delaying perception of the emotional, potentially threatening information, while the vigilant individual appears to be particularly sensitive to that information. In practice, it is difficult to establish the nature of the processes underlying perceptual defensiveness/vigilance effects, however studies using signal detection methods have favoured the perceptual sensitivity hypothesis over the response bias hypothesis (Dorfman, 1967; Broadbent & Gregory, 1967).

In contrast to the scoring of the DMT, the identification of an individual as defensive or vigilant using such preconscious processing techniques is an objective matter: one simply measures average stimulus duration or intensity levels at which awareness is indicated for each of the two categories of stimuli. Such a simple technique may therefore have promise as an alternative indicator of defensiveness that might be applied in a similar way to the more elaborate but problematic DMT. Following Olff's (1991) distinction between primary and secondary defence, perceptual defence/vigilance methodologies share with the DMT the likelihood that they are measuring primary defences, with all the accompanying advantages of reducing response bias associated with self-reflection/self-report measures. This paper reports on the development of a prototype apparatus that is designed to identify perceptually defensive and perceptually vigilant individuals. Two experiments have been conducted that relate performance on the prototype measure to other measures, of neuroticism and of extrasensory perception, where there are theoretical and empirical reasons to expect a relationship to exist. Before describing the apparatus and the experiments, the links between defensiveness and neuroticism, and between defensiveness and extrasensory perception, will be discussed.

Defensiveness and neuroticism

Defensiveness may be viewed as a maladaptive coping response to stress (Olff, 1991): as such, it would be expected to relate to neuroticism (N), the personality factor that is perhaps most closely related to response to stress (Costa & McCrae, 1992). On theoretical grounds, repression (an aspect of defensiveness in Freudian theory) has been considered to be an important element of a neurotic personality style (Kreitler & Kreitler, 1990). The relationship between defensiveness and neuroticism has also been demonstrated empirically, in validation studies of the NEO Personality Inventory (Costa & McCrae, 1992). Costa & McCrae (1992) reported that 'many theoretically immature or neurotic coping mechanisms...were significantly related to NEO-PI N scores...poor coping is intimately tied to this domain' (p. 51). For instance, in two studies reported by McCrae and Costa (1986), it was found that 'In both studies, neuroticism is associated with increased use of hostile reaction, escapist fantasy, self-blame, sedation, withdrawal, wishful thinking, passivity, and indecisiveness' (p. 392). Also, a study by Costa, Zonderman and McCrae (1991) that correlated 292 participants' neuroticism scores with three sets of measures of defence mechanisms (Bond, Gardner, Christian & Sigal, 1983; Haan, 1965; Ihilevich & Gleser, 1986) found that 'N was related to measures of regression, displacement, doubt, and maladaptive action patterns, confirming the association of N with poor coping styles...(and showing that)...individuals' characteristic ways of dealing with stress and conflict are consistent with their enduring personality traits' (Costa & McCrae, 1992, p. 52, our parentheses).

Based on these findings, therefore, it was predicted that individuals' performance on the prototype indicator of perceptual defence/vigilance would be related to their neuroticism scores, with higher neuroticism scores being associated with perceptual defence and lower neuroticism scores being associated with perceptual vigilance. It should be noted, however, that contrary to these findings, DMT scores tend *not* to relate to the major personality dimensions (Kragh & Smith, 1970; Cooper & Kline,

1986); and in five experiments, Haraldsson and Houtkooper (1992) found no relationship between DMT scores and neuroticism (as measured by the Eysenck Personality Questionnaire). This may suggest that a different aspect of defensiveness is being measured by the DMT compared to the other measures of defensiveness mentioned above.

Converging information on the validity of the prototype apparatus as a measure of perceptual defence/vigilance might be found in participants' self-reports of aspects of their mental health. If defensiveness reflects a maladaptive coping response to stress, then perceptually defensive individuals might show more signs of stress than vigilant individuals. Thus it might be worthwhile to gather descriptive information relevant to the 'real-life' stress reactions of defensive and vigilant participants. In her review of the literature on the health and psychological consequences of defence, Olff (1991) concluded that defences may be successful tools in suppressing subjective awareness of apprehension, but the physiological response associated with anxiety may remain. Correspondingly, the literature is not clear-cut. For instance, Greer, Morris and Pettingale (1979) categorised the psychological reactions of women diagnosed with breast cancer as fighting spirit, denial, stoic acceptance or hopelessness-helplessness. The denial group had the second best survival rate after the fighting spirit group, five years later.

Defensiveness and extrasensory perception

Recent advances in meta-analytic techniques suggest that there is growing evidence for the existence of extrasensory perception (ESP, one form of 'psi'), defined as information transfer in conditions precluding the usage of the currently-known senses or of inference (e.g. Utts, 1991). Such evidence comes not only from overall performance on ESP tests significantly exceeding chance expectation, but from internally consistent patterns of performance such as correlation of ESP success in controlled studies and certain personality measures. For instance, meta-analyses have shown a significant positive correlation between extraversion and ESP performance (Honorton, Ferrari & Bem, 1991). Such patterns are of interest to parapsychologists for what they can reveal of the psi *process*—that is, how psi works. For instance, Eysenck (1967) predicted that extraverts should do better on psi tests than introverts, on the basis of his biological model of personality which states that extraverts have lower levels of cortical arousal than introverts. The extraversion-ESP correlation is also consistent with the related suggestion that reduced physiological arousal is psi-conducive (Braud, 1975).

One fruitful line of process-related research has found various measures of defensiveness to relate to psi scoring. This research was inspired by the idea that common factors may influence the processing of unconscious material, whether it be of 'normal' or 'paranormal' origin. Tyrrell (1947) was one of the first to suggest that psi information is initially 'perceived' at an unconscious level, and that this information may be subject to distortions and transformations before it emerges at a conscious level, in the same way as normally-perceived information may be distorted. He stated: "Paranormal cognition is not a conscious process. Its product alone is revealed to consciousness... The same vehicle which mediates paranormal cognition also mediates subconscious expectations and beliefs or normally acquired knowledge which has not reached consciousness independently" (p. 117). Research comparing defensiveness with ESP performance thus emerged from the idea that "People who are prone to draw their preconscious blinds in matters of visual perception might act somehow similarly towards perceptions which are extrasensory" (Johnson, in Carpenter, 1965, pp. 70–71).

The most systematic studies of the defensiveness-psi relationship have related performance on the Defence Mechanism Test with performance on forced-choice ESP tasks (i.e. tasks where the participant is required to select the ESP target from a known group of possible targets) (e.g. Haraldsson, Houtkooper & Hoeltje, 1987). A typical DMT-ESP experiment (exemplified by the Icelandic series of Haraldsson and his colleagues) would use male non-psychology undergraduate students as participants; the students would be tested on the DMT in small groups, and then at a second session they would participate, individually or in competitive pairs, in one clairvoyance and one precognition task. [In the clairvoyance task the *S* was asked to choose which of four possible 'windows' on a computer screen had been selected by the random number generator (RNG) of a computer as target, for 40 trials. If the target window was correctly chosen, it would open up to display a colourful picture. In the precognition task the *S* was asked over 40 trials to guess which of four letters

a remote computer would at a later time select. Later, the computer generated a different random 'target' sequence of 40 letters for each *S*.] The number of correct choices ('hits') scored by each participant is compared with the theoretical chance expectation (i.e. 25% if there are four possible targets), and standard statistical techniques are used to determine the likelihood of any obtained departure from mean chance expectation. Scoring may be significantly below chance ('psi-missing') or above chance ('psi-hitting') and parapsychologists may predict which participants would be expected to consistently hit or miss; in this instance, defensive participants would be expected to psi-miss, vigilant participants would be expected to psi-hit. To guard against the possibility that the participant is somehow capitalising on non-random sequences from the RNG, the randomness of the RNG is automatically tested before and after each session. Following completion of testing, the DMT protocols are scored by a judge who is blind to the participant's ESP performance; then the DMT-ESP scores are correlated for each participant.

In a meta-analysis of a planned series of 10 DMT-ESP experiments, conducted in Iceland using very similar procedures for each experiment, Haraldsson and Houtkooper (1992) found eight DMT-ESP correlations in the predicted direction, and two of these were independently significant. For all 10 experiments, the combined $Z = 2.611$, $N = 462$, $P = 0.0045$, one-tailed. Five out of six other DMT-ESP experiments, conducted in the U.S.A. and Holland, also showed independently significant correlations in the predicted direction between DMT and ESP scores (combined $Z = 3.482$, $N = 120$, $P = 0.00025$, one-tailed). These results suggest, therefore, that DMT performance can predict performance on psi tasks. Because the DMT and measures of perceptual defence apparently share the characteristic of being measures of 'primary defence' (Olff, 1991), we would predict that, in line with the DMT-ESP literature, individuals who are perceptually defensive, as measured by the prototype apparatus to be described shortly, will tend to score poorly at psi tasks relative to perceptually vigilant individuals, who would be expected to score well at these tasks. It is acknowledged, however, that the DMT may be measuring different aspects of defensiveness from perceptual defence measures, if for no other reason than that the scoring system of the DMT is far more detailed than the simple threshold fluctuations of perceptual defence measures.

The prototype apparatus

A review of the literature (Watt, 1993) suggested that of the existing 'performance' (as opposed to 'paper and pencil') measures of defensiveness (e.g. Mathews & Wertheimer, 1958; Dixon & Lear, 1964; Wallace & Worthington, 1970; Broadbent & Gregory, 1967), Dixon's 'closed loop control' method (Dixon, 1958; Henley & Dixon, 1976) had several methodological strengths over the others. Notably, the critical stimulus material was presented to one eye at a level of intensity well below the participant's awareness threshold; the participant was required to indicate their awareness of a neutral spot of light presented to the other eye concurrently with the presentation of the emotional or neutral subliminal stimulus, thus the participant's indication of awareness of the neutral spot of light was taken as an index of their reaction to the emotional or neutral subliminal stimulus.

The main strengths of this method are, therefore, that the participant does not gain partial cues as to the nature of the critical stimuli, and that awareness of these stimuli is signalled via a response to a neutral stimulus (thus removing the likelihood of response bias). Unfortunately, though, the apparatus required for this method is complex and no longer available. Gregor (1972) did, however, present a simple methodology that retained the advantages of Dixon's method. Gregor's method, using a two-field tachistoscope, presented slides showing taboo (e.g. sexual) and neutral words at gradually increasing brightness. The participant was required to indicate the moment when they first became aware of the *presence* of the stimulus slide (which looked at that stage like a plain lit rectangle). At that level of illumination, participants reported no awareness of the *contents* of the stimulus slide; therefore, like Dixon's method, the participant was signalling awareness of the presence of the critical subliminal stimulus with reference to a neutral near-threshold stimulus.

In a series of studies prior to the present studies (Watt, 1993), Gregor's basic method was adapted in order to retain its simple strengths, but to remove weaknesses associated with manual control of slide presentation and illumination, and manual recording of results. The tachistoscope box was modified: a constantly-lit electroluminescent panel provided low level background illumination; the second field was replaced by a modified carousel projector whose lens was removed and whose light

source was a second electroluminescent panel capable of increasing in brightness over a range of 100 incremental steps. The projector thus enabled automatic stimulus presentation. A B.B.C. computer, working in tandem with the tachistoscope and projector, was programmed to control slide changing, to provide a random time delay before the presentation of each stimulus (in order to lessen the likelihood of the participant anticipating the appearance of the stimuli), and to write to disk the brightness level at which the participant (by pressing a button) indicated awareness of the presence of the stimulus slide. Using this method, the experimenter and the participant are kept blind during the session as to the nature and order of the stimulus slides, and of the participant's objective scoring; therefore the possible influence of the expectations of the experimenter and the participant is minimised.*

The stimulus slides were developed by CW. They consisted of simple black and white line drawings that had been previously judged by a number of individuals to be either emotionally unpleasant (E) or neutral (N). In order to control for the possibility that participants might be reacting to the physical characteristics of a slide (e.g. the amount of light it transmitted) rather than to the meaning of the picture, matched control slides were developed for each E and N slide (the controls were labelled EC and NC). The control slides consisted of rearranged or jumbled versions of the E and N slides, such that the EC and NC slides had the same brightness as their matched E and N slides, but they conveyed no meaning. The 64 stimulus slides were presented in a different random order for each participant. If, overall, an individual's mean brightness score for the E slides was higher than for the other three slide categories, that individual was defined as perceptually defensive (because the emotional slides had to get brighter before the participant signalled awareness to them); perceptual vigilance was indicated by lowest brightness scores for the E slides, relative to the EC, N, and NC slides.

Two experiments were conducted that compared participants' forced-choice ESP and Neuroticism scores with their perceptual defence/vigilance scores. Apart from the number of participants and some minor methodological details, the two studies were very similar, with the second study intended as a replication and confirmation of the first. Experiment 1 will be described in detail, and the description of Experiment 2 will simply note the procedural changes in the second experiment.

EXPERIMENT 1: METHOD

Participants

CW was the experimenter. Participants were volunteers who in most cases had contacted the parapsychology unit expressing an interest in our research; some were recruited by word-of-mouth from associates of participants. Prior to their participation, each volunteer completed a 'Participant Information Form' (PIF).

Procedure

The experiment was conducted between November 1990 and January 1991. Each participant took part in two testing sessions, and each was tested individually. At the first session, lasting about one hour, the participant took the measure of perceptual defence/vigilance. The participant was then given the Eysenck Personality Inventory to take home to complete† prior to returning, around 1 week later, for the second session—the forced-choice ESP measure. The experimenter remained blind to the participant's defensiveness and Neuroticism scores until completion of both testing sessions.

*Due to limited resources, the experimenter herself loaded each participant's unique random slide sequence prior to the testing session. She *could* have recalled the order of the 64 slides, or more importantly the placing of the 16 emotional slides, and then somehow communicated this information to the participant in order to bias their responses. However, this communication would have to have been non-verbal (since the experimenter did not speak to the participant during the slide runs), and would have to have been achieved even though the experimenter was blind to the participant's actual scoring to the slides. Further, the experimenter would have to have been able to predict how the participant would score on the following week's psi test, in order to bias their performance in line with the experimental hypothesis. Ideally, a person uninvolved in running the study should load the defensiveness testing slides, however in practice the likelihood of experimenter cueing seems very small.

†Participants were asked to find a quiet place and time to fill out the questionnaire, and to go through it quickly without reflecting too much on each individual question.

The questionnaire measures

The Eysenck Personality Inventory (Eysenck & Eysenck, 1964) was chosen as a measure of Neuroticism because it was a brief and well-established questionnaire. Questions relevant to participants' mental health (e.g. their sleep patterns, their experience of mental illness) were included in a 'Participant Information Form' (PIF) completed by each individual prior to their involvement in these studies. The PIF consisted of over 60 questions intended to gather information about the participant (e.g. their views on ESP, the vividness of their visual imagery) that in some cases might be used to select them for particular kinds of study. In the present case, as an exploratory measure of general mental wellness, the questions in the PIF relating to practice of mental discipline, participation in formal 'self-improvement' programs such as psychotherapy, quality and quantity of sleep, and experience of mental illness, were combined and compared post hoc with the participants' defensiveness and vigilance scores. It was thought that these questions (see Table 1 for further details) might give an informal picture of participants' general mental health or their methods of coping with stress that could add to our understanding of perceptual defensiveness and vigilance.

The measure of perceptual defence/vigilance

The participant sat with the experimenter in a dimly-lit sound-attenuated room. The procedure was explained to the participant, though no details were given of the experimental hypotheses and the participant was not told that there was stimulus information on each slide. The participant was told that the test was of their visual sensitivity, but that there were no right or wrong answers; the test was simply measuring when the presence of each slide was first perceived. The participant was asked to look into the box at the background field. The first (blank) slide that was shown was illuminated to maximum brightness in order to demonstrate to participants the location and shape that each subsequent slide would have. The participant then did five practice slides, where each slide gradually brightened until the participant pressed the response button to indicate their awareness of the presence of the slide (i.e. a rectangular area of light superimposed on the background field). When the response button was pressed, the brightness score for the practice slide was displayed on the experimenter's computer screen; this enabled the experimenter to check that the participant was responding at a typical level and so was following instructions, and it enabled the experimenter to inform the participant of their objective scoring (in terms of their brightness score for each of the practice slides) This latter was helpful to participants because they were asked to attempt to respond to each slide at the same level of brightness, in their judgement. Typically, brightness scores dropped to a steady level over the practice slides. Unknown to participants, the fifth practice slide also set a ceiling on the possible brightening of all subsequent slides. The ceiling was designed to remove the likelihood of the participant deliberately or accidentally letting the critical slides brighten to the level at which information about the slide contents could be consciously perceived. Therefore, if during the session itself a participant failed to press the response button the slide would brighten until it hit the ceiling brightness limit, when it would dim down again and the next slide would be presented. Any scores equal to the ceiling brightness were discounted from the analysis because they did not represent a true response from the participant.

When, after the demonstration and practice slides, the participant was quite clear about what they were being asked to do, the experiment proceeded with four runs of 16 slides each. The computer automatically changed each slide and ensured a random time delay (2–7 sec) between slide presentations so that the participant would not begin to anticipate when each slide would appear. The participant was able to rest between each run of slides; the duration of the rest was decided by the participant according to how tiring they found the test, but was usually between two and five minutes.

Following presentation of all slides, the participant was asked whether they saw anything on the screen apart from the rectangle of light they had been expecting. A handful of participants reported seeing indistinct 'blobs and blotches' on the screen, but no-one could relate these to the actual slide contents, when these were shown at the end of the session. All participants were surprised to see that there had been shapes and pictures on each slide, and many expressed scepticism that their brightness judgements could have been influenced by these images. It appears, therefore, that the slide contents were indeed presented at levels precluding conscious awareness.

The measure of extrasensory perception

When participants returned to the laboratory for their ESP session, they gave their completed personality questionnaire to the experimenter, who then explained the procedure for the ESP task. Experiment 1 had a 'telepathy' design, meaning that each participant brought along a friend to act as 'sender' (a member of staff would act as sender if the participant preferred). The psi task was therefore presented to participants in Experiment 1 as a joint task, where the sender was attempting to communicate the nature of the target to the 'receiver'.

The ESP targets consisted of 24 slides that were projected onto a screen in a sound-attenuated room (the 'target room', containing the projector) non-adjacent to the sound-attenuated room that contained the experimenter, participant, and apparatus for measuring perceptual defence/vigilance (the 'defensiveness-testing room'). There were 12 emotionally unpleasant ESP targets (some of which were simple black and white line drawings that had been used in the defensiveness testing session, some of which were more colourful and complex pictures) and 12 neutral ESP targets (all of which depicted an identical line drawing of a rectangle).

Prior to the commencement of the study, CW prepared a collection of random target slide sequences using the pseudorandom algorithm of a B.B.C. microcomputer. Strips of paper, each containing one of these sequences, were put in an envelope and prior to each session a person otherwise uninvolved with the experiment randomly selected one unique sequence and loaded the 24 ESP slides into the projector tray accordingly and prepared the projector for use; therefore each participant had a different random slide sequence. The slide tray was covered so that experimenter, sender, and participant could not glimpse the target sequence for that session; therefore all participants remained blind to the ESP target order. After initial instructions had been given, the double doors of the target room were closed and the experimenter and participant sat in the defensiveness-testing room where the previous week's session had taken place, the double doors of which were also closed.

In order to maximize similarity to the previous week's testing session, the participant again gazed into the tachistoscope and responded as before to a number of brightening slides. This time, however, each slide was blank. The participant was aware of this, and was told that the blank slides were to give a baseline measure for comparison with the previous week's session. In a change to the previous week's procedure, the computer did not automatically advance onto the next slide after the participant had made their response; instead, the participant manually advanced to the next slide by pressing the response button, thus self-pacing the trials. For this session, the B.B.C. computer was linked electronically to the projector housing the ESP targets in the target room so that when the participant advanced a blank slide within the tachistoscope, a new ESP target would simultaneously be projected in the target room.

Following their indication of awareness of each (blank) slide, the participant would pause awhile to consider the nature of the ESP target that was concurrently being displayed in the target room and then inform the experimenter of the nature of the target slide (i.e. whether it was emotional or neutral). The experimenter recorded the participant's responses to each of the 24 ESP targets manually. There was a break of about 5 min after 12 ESP slides had been responded to, and after completion of all 24 slides the experimenter and participant returned to the target room. The experimenter, participant and sender then looked at each of the target slides, to give the participant immediate feedback on how they scored. Later, the ESP scores were double-checked. With 24 slides, with a binary forced-choice (i.e. emotional or neutral), mean chance expectation is 50%, or 12 hits. All participants discussed the session together, and the experimenter answered any further questions on the experiment. Finally, on completion of collection and analysis of all participants' data, each participant was sent a personal letter informing them of their defensiveness and questionnaire scores, and telling them the results of the study as a whole.

RESULTS

Several different analyses were conducted with the data collected from these two experiments, but for the purposes of this paper the results presented will be restricted to comparisons of defensiveness with psi, with Neuroticism, and with the items on the Participant Information Form that might indicate mental health. Prior to running these experiments, it was decided that for these comparisons the

Table 1. A summary of responses to six questions related to mental health, for perceptually defensive and perceptually vigilant participants in Experiment 1 (E1) ($N = 23$) and Experiment 2 (E2) ($N = 43$)

	Mental discipline? (%'yes')		Formal self-improvement? (%'yes')		Regular sleep? (%'yes')		Hours of sleep (mean)		Enough sleep? (%'yes')		Mental disorder? (%'yes')	
	E1	E2	E1	E2	E1	E2	E1	E2	E1	E2	E1	E2
Perceptually defensive	73	89	20	67	53	67	7.0	7.2	47	67	7	22
Perceptually vigilant	61	57	5	14	54	79	7.2*	7.3	57	77	0	7

*This figure excludes the response of one participant who said he slept around 12 hr with 'a break at 6 hr'; it was not clear how long a break he had.

The 'mental discipline' question was 'Have you ever practised any form of mental discipline/exercise, e.g., meditation, biofeedback, hypnosis, relaxation exercises?' The 'self-improvement' question was: 'Have you ever taken part in a formal self-improvement program such as TM, psychotherapy, etc?' The three 'sleep' questions were: 'Do you have regular sleep habits?'; 'On average how many hours a night do you sleep?'; and, 'Do you usually feel you get enough sleep?' The 'mental disorder' question was: 'Occasionally our research might require our having some information about various medical problems. Please tick any of the following of which you have had experience in the indicated period' (the 'mental disorder' option was embedded among others such as 'heart trouble' and 'high blood pressure').

analysis would use the data of those participants (hereafter referred to as 'criterion participants') who showed the strongest signs of defensiveness or vigilance (i.e. their ranked mean brightness scores for the emotional compared to the other slides were 1 or 4, respectively). This was because it was expected that the strongest relationship between defensiveness and psi, neuroticism, and mental health, would be found for the most extremely defensive and vigilant participants.

Forty-eight individuals took part in Experiment 1 (mean age 39, range 19–66 yr). Of the 24 criterion participants, 10 were apparently defensive (three males, seven females) and 14 were apparently vigilant (two males, 12 females); the remaining 24 'non-criterion' participants consisted of 15 males and nine females. Males and females were therefore unevenly distributed on the measure of perceptual defence/vigilance [$\chi^2(2\text{d.f.}) = 9.614$, $P < 0.02$], with the greatest imbalance due to the dearth of vigilant males. All participants completed the Neuroticism measure, but one defensive participant did not complete the Participant Information Form that included the mental health questions, so the data for this latter questionnaire are from only 23 participants.

Defensiveness and psi

Overall ESP performance was at chance level, with a mean of 12 hits for all 48 participants ($Z = 0.06$, exact binomial $P = 0.48$, one-tailed); however, some internal patterning did emerge. Perceptually defensive participants scored a mean of 11.2 ESP hits (SD = 2.3) compared to a mean of 12 hits (SD = 2.6) for vigilant participants; thus ESP scoring related as predicted to defence/vigilance, though not to a statistically significant degree [$t(22) = -0.773$, $P = 0.224$, one-tailed; effect size, Cohen's $d = 0.334$].

Defensiveness and Neuroticism

The mean Neuroticism score for defensive participants was 14.1 (SD = 6.8) compared to a mean of 7.6 for vigilant participants (SD = 4.0); thus as predicted the defensive participants had significantly higher Neuroticism scores than vigilant participants [$t(22) = 2.69$, $P = 0.009$, one-tailed; Cohen's $d = 1.164$]. Although there was a significantly uneven gender distribution on the measure of perceptual defence/vigilance, males and females did not significantly differ in their Neuroticism scores: for the 28 female participants, mean $N = 11.1$, SD = 5.7; for the 20 male participants, mean $N = 9.6$, SD = 5.4; $t(46) = 0.944$, $P = 0.350$, two-tailed. No relationship was found between Neuroticism scores and ESP performance (Pearson $r = -0.024$, $P = 0.873$, two-tailed).

Defensiveness and mental health

In this exploratory measure, as Table 1 shows, in every case perceptually defensive participants showed fewer signs of mental health than vigilant participants (the exact wording of the questions

is given below the table). It is possible that these figures at least in part reflect the difference in Neuroticism for perceptually defensive and vigilant participants.

DISCUSSION

There was some support for each of the predictions made for this experiment. Perceptual defence and vigilance were found to relate as predicted with psi scoring, though not significantly so: defensive participants had lower scores for the forced-choice ESP task than vigilant participants. Neuroticism was significantly higher in defensive than in vigilant participants; and defensive participants appeared to have poorer mental health than vigilant participants. These results give support for the potential usefulness of the prototype measure as an indicator of defensiveness/vigilance; it is encouraging that this measure was found to correlate as predicted with Eysenck's Neuroticism, where the DMT did not. Although ESP scores did not significantly differ between defensive and vigilant participants, the scoring was in the predicted direction. If this weak relationship is not merely chance, then an experiment with a greater number of participants, and therefore greater statistical power, should be able to demonstrate a statistically significant effect.

EXPERIMENT 2: METHOD

Experiment 2, conducted between April and August 1992, was designed to replicate these encouraging results, with a greater number of participants and therefore greater statistical power. The other main difference from Experiment 1, which had a telepathy design, was that Experiment 2 had a 'clairvoyance' design. That is, the participant was asked to gain impressions of the nature of the psi target without the aid of a sender. The main reason for choosing not to have senders in Experiment 2 was for greater simplicity: theoretically, having no sender reduces the number of possible 'psi sources' in the experimental system; practically, scheduling and conducting of sessions is easier with fewer participants. Also, the successful DMT-ESP results had been achieved without the use of senders. Finally, although there was no suspicion or evidence of security leakage in Experiment 1, a clairvoyance design eliminates the possibility that sender and receiver are somehow communicating either deliberately by means of a signalling system, or unconsciously by the use of subtle sensory cues that have not been eliminated by the acoustic and spatial separation of the rooms. In this study, CW prepared the random target sequences using the RAND (1955) random number tables. Apart from these noted changes, the procedure in Experiment 2 was identical to that for Experiment 1.

RESULTS

Seventy-five individuals took part in Experiment 2 (mean age 37.6, range 16–74 yr). Of the 43 criterion participants, 15 were apparently defensive (10 males, five females), and 28 were apparently vigilant (10 males, 18 females); the remaining 32 'non-criterion' participants consisted of 11 males and 21 females. As in Experiment 1, the distribution of defensive and vigilant males and females was significantly uneven [χ^2(3d.f.) = 8.397, $P = 0.038$]; as in Experiment 1, there were more vigilant than defensive participants, and, also as in Experiment 1, of the vigilant participants there were more females than males.

Defensiveness and psi

Overall ESP performance was again at chance level, with a mean for all 75 participants of 11.9 hits ($Z = -0.35$; no P-value is given here because the direction of scoring is opposite to that predicted on a one-tailed test); however closer inspection reveals, as predicted, some internally consistent patterning of ESP performance. Perceptually defensive participants scored a mean of 11 ESP hits (SD = 1.6), compared to a mean of 12.5 hits for the vigilant participants (SD = 2.4); thus ESP scoring was, as predicted, significantly higher for vigilant participants compared to those who were identified as perceptually defensive [$t(41) = -2.077$, $P = 0.02$, one-tailed; Cohen's $d = 0.681$].

Defensiveness and Neuroticism

The mean Neuroticism score for defensive participants was 12.1 (SD = 5.3), compared with 9.1 (SD = 4.3) for vigilant participants. Thus as predicted defensive participants had higher Neuroticism scores than those who were vigilant; this difference in scoring, though smaller than in Experiment 1, is statistically significant [$t(41) = 1.999$, $P = 0.03$, one-tailed; Cohen's $d = 0.655$]. Although there was a significantly uneven gender distribution on the measure of perceptual defence/vigilance, males and females again did not significantly differ in their Neuroticism scores: for the 44 female participants, mean $N = 11.5$, SD = 5.2; for the 31 male participants, mean $N = 10.2$, SD = 4.6; $t(73) = -1.091$, $P = 0.279$, two-tailed. Again as in Experiment 1, no relationship was found between Neuroticism scores and ESP performance (Pearson $r = 0.124$, $p = 0.291$, two-tailed).

Defensiveness and mental health

Table 1 shows how participants in Experiment 2 answered the six exploratory 'mental health' questions. As was found in Experiment 1, for every question the vigilant participants showed more signs of mental health than those who had been identified as perceptually defensive.

DISCUSSION

As was found in Experiment 1, there was support for the predictions made for the measure of perceptual defence/vigilance: defensive participants had significantly lower psi scores than vigilant participants; defensive participants had significantly higher Neuroticism scores than vigilant participants; and defensive participants showed fewer signs of mental health than vigilant participants, though again this latter finding may also reflect the difference in Neuroticism between defensive and vigilant participants. Experiment 2 therefore successfully replicates the findings of Experiment 1, and suggests that the weak but non-significant ESP-defensiveness results of Experiment 1 were not merely chance effects: significant evidence of a defensiveness-ESP relationship was found even when no sender was present.

GENERAL DISCUSSION

The results of these two experiments are significant in several respects. The prototype indicator of perceptual defence/vigilance has related as would be expected with the well-established personality factor of Neuroticism, thus providing some evidence for the validity of the new indicator. Further support for the validity of the prototype measure comes from the finding that, compared to defensive individuals, those who are identified as perceptually vigilant show more signs of mental health as measured informally on a general Participant Information questionnaire. When the results of these two experiments are combined so as to give greater statistical power, perceptual defence/vigilance relates strongly to Neuroticism [$t(65) = 3.459$, $P = 0.0005$, one-tailed; Cohen's $d = 0.895$] and to ESP performance [$t(65) = -2.132$, $P = 0.0185$, one-tailed; Cohen's $d = 0.552$], while no correlation is found between Neuroticism and ESP performance (Pearson $r = 0.063$, $P = 0.490$, two-tailed). Therefore any defensiveness-ESP relationship is not mediated by a neuroticism factor. This relationship between defensiveness/vigilance and psi scoring conceptually replicates the findings of the series of DMT-ESP studies described earlier, and adds to the body of consistent process-related findings in the parapsychological literature; it also adds support to the line of reasoning that initially stimulated studies of defensiveness and psi, suggesting that common factors may operate on unconscious processing of weak information, whether that information is 'extrasensory' or 'sensory' in origin. The fact that overall ESP performance was at chance in both studies is a useful reminder that seemingly null ESP results may reveal consistent and predictable internal patterning upon more careful inspection.

This study cannot directly address the question of how the prototype measure of perceptual defence/vigilance compares with other 'paper and pencil' measures of defensiveness. Some authors have argued that a combination of high 'Lie' scores and low Neuroticism scores suggest suppression or repression, or that repression may be revealed through a combination of high scores on a measure such as the Marlowe–Crowne Social Desirability Scale (Crowne & Marlowe, 1964) and low scores

on a measure of trait anxiety (Weinberger, Schwartz & Davidson, 1979). We attempted to explore this possibility by identifying those participants who showed a combination of high L and low N scores to see if this was associated with perceptual defensiveness on the prototype measure. In Experiment 1, L scores ranged from a minimum of 0 to a maximum of 7, with a mean of 2.7 (SD = 1.7), while N scores ranged from a minimum of 1 to a maximum of 23, with a mean of 10.5 (SD = 5.6). Only seven participants in this experiment had L scores of 5, 6, or 7, and of these, only two had below average N scores of 2 and 6. Thus only two participants in Experiment 1 showed the 'High L Low N' pattern thought by some to be indicative of suppression or repression. Neither of these individuals was identified as perceptually defensive on the prototype indicator, with one being perceptually vigilant and the other being only slightly vigilant. In Experiment 2, L scores ranged from a minimum of 0 to a maximum of 6, with a mean of 2.4 (SD = 1.6), while N scores ranged from a minimum of 1 to a maximum of 21, with a mean of 11 (SD = 4.9). Only eight participants had relatively high L scores of 5 or 6, and of these five had below average N scores ranging from 1 to 7. Of the five individuals showing the 'High L Low N' pattern, two were perceptually vigilant, two were slightly vigilant, and one was perceptually defensive as measured by the prototype apparatus. Thus, this indirect comparison of the prototype apparatus with a possible 'paper and pencil' indicator of repression has not been particularly informative, due to the small number of participants fitting the 'High L Low N' profile; if anything, there was a tendency for those participants fitting the profile to show signs of perceptual vigilance. If, however, one accepts the argument made earlier that 'paper and pencil' instruments may be measuring 'secondary defences', which necessarily are distorted by the self-report nature of these instruments, while the DMT and the present prototype apparatus may be more direct measures of 'primary defences', which are less vulnerable to the operation of response biases, then one probably would not expect to find a straightforward relationship between the two kinds of measures. Further research is necessary on this interesting question.

Taken together, the findings of the two studies described here suggest that the prototype apparatus may be a useful alternative indicator of defensiveness/vigilance, given the relative ease of administration and scoring of this method. However, although individuals identified as perceptually defensive or vigilant on this measure could be differentiated in these experiments by their performance on other, related measures, there were in fact only small absolute differences in brightness scores for the defensive and vigilant participants. In other words, only weak signs of defensiveness and vigilance were found using this prototype methodology. This may be because the population sampled was not strongly defensive or vigilant to begin with, but it may also be due to methodological characteristics such as the nature of the emotional stimuli and the labile (and hence potentially 'noisy') measure of slide awareness. Further experiments therefore are planned to modify some aspects of the prototype methodology, to see if more pronounced variation in responses to the subliminal emotional stimuli may be elicited. For instance, more strongly emotional stimulus slides may be used and the Neutral and Neutral Control slides may be removed thus allowing for a greater number of Emotional and Emotional Control slides to be shown.

The tendency that was found for there to be relatively few vigilant males was unexpected, but deserves further comment. The question of gender differences in defensiveness/vigilance has received little systematic study. There has been some suggestion in the past (Brown, 1961; Wagstaff, 1974a, b) that males and females may differ in their defensive response, with males showing a linear increase in threshold for preconscious stimuli as stimulus emotionality increases, and females showing a curvilinear response, with thresholds increasing at first, and then decreasing as stimulus emotionality increases further. The present experiments cannot confirm this suggestion, though they do suggest that researchers should be aware of the possibility of gender differences in defensive response and in population parameters. The bulk of the DMT-ESP studies, for instance, had only male participants; detailed findings from these studies might not generalize to a female population.

In conclusion, the prototype instrument has shown some promise as a simple and effective tool to identify perceptual defence/vigilance. With further development and testing, it may have a future role to play in the identification and selection of individuals who perform well under stress, and ultimately in enhancing human performance.

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