11-1-2008

Sensation Seeking and Visual Selective Attention in Adults with HIV/AIDS

David J. Hardy
Loyola Marymount University, dhardy@lmu.edu

Steven A. Castellon
University of California, Los Angeles

Charles H. Hinkin
University of California, Los Angeles

Andrew J. Levine
University of California, Los Angeles

Mona N. Lam
University of California, Los Angeles

Recommended Citation

Hardy, D. J., Castellon, S. A., Hinkin, C. H., Levine, A. J., & Lam, M. N. (2008). Sensation Seeking and Visual Selective Attention in Adults with HIV/AIDS. AIDS and Behavior, 12(6), 930–934. http://doi.org/10.1007/s10461-007-9288-6

Published in final edited form as:
AIDS Behav. 2008 November ; 12(6): 930–934. doi:10.1007/s10461-007-9288-6.

Sensation Seeking and Visual Selective Attention in Adults with HIV/AIDS

David J. Hardy,
Department of Psychology, Loyola Marymount University, Suite 4700, Los Angeles, CA 90045, USA. Department of Psychiatry and Biobehavioral Sciences, University of California, Los Angeles, CA, USA

Steven A. Castellon,
Department of Psychiatry and Biobehavioral Sciences, University of California, Los Angeles, CA, USA. VA Greater Los Angeles Healthcare System, Los Angeles, CA, USA

Charles H. Hinkin,
Department of Psychiatry and Biobehavioral Sciences, University of California, Los Angeles, CA, USA. VA Greater Los Angeles Healthcare System, Los Angeles, CA, USA

Andrew J. Levine, and
Department of Neurology, University of California, Los Angeles, CA, USA

Mona N. Lam
VA Greater Los Angeles Healthcare System, Los Angeles, CA, USA. Department of Psychology, University of California, Los Angeles, CA, USA

David J. Hardy: dhardy@lmu.edu

Abstract

The association between sensation seeking and visual selective attention was examined in 31 adults with the Human Immunodeficiency Virus (HIV). Sensation seeking was measured with Zuckerman's Sensation Seeking Scale Form V (SSS-V). Selective attention was assessed with a perceptual span task, where a target letter-character must be identified in a quickly presented array of nontarget letter-characters. As predicted, sensation seeking was strongly associated (R^2 = .229) with perceptual span performance in the array size 12 condition, where selective attention demands were greatest, but not in the easier conditions. The Disinhibition, Boredom Susceptibility, and Experience Seeking subscales of the SSS-V were associated with span performance. It is argued that personality factors such as sensation seeking may play a significant role in selective attention and related cognitive abilities in HIV positive adults. Furthermore, sensation seeking differences might explain certain inconsistencies in the HIV neuropsychology literature.

Keywords

HIV; AIDS; Cognition; Personality; Performance; Individual differences

Introduction

Of interest to the present study is the finding that sensation seeking is associated with individual differences in certain aspects of attention processing (Ball and Zuckerman 1992; Martin

Correspondence to: David J. Hardy, dhardy@lmu.edu.

1985; Zuckerman 1979). This finding is important from a neuropsychological perspective because attention problems are reported to be the most frequent neuropsychological complaint in cognitively impaired HIV positive adults. Experimental studies have shown that HIV disrupts a variety of specific processing components of attention. Because effect sizes are often small in psychology, including neuropsychology, finding potent sources of individual differences in an outcome of significance (e.g., attention or cognitive functioning in HIV positive adults) can be helpful in its description, prediction, and elucidation. However, despite this interesting link between personality and attention in the general population, little if any research has examined the effect of personality traits on attention, or any other aspect of cognition, in HIV positive individuals.

The purpose of the present study is to examine visual selective attention in HIV positive adults as a function of the personality trait sensation seeking. Visual selective attention is a good candidate here because in seronegative adults, high sensation seekers have been shown to demonstrate superior performance in certain focused attention situations where a target stimulus must be selected among nontarget stimuli, such as in the Embedded Figures Test (and other tests of field-independence), a dichotic listening task, and certain aspects of the orienting reflex (Ball and Zuckerman 1992; Martin 1985; Zuckerman 1979). The orienting reflex represents an initial readjustment and narrowing of attention, possibly due to an increase in arousal to novel stimuli. This link between sensation seeking and the orienting reflex suggests that a possible mediating mechanism for the association between sensation seeking and selective attention is an increased level of arousal in high sensation seekers when presented with novel stimuli (Ball and Zuckerman 1992; Martin 1985).

Visual selective attention will be assessed in HIV positive adults with a perceptual span task. Perceptual span tasks involve the discrimination in a briefly presented array of a target letter-character among a varying number of nontarget letter-characters, and were originally used to delineate potential capacity limitations in early visual processing (Estes and Taylor 1964). Data from our laboratory has shown that the perceptual span task is sensitive to HIV infection (Hardy et al. 2004). Although sensation seeking has not been examined in relation to perceptual span performance, the sensitivity of the perceptual span task may be well suited for the examination of sensation seeking and selective attention. For the present study, it is predicted that the HIV positive adults with greater sensation seeking will demonstrate better perceptual span performance when selective attention demands are high (when target discrimination is difficult). Specific components of sensation seeking will also be examined in relation to perceptual span performance.

Methods

Participants

Participants included 31 HIV positive adult volunteers recruited from an infectious disease clinic and from community agencies specializing in services for HIV positive patients, who were examined at the West Los Angeles VA Medical Center as part of a larger study on medication adherence. The present sample is a subgroup of a larger group we have previously reported on (Hardy et al. 2004), and includes those with sensation seeking scores. Exclusionary criteria included history of head injury with loss of consciousness in excess of 10 min, history of learning disability, and adverse neurological history (e.g., stroke or seizure disorder) including secondary HIV-related central nervous system infection or lymphoma. In addition, a structured clinical interview composed of the mood, psychotic-spectrum, and substance use sections of the Structured Clinical Interview for the DSM-IV was administered to exclude those participants with current major depression disorder, bipolar disorder, or psychosis, as well as current drug or alcohol abuse/dependence. Mean age of the participants was 44.5 years (*SD* = 9.5) with an average of 13.6 years (*SD* = 2.5) of education. General cognitive status was

measured with the HIV Dementia Scale, with a mean score of 13.4 (*SD* = 2.6). Mean score on the Beck Depression Inventory (BDI-II) was 12.8 (*SD* = 11.2). Of the total sample of participants, 54.1% were African American, 21.6% were white, 16.2% were Latino, 2.7% were Asian, and 2.7% were of mixed race. The sample included 18.9% women. Of all the HIV positive participants, 67.6% met diagnostic criteria for Acquired Immunodeficiency Syndrome (AIDS). All participants were currently on highly active antiretroviral therapy (HAART). Participants provided written informed consent and were paid 50 dollars for their participation.

Measures

Sensation Seeking Scale Form V (SSS-V)—This is a 36-item self-report inventory (Zuckerman 1979). Items pertain to four subscales: *Thrill and Adventure Seeking* (TAS) (e.g., "I sometimes like to do things that are a little frightening."), *Experience Seeking* (ES) (e.g., "I like some of the earthy body smells."), *Disinhibition* (Dis) (e.g., "I like 'wild' uninhibited parties."), and *Boredom Susceptibility* (BS) (e.g., "I get bored seeing the same old faces."). Individuals are instructed to circle the one of two sentences that best describes their preference across several situations. A total score is obtained (between 0 and 36) as well as subscale scores (between 0 and 9). Higher scores reflect greater sensation seeking.

Perceptual span task—The perceptual span task was programmed (by the first author) with SuperLab software on a personal microcomputer. Each trial of the span task consisted of a 50 ms stimulus array. The stimulus array could be one, four, or 12 black letter-characters on a white background arranged on an imaginary 4 × 4 grid. The letter-characters *T* and *F* were targets and required a left and right button press respectively (with the left or right index finger) on a response box. Nontarget letter-characters included randomized selections from the alphabet with no repeat characters within a single array. Each array included a single target (except for target-absent catch trials). There were a total of 120 trials, with 40 trials per array size. After 20 trials of practice, participants completed six blocks of 20 trials each. Each block contained only one stimulus array size and blocks were presented in an alternating sequence (1, 4, 12, 1, 4, 12). More detail on this task is presented in Hardy et al. (2004).

Results

To assess the relationship between sensation seeking and selective attention, perceptual span performance (target identification percent accuracy) for each array size was linearly regressed on SSS-V total score. The regression function was significant in the array size 12 condition ($b = .012$, $R^2 = .229$, $P < .01$) but not in the smaller array conditions ($P > .23$). Regression analyses are illustrated in Fig. 1.

Two subsequent sets of analyses were conducted to further examine the relationship between sensation seeking and perceptual span performance in the array size 12 condition. First, zero-order Pearson correlations were conducted between each SSS-V subscale and response accuracy in the array size 12 condition. These are as follows: TAS ($r[29] = .230$, $P > .05$), ES ($r[29] = .346$, $P < .05$), Dis ($r[29] = .351$, $P < .05$), and BS ($r[29] = .344$, $P < .05$). Second, because the SSS-V sub-scales are not independent of each other, a hierarchical multiple regression analysis was conducted to determine the significance of using multiple SSS-V subscales in the prediction of response accuracy in the array size 12 condition. After entering the most salient predictor, Dis, which accounted for 12.3% of the variance, no other subscale added a statistically significant amount of accounted variance.

Discussion

The results provide preliminary support for our predictions about the association between sensation seeking and visual selective attention in HIV positive adults. When selective attention

demands were at their greatest in the perceptual span task (array size 12), sensation seeking accounted for 22.9% of the variance in target identification performance. Furthermore, as can be seen in Fig. 1, this effect appears to be genuine in that this association was not due to a small subset of participants or to a few outliers in the sample. Indeed, the range in target identification accuracy was large, with low sensation seekers performing quite poorly while high sensation seekers performed considerably better.

When selective attention demands were diminished (array sizes 1 and 4 conditions), sensation seeking was completely unrelated to perceptual span performance. Although the selective attention demands in the array size 4 condition were greater than in the array size one condition (there was a significant difference), this level of challenge was apparently not sufficient to elicit performance differences associated with sensation seeking. This lack of association was not likely due to a restricted range in performance in the array size 4 condition considering the evident variability in accuracy scores. These results are important because, at least in the present task situation, it shows that sensation seeking was not associated with perceptual or cognitive performance in general but only when selective attention demands were sufficiently high. Careful consideration should be addressed to this distinction between low and high attention demands in future studies that examine the relationship between sensation seeking and attention processing in HIV positive adults.

When examining specific components of sensation seeking, as per the subscales of the SSS-V, all but TAS was associated with span task performance in array size 12. Although the correlations for ES, Dis, and BS were all relatively modest in size compared to the relationship between sensation seeking in general (SSS-V total score) and performance in array size 12, this is to be expected because of the more restricted range in possible scores for the subscales (0–9) versus that of the total score (0–36). One possibility for why TAS (Thrill and Adventure Seeking) in particular would fail to be associated with perceptual span performance is that the desire to engage in physical risk-related behaviors is antithetical to performing a physically monotonous computer task. On the other hand, the same sort of reasoning would not necessarily apply to a subscale like BS or ES because of the challenge imposed in the array size 12 condition (the task feels quite difficult in this condition). In addition, it appears that the subscales were related to each other (as they are supposed to be), based on the finding that once Dis (the subscale with the largest correlation) is inserted as a predictor of array size 12 performance, none of the other subscales significantly add to the predictive function. Because the subscales of the SSS-V are interrelated, it might make more sense to remain at the more general conceptual level of sensation seeking, unless there are a priori hypotheses about specific subscales.

A mediating mechanism for the superior selective attention in the high sensation seeking HIV positive adults could be a relatively heightened level of arousal. Arousal is an admittedly elusive concept. However, if sensation seeking is indeed indicative of arousal differences in HIV positive adults, it may be useful to examine arousal in HIV positive adults in relation not only to processes of attention and other domains of cognition but also to risk-related behaviors, coping strategies, psychopathology, treatment, and other domains of behavior that could be influenced by individual differences in arousal. For example, although there is data showing that methylphenidate reduces cognitive slowing in HIV positive adults (Hinkin, et al. 2001), the effectiveness of such a stimulant might clearly be modulated by individual differences in levels of arousal. This same issue also pertains to our recent finding of impaired sustained attention in stimulant (cocaine and/or methamphetamine) using HIV positive adults (Levine et al. 2006). Individual differences in sensation seeking and/or arousal might also explain the inconsistency in research results on drug abuse and HIV infection. Although some studies report greater cognitive impairment in drug abusing HIV positive adults relative to control subject groups (seronegative drug abusers and clean seronegatives) (e.g., Starace et al. 1998),

other studies report no interactive effect between drug abuse and HIV infection (e.g., Selnes et al. 1997). Perhaps the greater sensation seeking (on average) in HIV positive drug abusers facilitates their selective attention and related cognitive abilities, offsetting any expected exacerbated cognitive deficits due to drug abuse.

Another factor that could influence the high sensation seekers superior selective attention performance is coping style. With an average response accuracy of 57.5% in the array size 12 condition, it is clear that the selective attention demands were quite high and exceeded the capacity of the lowest sensation seekers. If a unique and difficult computer task can be construed as a novel experience, then while the low sensation seekers apparently were overwhelmed (or perhaps gave up), the high sensation seekers appeared to have vigorously engaged this difficult novel situation, thus "rising to the occasion". Although coping with a difficult computer task is not the same as coping with a difficult life situation, the present results are compatible with research showing an association between high sensation seeking and more active efficacious coping strategies in such disparate populations such as ex-prisoners of war (Solomon et al. 1995) and injured high school athletes (Smith et al. 1992).

Ultimately, the role of individual differences (gender, education, age, etc.) is important to more precisely characterize the cognitive sequela of neuropsychologically important disorders. The finding that sensation seeking accounted for 22.9% of the variance in perceptual span performance is a large effect, not only in HIV research but in psychological research in general. One question for future studies is, how does sensation seeking modify other aspects of attention and cognition in HIV positive adults? Because sensation seeking is not strongly associated with general intelligence (Zuckerman 1979), it would be expected that sensation seeking is associated with only certain aspects of cognition in HIV positive adults. In fact, because perceptual span performance is considered an index of early selective visual processing and iconic capacity limitations, it seems likely that individual differences in sensation seeking would be associated with subsequent cognitive processes or domains that are linked to perceptual span. Another related question, from a more neuropsychological perspective, is how does sensation seeking modify the neuropsychological profile of HIV positive adults?

The present results with sensation seeking and selective attention show that personality factors may be an important source of individual differences in the neuropsychological outcome of HIV positive adults. This is a preliminary report, and a replication of such a finding is needed with a larger sample of participants. In addition, although the perceptual span task has been a useful tool, shown to be sensitive both to HIV infection and to sensation seeking, the relationship between sensation seeking and other measures or aspects of attention should be examined. For instance, although greater sensation seeking seems to be related to improved selective attention on a task like the perceptual span task, this may not be the case where attention must be sustained over time such as on a vigilance task. The role of substance abuse should also be considered. Although a previous report (Hardy et al. 2004) showed no association with past alcohol and substance abuse with perceptual span performance, current abusers were excluded from those analyses as they were in the present report as well. Considering that sensation seeking differences may be mediated by differences in arousal, active substance abuse (especially stimulant abuse) might modify the association between sensation seeking and selective attention in HIV. And finally, because age and disease progression has been shown to affect neurocognitive functioning (especially attention) in HIV positive adults (Hardy et al. 1999), such factors are commendable of examination in the relationship between sensation seeking and attention in HIV.

Acknowledgments

This study was supported by National Institute of Mental Health Grant Nos. R01 MH-58552 (awarded to Charles H. Hinkin) and T32 MH-19535, and by National Institute on Aging Grant No. R03 AG-18549 (awarded to David J. Hardy). We gratefully acknowledge Bryan Zolnikov for his assistance on the present study.

References

Ball SA, Zuckerman M. Sensation seeking and selective attention: Focused and divided attention on a dichotic listening task. Journal of Personality and Social Psychology 1992;63:825–831. [PubMed: 1447694]

Estes WK, Taylor HA. A detection method and probabilistic models for assessing information processing from brief visual displays. Proceedings of the National Academy of Science 1964;52:446–454.

Hardy DJ, Castellon SA, Hinkin CH. Perceptual span deficits in adults with HIV. Journal of the International Neuropsychological Society 2004;10(1):135–140. [PubMed: 14751015]

Hardy DJ, Hinkin CH, Satz P, Stenquist PK, van Gorp WG, Moore LH. Age differences and neurocognitive performance in HIV-infected adults. New Zealand Journal of Psychology 1999;28(2): 94–101.

Hinkin CH, Castellon SA, Hardy DJ, Farinpour R, Newton T, Singer E. Methylphenidate improves HIV-1 assoicated cognitive slowing. The Journal of Neuropsychiatry and Clinical Neurosciences 2001;13(2): 248–254. [PubMed: 11449032]

Levine AJ, Hardy DJ, Miller E, Castellon SA, Longshore D, Hinkin CH. The effect of recent stimulant use on sustained attention in HIV-infected adults. Journal of Clinical and Experimental Neuropsychology 2006;28:29–42. [PubMed: 16448974]

Martin M. Individual differences in sensation seeking and attentional ability. Personality and Individual Differences 1985;6:637–639.

Selnes OA, Galai N, McArthur JC, Cohn S, et al. HIV infection and cognition in intravenous drug users: Long-term follow-up. Neurology 1997;48:223–230. [PubMed: 9008522]

Smith RE, Ptacek JT, Smoll FL. Sensation seeking, stress, and adolescent injuries: A test of stress-buffering, risk-taking, and coping skills hypotheses. Journal of Personality and Social Psychology 1992;62:1016–1024. [PubMed: 1619547]

Solomon Z, Ginzburg K, Neria Y, Ohry A. Coping with war captivity: The role of sensation seeking. European Journal of Personality 1995;9:57–70.

Starace F, Baldassarre C, Biancolilli V, Fea M, Serpelloni G, Bartoli L, Maj M. Early neuropsychological impairment in HIV-seropositive intravenous drug users: Evidence from the Italian multicentre neuropsychological HIV study. Acta Psychiatrica Scandinavica 1998;97:132–138. [PubMed: 9517907]

Zuckerman, M. Sensation-seeking: Beyond the optimal level of arousal. Hillsdale, NJ: Lawrence Erlbaum Associates; 1979.

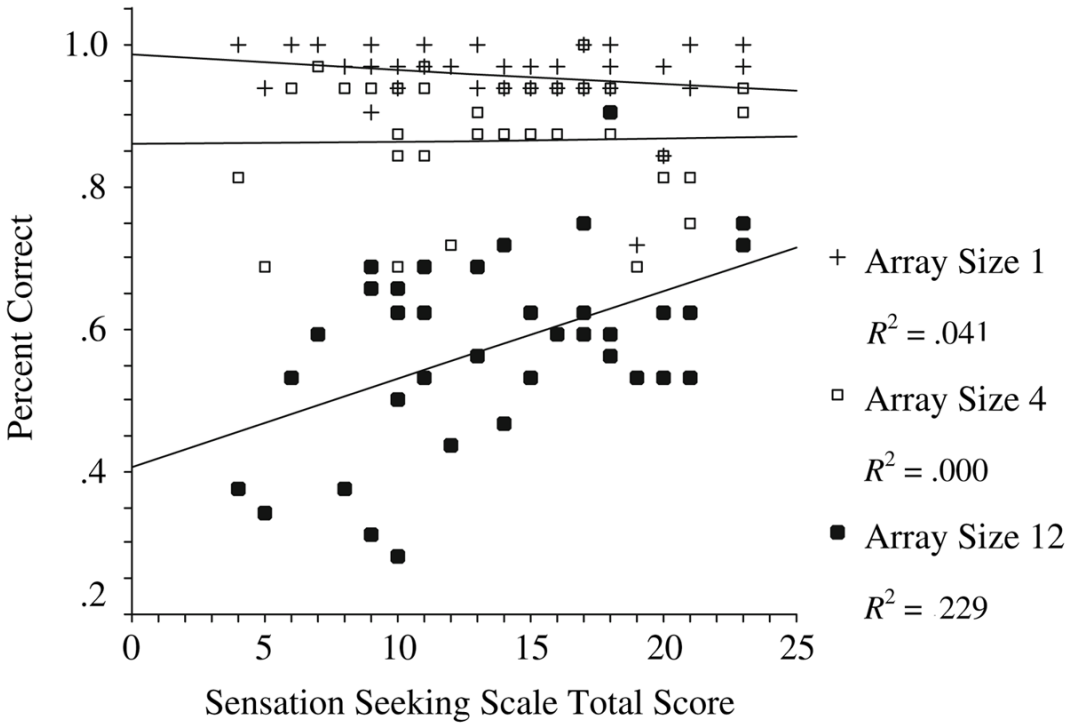

Fig. 1.
Target identification accuracy on the perceptual span task in HIV-positive adults as a function of array size and Sensation Seeking Scale total score