Document details

Back to results | 1 of 1

Export Download Print E-mail Save to PDF Add to List More...

Full Text View at Publisher

Work
Volume 44, Issue 2, 2013, Pages 231-243

Effect of biofeedback training on operator's cognitive performance (Article)

Sutarto, A.P.[a], Wahab, M.N.A.[b], Zin, N.M.[c]

[a]Department of Industrial Engineering, University of Ahmad Dahlan, Jln Prof Dr. Soepomo, Janturan, Yogyakarta, 55164, Indonesia
[b]Department of Human Sciences, University of Malaysia Pahang, Pahang, Malaysia
[c]Department of Psychiatry, Kulliyyah of Medicine, Islamic International University of Malaysia, Kuala Lumpur, Malaysia

Abstract

View references (71)

BACKGROUND: Predominantly cognitive tasks assigned to the shop floor can lead to decreased cognitive functions problems, thereby increasing occupational accident risks. A potential approach to prevent such circumstances is by improving operator's cognitive performance. OBJECTIVE: This study aimed to examine whether heart rate variability (HRV) biofeedback training could improve cognitive performance among electronic manufacturing's operators. PARTICIPANTS: Subjects consisted of 36 female operators who were randomly assigned as the experimental (n=19), and control group (n=17). METHOD: The experimental participants received five session of weekly HRV biofeedback training of 30-50 minutes each. Physiological stress profiles and cognitive performance were assessed at pre and post-intervention. RESULTS: Significant group x time effects were observed for attention and memory ($p < 0.01$) but not present for cognitive flexibility. Significant higher total spectrum HRV and low frequency (LF) power also occurred during biofeedback sessions, in addition to slower respiration rate. Physiological stress profile showed that the biofeedback participants were able to increase their LF activity at baseline, stressor, and recovery periods from pre to post. CONCLUSION: This study demonstrates potential application of HRV biofeedback for operator's performance enhancement, associated with increases in HRV.

SciVal Topic Prominence

Topic: Oman | Diabetes Mellitus, Type 2 | Prevalence

Prominence percentile: 64.126

Author keywords

attention | cognitive flexibility | heart rate variability | memory | Psychophysiology

Indexed keywords

EMTREE medical terms: article | elderly care | human | public relations | vocational rehabilitation

MeSH: Community-Institutional Relations | Health Services for the Aged | Humans | Rehabilitation, Vocational

ISSN: 10519815
CODEN: WORKF
Source Type: Journal
Original language: English

DOI: 10.3233/WOR-121499
PubMed ID: 23324677
Document Type: Article

References (71)

View in search results format >

Metrics

View all metrics >

5 Citations in Scopus
40th percentile

0.53 Field-Weighted Citation Impact

PlumX Metrics
Usage, Captures, Mentions, Social Media and Citations beyond Scopus.

Cited by 5 documents

Opening the mind through the body: The effects of posture on creative processes
Andolfi, V.R. , Di Nuzzo, C. , Antonietti, A.
(2017) Thinking Skills and Creativity

Stress monitoring through non-invasive instrumental analysis of skin conductivity
Joshi, A. , Kiran, R. , Sah, A.N.
(2017) Work

Abbreviated Resonant Frequency Training to Augment Heart Rate Variability and Enhance On-Demand Emotional Regulation in Elite Sport Support Staff
Gross, M.J. , Shearer, D.A. , Bringer, J.D.
(2016) Applied Psychophysiology Biofeedback

View all 5 citing documents

Inform me when this document is cited in Scopus:

Set citation alert >
Set citation feed >

Related documents

Heart Rate Variability (HRV) biofeedback: A new training approach for operator's performance enhancement
Sutarto, A.P. , Wahab, M.N.A. , Zin, N.M.
(2010) Journal of Industrial Engineering and Management

1 Blumberg, M., Pringel, C.D.
The missing opportunity in organizational research: Some implications for a theory of work performance
(1982) *Acad of Manag Rev*, 19 (3), pp. 510-536.

2 Matthew, G., Davies, D.R., Westerman, S.J., Stammers, R.B.
(2000) *Human Performance: Cognition Stress and Individual Differences*. Cited 283 times.
Philadelphia: Taylor & Francis

3 Newell, A.F., Carmichael, A., Gregor, P., Alm, N.
(2008) *Information Technology for Cognitive Support, In: The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications, 2nd Ed*, pp. 811-828.
Lawrence Erlbaum, New Jersey

4 Gluckman, J.P.
(1990) *Changing Task Demands in Sustained Attention: Effects on Performance and Perceived Workload*. Cited 2 times.
Dissertation, University of Cincinnati [UMI Number 9108613]

5 Fox, E.
Allocation of visual attention and anxiety

(1993) *Cognition and Emotion*, 7 (2), pp. 207-215. Cited 141 times.
doi: 10.1080/02699939308409185

View at Publisher

6 Marsh, R.L., Sebrechts, M.M., Hicks, J.L., Landau, J.D.
Processing strategies and secondary memory in very rapid forgetting

(1997) *Memory and Cognition*, 25 (2), pp. 173-181. Cited 13 times.
http://springerlink.com/content/0090-502x/
doi: 10.3758/BF03201110

View at Publisher

7 Temple, J.G., Warm, J.S., Dember, W.N., Jones, K.S., LaGrange, C.M., Matthews, G.
The effects of signal salience and caffeine on performance, workload, and stress in an abbreviated vigilance task

(2000) *Human Factors*, 42 (2), pp. 183-194. Cited 156 times.
http://hfs.sagepub.com/
doi: 10.1518/001872000779656480

View at Publisher

8 Bourne Jr., L.E., Yaroush, R.A.
(2003) *Stress and Cognition: A Cognitive Psychological Perspective*. Cited 56 times.
[2009-2-2]
http://humansystems.arc.nasa.gov/eas/download/non_EAS/ Stress_and_Cognition.pdf

Resonant breathing biofeedback training for stress reduction among manufacturing operators
Purwandini Sutarto, A. , Abdul Wahab, M.N. , Mat Zin, N.
(2012) International Journal of Occupational Safety and Ergonomics

Effects of heart rate variability biofeedback therapy on patients with poststroke depression: A case study
Li, X. , Zhang, T. , Song, L.-P.
(2015) Chinese Medical Journal

View all related documents based on references

Find more related documents in Scopus based on:

Authors > Keywords >

9 Pattyn, N., Neyt, X., Henderickx, D., Soetens, E.
Psychophysiological investigation of vigilance decrement: Boredom or cognitive fatigue?

(2008) *Physiology and Behavior*, 93 (1-2), pp. 369-378. Cited 143 times.
www.elsevier.com/locate/physbeh
doi: 10.1016/j.physbeh.2007.09.016

View at Publisher

10 Wallace, J.C., Vodanovich, S.J.
Workplace Safety Performance: Conscientiousness, Cognitive Failure, and Their Interaction

(2003) *Journal of Occupational Health Psychology*, 8 (4), pp. 316-327. Cited 84 times.
doi: 10.1037/1076-8998.8.4.316

View at Publisher

11 Wallace, J.C., Kass, S.J., Stanny, C.J.
The cognitive failures questionnaire revisited: Dimensions and correlates

(2002) *Journal of General Psychology*, 129 (3), pp. 238-256. Cited 138 times.
doi: 10.1080/00221300209602098

View at Publisher

12 Hansen, C.P.
A Causal Model of the Relationship Among Accidents, Biodata, Personality, and Cognitive Factors

(1989) *Journal of Applied Psychology*, 74 (1), pp. 81-90. Cited 130 times.
doi: 10.1037/0021-9010.74.1.81

View at Publisher

13 Arthur, W., Barrett, G.V., Alexander, R.A.
Prediction of Vehicular Accident Involvement: A Meta-Analysis

(1991) *Human Performance*, 4 (2), pp. 89-105. Cited 95 times.
doi: 10.1207/s15327043hup0402_1

View at Publisher

14 Hallam, S., Price, J., Katsarou, G.
The effects of background music on primary school pupils' task performance

(2002) *Educational Studies*, 28 (2), pp. 111-122. Cited 87 times.
doi: 10.1080/03055690220124551

View at Publisher

15 Cockerton, T., Moore, S., Norman, D.
Cognitive test performance and background music

(1997) *Perceptual and Motor Skills*, 85 (3 PART II), pp. 1435-1438. Cited 36 times.

View at Publisher

16 Thompson, W.F., Schellenberg, E.G., Husain, G.
Arousal, mood, and the Mozart effect (Open Access)

(2001) *Psychological Science*, 12 (3), pp. 248-251. Cited 303 times.
http://www.sagepub.com/home.nav
doi: 10.1111/1467-9280.00345

View at Publisher

17 Cassidy, G., Macdonald, R.A.R.
The effect of background music and background noise on the task performance of introverts and extraverts

(2007) *Psychology of Music*, 35 (3), pp. 517-537. Cited 79 times.
http://pom.sagepub.com/
doi: 10.1177/0305735607076444

View at Publisher

18 Llewellyn, D.J., Lang, I.A., Langa, K.M., Huppert, F.A.
Cognitive function and psychological well-being: Findings from a population-based cohort (Open Access)

(2008) *Age and Ageing*, 37 (6), pp. 685-689. Cited 45 times.
doi: 10.1093/ageing/afn194

View at Publisher

19 Willis, S.L., Tennstedt, S.L., Marsiske, M., Ball, K., Elias, J., Koepke, K.M., Morris, J.N., (...), Wright, E.
Long-term effects of cognitive training on everyday functional outcomes in older adults (Open Access)

(2006) *Journal of the American Medical Association*, 296 (23), pp. 2805-2814. Cited 842 times.
http://jama.ama-assn.org/cgi/reprint/296/23/2805
doi: 10.1001/jama.296.23.2805

View at Publisher

20 Moore, A., Malinowski, P.
Meditation, mindfulness and cognitive flexibility

(2009) *Consciousness and Cognition*, 18 (1), pp. 176-186. Cited 342 times.
doi: 10.1016/j.concog.2008.12.008

View at Publisher

21 Papadelis, C., Kourtidou-Papadeli, C., Bamidis, P., Albani, M.
Effects of imagery training on cognitive performance and use of physiological measures as an assessment tool of mental effort

(2007) *Brain and Cognition*, 64 (1), pp. 74-85. Cited 44 times.
doi: 10.1016/j.bandc.2007.01.001

View at Publisher

22 Kramer, A.F., Hahn, S., Cohen, N.J., Banich, M.T., McAuley, E., Harrison, C.R., Chason, J., (...), Colcombe, A.
Ageing, fitness and neurocognitive function [7]

(1999) *Nature*, 400 (6743), pp. 418-419. Cited 850 times.
doi: 10.1038/22682

View at Publisher

23 Hansen, A.L., Johnsen, B.H., Sollers III, J.J., Stenvik, K., Thayer, J.F.
Heart rate variability and its relation to prefrontal cognitive function: The effects of training and detraining

(2004) *European Journal of Applied Physiology*, 93 (3), pp. 263-272. Cited 170 times.
doi: 10.1007/s00421-004-1208-0

View at Publisher

24 Mohd Nordin, N.A.M., Shamsuddin, K., Jamaludin, J., Zulkafli Work, N.H.
Home physical activity profile of women workers in an electronics factory in the klang valley malaysia
(1999) *Women's Health and Urban Life*, 2 (2), pp. 5-20. Cited 3 times.

25 Caldwell, J.A., Wilson, G.F., Cetinguc, M., Gaillard, A.W.K., Gunder, A., Lagarde, D., Makeig, S., (...), Wright, N.A.
Psychophysiological Assessment Methods. Agard Advisory Report (1994:324)
[2010-01-15]
ftp://ftp.rta.nato.int//PubFullText/AGARD/AR/AGARD-AR-324/AGARDAR324.pdf

26 Yerkes, R.M., Dodson
The relation of strength of stimulus to rapidity of habit formation
(1908) *J Comp Neuro Psychol*, 18, pp. 459-482. Cited 2700 times.
[2009-05-03]
http://psychclassics.yorku.ca/Yerkes/Law/

27 Lehrer, P.M., Vaschillo, E., Vaschillo, B., Lu, S.-E., Eckberg, D.L., Edelberg, R., Shih, W.J., (...), Hamer, R.M.
Heart rate variability biofeedback increases baroreflex gain and peak expiratory flow
(2003) *Psychosomatic Medicine*, 65 (5), pp. 796-805. Cited 204 times.
doi: 10.1097/01.PSY.0000089200.81962.19
View at Publisher

28 Casden, D.R.
(2005) *The Effects of Asthanga Yoga on Autonomic, Respiratory, and Cognitive Functioning; Psychological Symptoms and Somatic Complaints: A Controlled Study.* Cited 2 times.
Dissertation, Alliant International University San Diego, [UMI Number 3164910].

29 Karavidas, M.K., Lehrer, P.M., Vaschillo, E., Vaschillo, B., Marin, H., Buyske, S., Malinovsky, I., (...), Hassett, A.
Preliminary results of an open label study of heart rate variability biofeedback for the treatment of major depression
(2007) *Applied Psychophysiology Biofeedback*, 32 (1), pp. 19-30. Cited 174 times.
doi: 10.1007/s10484-006-9029-z
View at Publisher

30 McCraty, R.
Influence of cardiac afferent input on heart-brain synchronization and cognitive performance
(2002) *Int J of Psy-chophysiol*, 45 (1-2), pp. 72-73. Cited 26 times.

31 Vernon, D.J.
Can neurofeedback training enhance performance? An evaluation of the evidence with implications for future research
(2005) *Applied Psychophysiology Biofeedback*, 30 (4), pp. 347-364. Cited 147 times.
doi: 10.1007/s10484-005-8421-4
View at Publisher

32 Vernon, D., Egner, T., Cooper, N., Compton, T., Neilands, C., Sheri, A., Gruzelier, J.
The effect of training distinct neurofeedback protocols on aspects of cognitive performance
(2003) *International Journal of Psychophysiology*, 47 (1), pp. 75-85. Cited 236 times.
doi: 10.1016/S0167-8760(02)00091-0
View at Publisher

33 Schwartz, N.M., Schwartz, M.S.
Definition of biofeedback and applied psychophysiology
(2003) *Biofeedback: A Practicioner's Guide*, pp. 27-42.
M.S. Schwartz and F. Andrasik F, eds, 3rd ed., The Guilford Press, New York

34 Shellenberger, R., Green, J.A.
(1986) *From the Ghost in the Box to Successful Biofeedback Training*. Cited 23 times.
Greeley, CO: Health Psychology Publication

35 Norris, P.A., Fahrion, S.L.
Autogenic biofeedback in psychophysiological therapy and stress management
(1993) *Principles and Practice of Stress Management*, pp. 231-262. Cited 9 times.
P.M. Lehrer, R.L. Woolfolk and W.E. Sime, eds, The Guilford Press, New York

36 Byrne, E.A., Parasuraman, R.
Psychophysiology and adaptive automation

(1996) *Biological Psychology*, 42 (3), pp. 249-268. Cited 219 times.
www.elsevier.com/locate/biopsycho
doi: 10.1016/0301-0511(95)05161-9

View at Publisher

37 Berntson, G.G., Thomas Bigger Jr., J., Eckberg, D.L., Grossman, P., Kaufmann, P.G., Malik, M., Nagaraja, H.N., (...), Van Der Molen, M.W.
Heart rate variability: Origins methods, and interpretive caveats (Open Access)

(1997) *Psychophysiology*, 34 (6), pp. 623-648. Cited 1899 times.
http://www.blackwellpublishing.com/aims.asp?ref=0048-5772
doi: 10.1111/j.1469-8986.1997.tb02140.x

View at Publisher

38 Malik, M., Camm, A.J., Bigger Jr., J.T., Breithardt, G., Cerutti, S., Cohen, R.J., Coumel, P., (...), Singer, D.H.
Heart rate variability. Standards of measurement, physiological interpretation, and clinical use (Open Access)

(1996) *European Heart Journal*, 17 (3), pp. 354-381. Cited 3960 times.
http://eurheartj.oxfordjournals.org/
doi: 10.1093/oxfordjournals.eurheartj.a014868

View at Publisher

39 Lehrer, P.M.
Biofeedback training to increase heart rate variability
(2007) *Principles and Practice of Stress Management*, pp. 227-248. Cited 58 times.
P.M. Lehrer, R.L. Woolfolk and W.E. Sime, eds, (3rd ed.), The Guilford Press, New York

40 Appelhans, B.M., Luecken, L.J.
Heart rate variability as an index of regulated emotional responding

(2006) *Review of General Psychology*, 10 (3), pp. 229-240. Cited 585 times.
doi: 10.1037/1089-2680.10.3.229

View at Publisher

41 Tiller, W.A., McCraty, R., Atkinson, M.
Cardiac coherence: A new, noninvasive measure of autonomic nervous system order

(1996) *Alternative Therapies in Health and Medicine*, 2 (1), pp. 52-65. Cited 124 times.

42 McCraty, R., Tomasino, D.
Heart Rhythm Coherence Feedback: A New Tool for Stress Reduction Rehabilitation and Performance Enhancement. Cited 2 times.
[2007-10-30]
http://www.heartmath.com/health/professional/hrv.biofeedback.pdf

43 Duschek, S., Muckenthaler, M., Werner, N., Reyes del Paso, G.A.
Relationships between features of autonomic cardiovascular control and cognitive performance

(2009) *Biological Psychology*, 81 (2), pp. 110-117. Cited 117 times.
doi: 10.1016/j.biopsycho.2009.03.003

View at Publisher

44 Aasman, J., Mulder, G., Mulder, L.J.M.
Operator effort and the measurement of heart-rate variability (Open Access)

(1987) *Human Factors*, 29 (2), pp. 161-170. Cited 172 times.
doi: 10.1177/001872088702900204

View at Publisher

45 Levy, M.N., Pappano, A.J.
(2007) *Cardiovasc Physiol*
Philadelphia: Mosby Elsevier

46 Barrios-Choplin, B., Mccraty, R., Cryer, B.
An inner quality approach to reducing stress and improving physical and emotional wellbeing at work

(1997) *Stress Medicine*, 13 (3), pp. 193-201. Cited 26 times.
doi: 10.1002/(SICI)1099-1700(199707)13:3<193::AID-SMI744>3.0.CO;2-I

View at Publisher

47 McCraty, R., Tomasino, D., Atkinson, M., Sundram, J.
Impact of the HeartMath Self-Management Skills Program on Physiological and Psychological Stress in Police Officers. Cited 11 times.
HeartMath Research Center Institute Of HeartMath. (1999: 075) [2009-11-29]
http://www.heartmath.org/templates/ihm/section_includes/research/ research-papers/police/police-study.pdf

48 McCraty, R., Atkinson, M., Lipsenthal, L., Arguelles, L.
Impact of the Power to Change Performance Program on Stress and Health Risks in Correctional Officers
HeartMath Research Center Institute Of HeartMath. (2003:014) [2009-11-23]
http://www.heartmath.org/templates/ihm/section_includes/research/ research-papers/CPOST.Report.pdf

49 Suvorov, N.
Psychophysiological training of operators in adaptive biofeedback cardiorhythm control

(2006) *Spanish Journal of Psychology*, 9 (2), pp. 193-200. Cited 7 times.
http://www.ucm.es/BUCM/revistasBUC/portal/modulos.php?name=Revistas2&id=SJOP
doi: 10.1017/S1138741600006090

View at Publisher

50 Vaschillo, E., Lehrer, P., Rishe, N., Konstantinov, M.
Heart rate variability biofeedback as a method for assessing baroreflex function: A preliminary study of resonance in the cardiovascular system

(2002) *Applied Psychophysiology Biofeedback*, 27 (1), pp. 1-27. Cited 107 times.
doi: 10.1023/A:1014587304314

View at Publisher

51 Lehrer, P.M., Vaschillo, E., Vaschillo, B.
Resonant frequency biofeedback training to increase cardiac variability: Rationale and manual for training

(2000) *Applied Psychophysiology Biofeedback*, 25 (3), pp. 177-191. Cited 212 times.
doi: 10.1023/A:1009554825745

View at Publisher

52 Moss, D.
Heart Rate Variability (HRV) Biofeedback Psychophysiol Today
(2004:1), [2007-11-25]
http://www.bfe.org/articles/issue1_final.pdf

53 Conrad, A., Müller, A., Doberenz, S., Kim, S., Meuret, A.E., Wollburg, E., Roth, W.T.
Psychophysiological effects of breathing instructions for stress management

(2007) *Applied Psychophysiology Biofeedback*, 32 (2), pp. 89-98. Cited 35 times.
doi: 10.1007/s10484-007-9034-x

View at Publisher

54 Karavidas, M.K., Lehrer, P.M., Vaschillo, E., Vaschillo, B., Marin, H., Buyske, S., Malinovsky, I., (...), Hassett, A.
Preliminary results of an open label study of heart rate variability biofeedback for the treatment of major depression

(2007) *Applied Psychophysiology Biofeedback*, 32 (1), pp. 19-30. Cited 174 times.
doi: 10.1007/s10484-006-9029-z

View at Publisher

55 Zucker, T.L., Samuelson, K.W., Muench, F., Greenberg, M.A., Gevirtz, R.N.
The effects of respiratory sinus arrhythmia biofeedback on heart rate variability and posttraumatic stress disorder symptoms: A pilot study

(2009) *Applied Psychophysiology Biofeedback*, 34 (2), pp. 135-143. Cited 159 times.
doi: 10.1007/s10484-009-9085-2

View at Publisher

56 Siepmann, M., Aykac, V., Unterdörfer, J., Petrowski, K., Mueck-Weymann, M.
A pilot study on the effects of heart rate variability biofeedback in patients with depression and in healthy subjects

(2008) *Applied Psychophysiology Biofeedback*, 33 (4), pp. 195-201. Cited 110 times.
doi: 10.1007/s10484-008-9064-z

View at Publisher

57 Strack, B.W.
(2003) *Effect of Heart Rate Variability (HRV) Biofeedback on Batting Performance in Baseball*. Cited 16 times.
Dissertation, Al-liant International University San Diego [UMI Number 3083450]

58 Lagos, L., Vaschillo, E.G., Vaschillo, B., Lehrer, P.M., Bates, M., Pandina, R.
Heart rate variability biofeedback as a strategy for dealing with competitive anxiety: A case study
(2008) *Biofeedback*, 36 (3), pp. 109-115. Cited 32 times.

59 Sutarto, A.P., Abdul Wahab, M.N.
The effect of HRV biofeedback for improving operators' cognitive performance
(2008) *Proceedings of Fifth International Cyberspace Conference on Ergonomics [CD-ROM]*
Sarawak, Malaysia

60 (2010) *Key Indicator of the Labour Market Malaysia, 2001-2009*. Cited 2 times.
Department of Statistic Malaysia Series 3 No. 1/2010

61 Di Martino, V., Musri, M.
(2001) *Guidance for the Prevention of Stress and Violence at the Workplace*. Cited 10 times.
Department of Occupational Safety and health Malaysia

62 van Dixhoorn, J., Duivenvoorden, H.J.
Efficacy of Nijmegen questionnaire in recognition of the hyperventilation syndrome
(1985) *Journal of Psychosomatic Research*, 29 (2), pp. 199-206. Cited 206 times.
doi: 10.1016/0022-3999(85)90042-X
View at Publisher

63 Wesnes, K., Simpson, P., Christmas, L.
The assessment of human information processing abilities in psychopharmacol-ogy
(1987) *Human Psychopharmacology: Measures and Methods, i*, pp. 79-91. Cited 52 times.
Hindmarch, PD. Stonier, eds, John Wiley & Sons, Chichester, UK

64 Hockey, R., Hamilton, P.
The cognitive patterning of stress states
(1993) *Stress and Fatigue in Human Performance*, pp. 331-362. Cited 125 times.
R. Hockey ed., John Wiley & Sons, Chichester, UK

65 Fafrowicz, M., Marek, T.
Attention, selection for action, error processing, and safety
(2008) *Ergonomics and Psychology: Developments in Theory and Practice*, pp. 203-218. Cited 3 times.
https://www.taylorfrancis.com/books/e/9781420067019
ISBN: 978-142006701-9; 1420067001; 978-142006700-2
View at Publisher

66 Brickenkamp, R., Zillmer, E.
(1998) *The d2 Test of Attention*. Cited 326 times.
Seattle: Hogrefe and Huber Publishers

67 Indra, M., Bohdanecký, Z.
A computerized modification of Sternberg memory test with additional perceptual distraction

(1994) *Computer Methods and Programs in Biomedicine*, 42 (3), pp. 207-212.
doi: 10.1016/0169-2607(94)90130-9

View at Publisher

68 Cañas, J.J., Quesada, J.F., Antolí, A., Fajardo, I.
Cognitive flexibility and adaptability to environmental changes in dynamic complex problem-solving tasks

(2003) *Ergonomics*, 46 (5), pp. 482-501. Cited 78 times.
doi: 10.1080/0014013031000061640

View at Publisher

69 Golden, C., Freshwater, S.M.
(2002) *Stroop Color and Word Test: A Manual for Clinical and Experimental Uses*. Cited 2351 times.
California: Stoelting Co

70 Sherlin, L., Gevirtz, R., Wyckoff, S., Muench, F.
Effects of Respiratory Sinus Arrhythmia Biofeedback Versus Passive Biofeedback Control

(2009) *International Journal of Stress Management*, 16 (3), pp. 233-248. Cited 23 times.
doi: 10.1037/a0016047

View at Publisher

71 Vaschillo, E.G., Vaschillo, B., Lehrer, P.M.
Characteristics of resonance in heart rate variability stimulated by biofeedback

(2006) *Applied Psychophysiology Biofeedback*, 31 (2), pp. 129-142. Cited 112 times.
doi: 10.1007/s10484-006-9009-3

View at Publisher

Sutarto, A.P.; Department of Industrial Engineering, University of Ahmad Dahlan, Jln Prof Dr. Soepomo, Indonesia; email:auditya_ps@yahoo.com

Back to results | 1 of 1

Top of page