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Personality Type and Cued Vigil Performance

Upagya Rai and Indramani L. Singh
Banaras Hindu University, Varanasi

The present study tries to examine the effect of personality differences on cued vigilance task performance. Thirty two students of Banaras Hindu University participated in this study, whose age varied form 19 to 24 years, with a mean age of 21.4 year. All subjects received 3 min. task demonstration, a practice of 10 min. then final test session of 40 minutes. During the experimental session cue was manipulated as valid (indicating correct location of target) and invalid (wrong location of target). Target was a square of 3.3 cm and non-target was a square of 2.8 cm. Subjects were classified as introverts and extraverts on EPQ-R questionnaire. Performance in terms of speed and accuracy were recorded. Results revealed that extraverts performed better than introverts during a cued vigil task performance on accuracy measure. Furthermore, extraverts showed more benefit on both valid and invalid cues than their counterpart i.e. introverts. The obtained difference in cued vigil performance with regard to personality type could be due to over arousal of introverts with cue.

Keywords: Extravert, Introvert, Cued Vigilance, Decrement Function, Accuracy and Speed.

In order to complete any cognitively planned activity, any sequenced action, or any thought one must use sustained attention. As it has already been studied there are number of factors which affect the performance of an individual on vigilance task but, one of the most influential, affecting and widely studied factor is individual differences, on the personality dimensions of introversion and extraversion as they are high on the potential sources of variation in arousal. Vigilance studies have proved to be particularly useful for investigating performance between introverts and extraverts. Although there are various different type of vigilance task used, they all of them require participants to detect inconspicuous auditory or visual signals over a relatively prolonged period of time. There are other important variables that can produce different research outcomes (e.g., strength of stimulus, environmental stressors, rate of signals, etc.).

The personality dimension extraversion-introversion has been implicated by Eysenck (1959) and Broadbent (1958) as a correlate of detrimental performance in vigilance tasks. Typically, extraverts detect a lower proportion of signals than introverts in both visual and auditory modalities (Davis & Parasuraman, 1982).

Eysenck (1967) proposed that behavioral differences between introverts and extraverts could be explained in terms of differential arousal. Eysenck's (1994) theory of introversion is that introvert's have an overactive Ascending Reticular Activating System (ARAS) while extraverts have a poorly functioning ARAS. This difference in functioning is what leads extravert to seek strong stimulation while introverts avoid it. Tran, Craig, and McIsaac (2001) hypothesized that the EEG alpha rhythms, those that are inhibited when the person becomes aroused, would be less prominent

in introverts found significant difference between introverts and extraverts in terms of EEG 8-13 Hz activity (alpha waves), thus supporting Eysenck's theory. Similarly, Johnson, Wiebe, Gold, Anderson, Hichwa, Watkins, and Boles Ponto (1999) found that introverts had increased blood flow in their frontal lobes when they lie still and think about anything they wanted. In addition, introverts showed increased blood flow in Broca's area, which supports that this population is engaging is "self talk". Moreover, Smith, Kline, Lindgren, Ferro, Smith, and Nespor (1995) found that frontal lobe activation differences were significant in the right hemisphere but not in left. However, Standing, Lynn, and Moxness (1990) found that anxiety level of the introverts and extraverts in the noise/quiet condition were not statistically different, although the introverts' anxiety levels were higher than extraverts in both conditions. The prediction that introverts characteristically perform better on vigilance tasks than extraverts has been established with regularity (Davis, Hockey, & Taylor, 1969; Eysenck, 1967, 1981; Eysenck & Eysenck, 1985; Harkin & Geen, 1975; Koelega, 1992; Krupski, Raskin, & Bakan, 1971; Smith & Maben, 1993; Thackray, Jones, & Touchstone, 1974).

Arousal theory has shed strong light on the relationship between extraversion and vigilance performance. Yerkes and Dodson (1980) proposed an inverted U-shaped relationship between arousal and performance. Extraversion has been shown to correlate with the demanding task performance. It has been suggested that extraverts tends to perform better than introvert in highly aroused condition because extraverts are less prone to over-arousal and they perform worse than introverts in de-arousing conditions because they are more susceptible to under-arousal in comparison to high arousal condition for performance (Mathews, 1992). Eysenck and Eysenck (1982; 1985) suggested that extraverts perform better on demanding tasks, requiring divided attention, resistance to distraction or resistance to interference, as compared to introverts. Singh (1989) reported better signal detection performance in extravert locomotive drivers in an applied setting. Extraverts also showed higher scores on a speeded mail coding task (Mathews, Jones, & Chamberlain 1992). Some studies reported that the relationship of extraversion and performance varied with the level of ambient stimulation (Stelmack, 1990; Gale, 1981). Corr, Pickering, and Gray (1995) found that introverts were overaroused when given caffeine, while extraverts were optimally aroused with caffeine. The experimenter concluded that the introverts have a higher basal arousal level than the extraverts, although Eysenck would say that it was arousability and not basal levels that caused these differences (Eysenck, 1994). Introverts, while in a state of over-arousal, seemed to inhibit their autonomic responses, causing their performance in tasks to decline as compared to the extraverts. Levey and Martin (1981) reported that the superior conditionability of introverts disappears when stimuli are intense.

The this present study was an endeavor to explore, to what extent the performance of extraverts enhances in comparison to introverts when visual cue (arousing agent) is used during a vigilance task performance.

Method

Sample:

Thirty two students of Banaras Hindu University who were randomly selected, participated in this study. The age of the participants varied from 19 to 24 years, with a mean age of 21.4 years. All participants had normal or corrected to normal vision which was tested by the experimenter.

Task:

A visual cue is used to locate the target and the non target and was manipulated as

valid and invalid cue. A square of 3.30cm and a square of 2.80cm were used as a target and non target, respectively. This task was displayed on a 15'' color monitor of a Pentium IV computer.

Hindi adaptation of Eysenck Personality Questionnaire (EPQ-R: Eysenck, Eysenck & Barrett, 1985) was then administered to each participant at the end of test session.

Procedure:

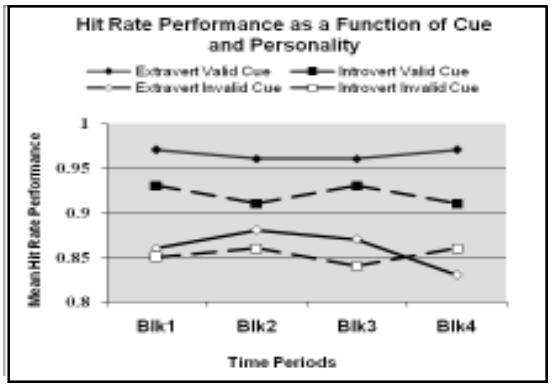
All volunteered participants who had given their consent, participated in this experiment, they also completed a biographical questionnaire, which had several questions about their age, education, socio-economic status, knowledge about computer and frequency of practice on a computer. The on-line instruction with brief introduction about the task was imparted lucidly to all participants as follows: *"The present experiment is related to cued vigilance task performance. In this study you will see a fixation (+) sign for 500 ms, then a cue for 350 ms indicating the location of the two squares of different sizes i.e. target (big square) and non target (small square) for 100 ms which will be manipulated as valid and invalid cues. You are required to press space bar immediately after detecting a big square which will appear in screen after visual cue and to ignore small square. Speed and accuracy will be recorded as response criteria. Is it clear to you? If you have any questions do not hesitate to ask".*

The queries of the participants were properly attended by the experimenter. Each subject received a 3-min demo of the task then they received 10-min common practice. Subjects who scored 75% of the accuracy in practice were selected for final study. Eysenck Personality Questionnaire (EPQ-R) was administered on each subject after completion of 40-min final test session. Correct detection (accuracy), incorrect detection (false alarms), and reaction time (speed) of the subjects were recorded as a performance measure.

Results and Discussion

Mean correct detection performance indicated that extraverts showed very high vigilance performance (97%) with valid (M=0.97; SD=0.02) and (86%) vigil performance with invalidly (M=0.86; S.D=0.06) cued conditions, while introverts showed little low vigil performance (92%) with valid (M=0.92; SD=0.09) and (85%) performance with invalidly cued conditions (M=0.85; SD=0.08). The obtained benefit in vigil performance has been demonstrated by extravert across the blocks.

Figure 1: Graphical Presentation of Hits scores with function of cue, block, and personality.

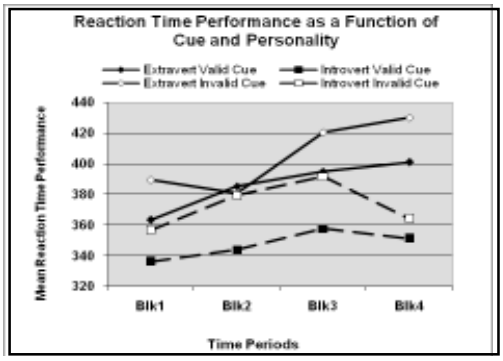


The mean performance data were then submitted for 2 (Personality) x 2 (Cue: Valid, Invalid) x 4 (Block: 10-min) analysis of variance (ANOVA) with the repeated measure on the last two factors to examine the interaction effects, if any. The ANOVA results revealed significant interaction effect between cue and personality ($F_{(1,30)} = 7.17$; $p<0.01$) on correct detection performance. This finding suggests that personality does play role in vigilance task detection performance especially while using cued vigil task. Result further exhibited that the benefit of personality with cue was maintained across blocks ($F_{(3,90)} = 0.004$; $p<0.09$). Thus, extraverts over performed across time periods than introverts. Contrarily, false

alarms performance was found higher in extraverts with valid cue (M=0.033; S.D=0.035) than introvert with valid cue (M=.015; S.D=.018), whereas for invalid cue condition the mean performance was similar (M=0.2; S.D=0.2) for both extraverts and introverts personality type. However, this difference on false alarms was not significant.

Similarly mean reaction time performance was also found poor for extraverts with valid cue (M=386.11; SD=182.94) and with invalid cue (M=405.07; SD=204.27) than of introverts with valid cue (M=347.17; SD=104.24), and introverts with invalid cue condition (M=372.94; SD=120.72). These reaction time performances are graphically presented.

Figure 2: Graphical Presentation of Reaction time of Valid and Invalid Cue for Extraverts and Introverts.



The ANOVA results obtained on reaction time performance showed no significant interaction effect. In sum, results revealed that extravert subjects received more cue benefits in the detection of critical signal across time periods (Four 10-min blocks) in comparison to its counterparts i.e. with paying significant cost (Reaction time). The obtained results shows that extraverts performed better during cued vigil task on accuracy than introverts which is consistent with other researcher (Singh, 1989). The superiority of extraverts on cued vigil task performance supports the contention of Eysenck's (1994) that introverts' have an overactive ascending reticular activating system (ARAS) while extraverts have a poorly functioning ARAS. This difference leads extravert to seek strong stimulation from visual cue (valid / invalid) while introverts avoid it because of having high cortical arousal, resulting decrement in performance across time periods. Similarly, extraverts also showed higher scores on speeded mail coding task (Mathews, Jones, & Chamberlain, 1992) and it has been found that extraverts performed better on demanding tasks as compared to introverts (Eysenck & Eysenck (1982; 1985).

In general, during vigilance studies introvert overcome the performance of extraverts (Davis & Parasuraman, 1982). The result of the present study enables us to understand the fact that these personality type (extraverts and introverts) not only differ in their cortical arousal but also in overall vigilance task performance. The obtained result shows that during cued vigil task extraverts overcome the performance of introverts, which means that cue act as an arousing agent and extraverts having low cortical arousal show increment in performance due to optimum arousal, whereas, introverts show decrement in performance due to over arousal during cued vigilance. Thus, it can be concluded that personality of an individual plays a vital role during vigilance performance.

References

Broadbent, D. E. (1958). *Perception and communication*. London: Pergamon Press.

Corr, P. J., Pickering, A. D., & Gray, J. A. (1995). Sociability / impulsivity and caffeine induced arousal: Critical flicker/fusion frequency and procedural learning. *Personality and Individual Differences, 18,* 713-730.

Davies, D. R., & Parasuraman, R. (1982). *The psychology of vigilance*. London: Academic Press.

Davies, D., Hockey, L., & Taylor, A. (1969). Varied auditory stimulation, temperature differences, and vigilance performance. *British Journal of Psychology, 60*, 453-457.

Eysenck, H. J. (1959) *The Maudsley Personality Inventory*. London: University Press.

Eysenck, H. J. (1967). *The biological basis of personality*. Springfield, IL: Thomas.

Eysenck, H. J. (1994). Personality: Biological foundations. In P. A. Vernon (Ed.), *The Neuropsychology of individual differences.* San Diego: Academic Press, 151-207.

Eysenck, H. J., & Eysenck, M. (1985). *Personality and individual differences*. New York: Plenum Press.

Eysenck, H. J., & Eysenck, S. B. G. (1982). *Recent advances in the cross-cultural study of personality*. In C.D. Spielberger and J. N. Butcher (Eds.), *Advances in personality assessment*. Hillsdale, NJ:LEA.

Gale, A. (1981). EEG studies of extraversion-introversion: What's the next step? In R. Lynn (Ed.) dimensions of personality: Papers in Honour of H. J. Eysenck, Oxford: Pergamon.

Harkins, S. G., & Geen, R. G. (1975). Discriminability and criterion differences between extraverts and introverts during vigilance. *Journal of Research in Personality, 9*, 335-340.

Johnson, D. L., Wiebe, J. S., Gold, S. M., Anderson, N. C., Hichwa, R. D., Watkins, G. L., & Boles Ponto, L. L. (1999). Cerebral blood flow and personality: A positron emission tomography study. *American Journal of Psychiatry*, *156,* 252-257.

Koelega, H. S. (1992). Extraversion and vigilance performance: 30 years of inconsistencies. *Psychological Bulletin*, *112*, 239-258.

Krupski, A., Raskin, D., & Bakan, P. (1971). Physiological and personality correlates of commission errors in an auditory vigilance task. *Psychophysiology, 8*, 304-311.

Levey, A. B., & Martin, I. (1981). Personality and conditioning. In H. J. Eysenck (Ed.), *A model for personality.* Berlin: Springer.

Matthews, G. (1992). Extraversion. In A. P. Smith and D. M. Jones (Eds.), *Handbook of human performance,* Vol. 3. State and trait London: Academic.

Matthews, G., Jones, D.M., & Chamberlain, A. G. (1992). Predictors of individual differences in mail coding skill, and their variation with ability level. *Journal of Applied Psychology*, 77, 406-418.

Singh, I. L. (1989). Personality correlates and perceptual detectibility of locomotive drivers. *Personality and Individual Differences, 10*, 1049-54.

Smith, A. P., & Maben, A. (1993). Effects of sleep deprivation, lunch, and personality on performance, mood, and cardiovascular function. *Physiology and Behaior, 54*, 967-972.

Smith, B. D., Kline, R., Lindgren, K., Ferro, M., Smith, D. A., & Nespor, A. (1995). The lateralized processing of affect in emotionally labile extraverts and introverts: Central and autonomic effects. *Biological Psychology, 39*, 143-157.

Standing, L., Lynn, D., & Moxness, K. (1990). Effects of noise upon introverts and extraverts. *Bulletin of the Psychonomic Society, 28,* 138-140.

Stelmack, R. M. (1990). Biological bases of extraversion: psycho physiological evidence. *Journal of personality, 58*, 293-311.

Thackray, R., Jones, K., & Touchstone, R. (1974). Personality and physiological correlates of performance decrements on a monotonous task requiring sustained attention. *British Journal of Psychology, 65*, 351-358.

Tran, Y., Craig, A., & McIsaac, P. (2001). Extraversion-introversion and 8-13 Hz waves in frontal cortical regions. *Personality and Individual Differences, 30,* 205-215.

Yerkes, R. M., & Dodson, J. D. (1980). The relation of strength of stimulus to rapidity of habit formation. *Journal of Comparative and Neurological Psychology, 18,* 459-482.

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Upagya Rai, Cognitive Science Laboratory, Department of Psychology, Banaras Hindu University, Varanasi – 221 005. Email: upagya_bhu@rediffmail.com,

Indramani L. Singh, PhD, Cognitive Science Laboratory, Department of Psychology, Banaras Hindu University, Varanasi – 221005.