

Stress and Fatigue in Foreign Language Professionals: Implications for Global Security

James A. McCubbin, June J. Pilcher, Thomas W. Britt, and Thomas Wallsten

James A. McCubbin, Professor of Psychology, Clemson University

June J. Pilcher, Professor of Psychology, Clemson University

Thomas W. Britt, Associate Professor of Psychology, Clemson University

Thomas Wallsten, Professor of Psychology, Center for Advanced Study of Language, University of Maryland

This research was funded by a federal contract to the Center for Advanced Study of Language, University of Maryland.

Abstract

Information critical to the security of nations is embedded in an array of foreign languages. Foreign language professionals must often analyze complex information from different language sources, and the integrity of their analyses can significantly affect corporate and government decision-making, policy development, and response to world events. Psychological stress and fatigue can degrade the performance of foreign language professionals resulting in errors that may adversely affect security. Optimal design of work organization and work environments, individual stress management training, and augmented cognitive linguistics may facilitate the performance of foreign language professionals. Strategic assessment and management of stress and fatigue in foreign language professionals can improve the integrity of information analysis, facilitate decision-making, and enhance global security.

Introduction

The security of nations depends on timely and accurate analysis of complex information which is often derived from sources in different languages and dialects. Global security is supported by private sector and governmental foreign language professionals who provide detailed multilingual analysis of information critical to matters of commerce, state, justice, intelligence and defense. The performance of foreign language professionals and the integrity of their analyses can be severely compromised by psychological stress and fatigue. Inaccurate linguistic analyses can have catastrophic effects on corporate and governmental decision-making, policy development, and response to world events. Prevention and management of stress and fatigue in foreign

language professionals can significantly improve security in globalized economic, diplomatic and security environments.

Foreign Language Professionals in Difficult Work Environments

Foreign language professionals are multilingual workers who facilitate decision-making in important matters of global security. Working in the public and private sectors, these professionals are often required to perform essential duties under highly challenging conditions. For example, some assignments are characterized by especially high workloads, complex duties and difficult work environments. It is common for foreign language professionals to travel, at times in hostile and hazardous environments, experiencing separation from family and other social support networks. Foreign language professionals must sometimes work in emotionally-charged situations involving communication of significant anger or conflict. It is not always possible for foreign language professionals to insulate themselves from the emotional content or context of their target material. Some decisions resulting from foreign language analyses involve extraordinarily high stakes, where accurate and timely performance can contribute to mission success and protection of human life. Conversely, inaccurate performance of foreign language professionals can sometimes fail to avoid extraordinary loss.

These and other sources of psychological stress can be embedded within a general context of occupational strain and lack of perceived organizational justice. Although foreign language professionals must often use high levels of executive judgment to

interpret ambiguous or complex communications, their organizational advancement and career trajectories are not always sufficiently commensurate with their importance to mission success. For example, translators in combat zones are often exposed to imminent personal harm, yet their essential role in the organizational hierarchy is not always fully recognized. These multiple sources of stress can have cumulative adverse effects on the performance and health of the foreign language professional.

Stress and Fatigue

The scientific literature on human performance suggests that certain cognitive processes can be degraded by psychological stress and fatigue, including challenges associated with difficult work environments and assignments. Stress can affect a broad spectrum of behavior, ranging from simple reflexes to complex cognitive and integrative functions, including language perception and production. Psychological stress is a complex process by which individuals perceive and respond to certain events appraised as threatening or challenging (Lazarus and Folkman, 1984). Intense stimuli, or stressors, can be primarily physical, such as heat, cold, and noise, or primarily psychological, such as cognitive overload, high stakes consequences, trauma, and psychosocial conflict. Significant stressors evoke arousal, a psychophysiological excitation associated with readiness to respond. Arousal may facilitate preparation for the physical exertion of fight or flight, but prolonged, exaggerated, or inappropriate arousal can degrade performance on complex cognitive tasks (Wesnes and Warburton, 1983). Cognitive and behavioral strategies may modify consequences of a stressor (Lazarus, 1991; Lazarus et al., 1984).

For example, motion sickness can be decreased by giving the individual control over the motion (Rolnick and Lubow, 1991).

Fatigue is often associated with reduced levels of psychophysiological arousal (Hebb, 1955) and can result from sustained operations, sleep deprivation, or low levels of stimulation. As commonly described in the Yerkes-Dodson Law (Watters and Patel, 2002), performance can decrease at very low and very high levels of arousal, while maximum performance is associated with moderate levels of arousal. Task difficulty is considered important in the determination of the optimal arousal level (Denenberg and Karas, 1960; Anderson, 1994, Wickens and Hollands, 2000), where difficult tasks have a lower optimum arousal level than easy tasks. Therefore, control of arousal levels may provide a useful strategy for optimization of language performance under difficult work conditions.

The Effects of Stress and Fatigue on Performance

The effects of different types of stressors have been studied in relation to performance and psychophysiological functioning. For example, laboratory and naturalistic studies have focused on the effects of ambient heat, cold, (Ramsey, 1983; Pilcher, Nadler and Busch, 2002) and crowding (Sinha and Sinha, 1991). Studies of noise (Jones, 1983) and distraction may be especially pertinent to performance of foreign language professionals. Studies of natural disasters and combat have allowed scientific evaluation of the effects

of naturalistic stressors. Sleep disruption and sustained work has been consistently shown to degrade performance (Smith, McEvoy, & Gevins, 2002, Pilcher et al., in press).

The consequences of intense physical and psychological stressors have been assessed for various performance measures. For example, stress has been shown to degrade memory function, sustained attention and various indices of information processing. The negative consequences of fatigue have been shown in tasks requiring visual attention and sustained vigilance. Stress and fatigue have been shown to produce decrements in musculoskeletal function, athletic performance and academic performance. There is developing evidence to suggest that the observed relationship between stress and performance is generalizable to language-based tasks (Blumenthal, et al., in press).

The effects of stress and fatigue on performance have been studied primarily in monolingual, or unspecified populations. There is a substantial literature that addresses the effects of stress in clinical patients, and its consequences on both physio- and psychopathology (Cooper, 1996). In addition to clinical populations, the effects of stress and fatigue have been well-documented on performance in soldiers, astronauts, elite athletes, business executives and others working in difficult or challenging environments.

Professionals who work in multiple languages must effectively perform a set of extra cognitive linguistic processes in addition to the typical cognitive work tasks performed in a single language. For example, complex decision-making using input and/or output in different languages requires steps such as decoding and language switching in addition to

the typical cognitive processing of tasks using single languages. In addition, there is considerable nuance required when verbatim translation is not feasible or when cultural idiosyncrasies require careful judgment of ambiguous meaning. Some multilingual tasks such as simultaneous interpretation require high levels of sustained attention and working memory.

The additional cognitive processes of multilingual performance may be especially sensitive to the degrading effects of stress and fatigue. For example, a series of studies in our lab (Pilcher, et al., in press) exposed native and non-native English speakers to sustained overnight performance on a battery of English language based tasks. Analyses of performance decay curves over time suggest that language performance can be degraded by a number of factors including continuous work, sleep deprivation, non-native proficiency, and tasks requiring controlled attention. Therefore, stress and fatigue may have significant negative effects on the integrity of multilingual information analyses.

Levels of Intervention in Management of Stress and Fatigue

Comprehensive approaches to prevention and mitigation of the deleterious effects of stress and fatigue in the work context typically involve three basic levels of intervention. Adapted from the public health and occupational health psychology literatures, stress mitigation strategies for foreign language professionals can be focused on prevention of

stress exposure, enhancement of stress resiliency, and treatment of the negative consequences of stress and fatigue (Quick, 1999).

Primary Prevention. Primary prevention is usually targeted at the organizational level, and entails a variety of strategies designed to eliminate or minimize the degree of stress and fatigue to which workers are exposed. Applied to foreign language professionals, stress and fatigue can be avoided or reduced by optimal managerial strategies related to scheduling of work and break regimens, tailoring of work assignments based on level of proficiency, and design of work environments to facilitate performance on specific job functions. For example, continuous performance in a specific modality, such as listening, can result in modality specific perceptual fatigue (Moolenaar, et al., 1999). Therefore, shifting tasks or strategic scheduling of intermittent breaks may prevent modality specific decrements in language-based performance and could result in higher overall quality of work product. There may be interactions between proficiency and sensitivity to stress and fatigue, thus strategically guiding optimal employee selection and scheduling. For example, repeated assignment of tasks to the most proficient team member may result in less accuracy and work volume than distributing the task among several less proficient members.

Secondary Prevention. Secondary prevention is usually targeted at the individual level, and entails cognitive/behavioral procedures designed to detect and reduce unavoidable stress and fatigue. The relationship between arousal and performance suggests that a number of practical interventions can be deployed in training and field settings to shift

arousal levels for optimized performance. For example, physical fitness (McCubbin, et al., 1992), relaxation training (McCubbin, et al., 1996), and educational programs such as stress inoculation training (Meichenbaum and Deffenbacher, 1988) can reduce responses during exposure to stress. Stimulants such as caffeine can facilitate performance during fatigue associated with sleep deprivation and sustained work. Therefore, effects of fatigue and stress on arousal and performance provide a basis for exploration of secondary prevention strategies to optimize language performance in foreign language professionals.

Specialized techniques or styles of coping with stress can buffer the relationship between stressor and response, and enhance resiliency. For example, Bandura and colleagues (Bandura, et al., 1988) suggest that perceived coping self efficacy can reduce stress reactions. Social support from family, friends or trusted colleagues can also serve as an effective stress buffer (Stewart and Barling, 1996). Monitoring and blunting coping styles may facilitate physiological mechanisms that aid recovery from stress (Bruehl, et al., 1994). The performance of foreign language professionals may be improved by stress management techniques and coping styles that buffer an individual's reaction to stress.

New technological strategies are evolving that may be of significant value in minimization of stress and fatigue effects on performance of the foreign language professional. The rise of human factors psychology has stimulated enhanced design of the interface between technology and human users. In some work environments, animated workstation design can potentially provide informational feedback strategies for

enhanced foreign language performance. Augmented cognition technologies can be strategically tailored to specific needs of the foreign language professional. Direct language-based research in human/computer interfaces potentially can provide novel strategies to enhance foreign language performance in specialized settings and applications. Therefore, in situations where work stress is unavoidable, it may be possible to design stress management interventions and augmented cognition strategies at the individual level to increase resilience and improve language performance under conditions of stress and fatigue.

Tertiary Stress Prevention. When primary and secondary prevention is ineffective, stress and fatigue can produce a variety of negative consequences, ranging from acute cognitive performance deficits to prolonged threats to health, well-being and career success. Tertiary prevention refers to strategies that are designed to reverse the significant negative consequences of stress and fatigue to return workers to productive and fulfilling employment. Employee assistance programs were developed to support workers with a variety of problems including alcohol dependency and substance abuse. New directions in the design of employee assistance programs are beginning to address the needs of impaired professionals (White et al.; 1996).

Treatment programs in work environments with significant populations of foreign language professionals should be designed to address problems related to both acute and chronic stress. For example, prevalence of post traumatic stress disorder in military and law enforcement personnel, including foreign language professionals, can be a significant

threat to employee wellbeing and organizational effectiveness. Other psychological problems associated with chronic stress include drug and alcohol dependency, marital problems, depression and suicide. Symptoms of some chronic diseases such as diabetes, hypertension, and heart disease, are exacerbated by psychological and physiological effects of stress. For example, neural and hormonal responses to stress can increase blood pressure and blood glucose levels. Health management behaviors such as proper diet, exercise and sleep regimens can degrade under conditions of chronic stress. Chronic stress can increase psychophysiological sensitivity to acute stressors, further threatening the performance, health and wellbeing of the foreign language professional.

Employee assistance programs can be effective when viewed as part of a more comprehensive worksite health program, but there is concern about their effectiveness for several reasons (Arthur, 2000). No treatment can be effective unless the client seeks treatment, is properly diagnosed, and adheres to the appropriate prescribed regimen. There are numerous barriers to the seeking of treatment that may be applicable to foreign language professionals. Considerable stigma is associated with seeking treatment because of the traditional role of employee assistance programs in treatment of drug and alcohol dependency. There are concerns about confidentiality and threats to employment status if treatment for factors affecting work-related performance becomes known to managers. Moreover, military and law enforcement culture does not always encourage seeking of psychological support services. Assessment and approaches to organizational culture, stigma and adherence may reduce significant barriers to effective treatment. Effective tertiary prevention programs may be of great value for foreign language

professionals suffering from health or performance problems related to acute and/or chronic stress or fatigue.

Conclusions

Foreign language professionals are essential for national security in a globalized economic, political and security environment. Acute and chronic stress and fatigue can diminish work performance via several mechanisms. Performance of foreign language professionals may be facilitated by optimal design of work organization and work environments, individual stress management training, and augmented linguistic cognition. Strategic assessment and management of stress and fatigue in foreign language professionals can improve the integrity of information analysis, facilitate decision-making, and enhance global security.

References

- Anderson, K.J. 1994. Impulsivity, caffeine, and task difficulty: A within-subjects test of the Yerkes-Dodson law. *Personality and Individual Differences*, 16, 6: 813-829.
- Arthur, A.R. 2000. Employee assistance programmes: the emperor's new clothes of stress management? *British Journal of Guidance and Counselling*, 28, 4: 549-559.
- Bandura, A., Cioffi, D., Taylor, C. B., & Brouillard, M. E. 1988. Perceived self-efficacy in coping with cognitive stressors and opioid activation. *Journal of Personality & Social Psychology*, 55, 3: 479-488.
- Blumenthal, P., Britt, T.W., Cohen, J., McCubbin, J.A., Maxfield, N., Michael, E., Moore, P., Obler, L.K., Scheck, P., Signorelli, T. and Wallsten, T.S. In press. Stress effects on bilinguals language professionals' performance. *International Journal of Bilingualism*.
- Bruehl, S., McCubbin, J.A., Wilson, J.F., Montgomery, T., Ibarra, P., and Carlson, C.R. 1994. Coping styles, endogenous opioids, and cardiovascular response to stress. *Journal of Behavioral Medicine*, 17: 25-40.
- Cooper, C.L. (Ed) *Handbook of Stress, Medicine and Health*, CRC Press, Boca Raton, 1996.
- Denenberg, V.H. and Karas, G.G. 1960. Supplementary report: The Yerkes-Dodson law and shift in task difficulty. *Journal of Experimental Psychology*, 59: 429-430.
- Hebb, D.O. 1955. Drives and the CNS (conceptual nervous system). *Psychological Review*, 62: 243-254.
- Jones, D.M. 1983. Noise. In G.R.L. Hockey (Ed) *Stress and Fatigue in Human Performance*. Chichester : John Wiley and Sons, Ltd.: 61-95.

- McCubbin, J.A., Cheung, R., Montgomery, T.B., Bulbulian, R. and Wilson, J.F. 1992. Aerobic fitness and opioidergic inhibition of cardiovascular stress reactivity. *Psychophysiology*, 29: 687-697.
- McCubbin, J.A., Wilson, J.F., Bruehl, S., Ibarra, P., Carlson, C.R., Norton, J.A. and Colclough, G.W. 1996. Relaxation training and opioid inhibition of blood pressure response to stress. *Journal of Consulting and Clinical Psychology*, 64: 593-601.
- Meichenbaum, D., and Deffenbacher, J. L. 1988. Stress inoculation training. *Counseling Psychologist*, 16: 69-90.
- Moolenaar, M., Desmond, P. A., Mascord, D. J., Starmer, G. A. Tattam, B. and Volkerts, E. R. 1999. The effects of ephedrine on the development of fatigue in a prolonged driving-related task. *Human Psychopharmacology: Clinical and Experimental*, 14, 6: 415-427.
- Muse, L.A., Harris, S.G. and Field, H.S. 2003. Has the Inverted-U Theory of Stress and Job Performance Had a Fair Test? *Human Performance*, 16, 4, 349-364
- Pilcher, J. J., McClelland, L. E., Moore, D. D., Haarmann, H., Baron, J., Wallsten, T. S. and McCubbin, J. A. In press. Language performance under sustained work and sleep deprivation conditions. *Aviation, Space and Environmental Medicine*.
- Pilcher, J., Nadler, E., and Busch, C. 2002. Effects on hot and cold temperature exposure on performance: a meta-analytic review. *Ergonomics*, 45: 682-698.
- Quick, J.C. 1999. Occupational health psychology: The convergence of health and clinical psychology with public health and preventive medicine in an organizational context. *Professional Psychology: Research and Practice*, 30, 2: 123-128.
- Ramsey, J.D. 1983. Heat and cold. In G.R.L. Hockey (Ed) *Stress and Fatigue in Human Performance* Chichester: John Wiley and Sons, Ltd.: 33-60.
- Sanders, A.F. 1983. Towards a model of stress and human performance. *Acta Psychologica (Amst)*. 53, 1: 61-97.
- Sinha, S.P. and Sinha, S.P. 1991. Personal space and density in task performance and feelings of crowding. *Journal of Social Psychology*, 131, 6: 831-7.
- Smith, M. E., McEvoy, L. K., & Gevins, A. 2002. The impact of moderate sleep loss on neurophysiologic signals during working-memory task performance. *Sleep*, 25: 784-794.
- Stewart, W., & Barling J. 1996. Daily work stress, mood and interpersonal job performance: a mediational model. *Work & Stress*, 10: 336-351.
- Wesnes, K. and Warburton, D.M. 1983. Stress and drugs. In G.R.L. Hockey (Ed) *Stress and Fatigue in Human Performance*, Chichester: John Wiley and Sons, Ltd.: 203-243.
- White, R.K., McDuff, D.R., Schwartz, R.P., Tiegel, S.A. and Judge, C.P. 1996. New developments in employee assistance programs. *Psychiatric Services*, 47, 387-391.
- Wickens, C.D. & Hollands, J.G. 2000. *Engineering Psychology and Human Performance 3rd Edition*. New Jersey: Prentice Hall.

Published by the Forum on Public Policy

Copyright © The Forum on Public Policy. All Rights Reserved. 2006.