

# Emotion regulation intervention to sustain physical activity in rural-dwelling women and men after myocardial infarctions

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**Aim/Purpose/Objective:** Among a sample of rural dwelling adults enrolled in cardiac rehabilitation after a first myocardial infarction (MI; n=24), the specific aims of this project were to:

Aim 1: Evaluate early preliminary efficacy of the eMotion intervention to improve moderate to vigorous physical activity (MVPA) and secondary outcomes of symptom improvement and health related quality of life.

Aim 2: Evaluate cognitive processes (emotion regulation efficiency and strategy use, perceived cardiac threat and general stress, cognition, attention, motivation, and activation) as intervention response variables.

Exploratory Aim. Examine relationships between emotion regulation, cognitive processes, and symptoms.

**Aim/Purpose/Objective Met:** Yes, partially.

Alterations in the study timeline and variables measured occurred. The changes were necessitated by COVID-19 restrictions and closure of recruitment sites.

**Sample:** Sample consisted of 40 participants who recently experienced a first time major cardiac event and experiencing symptoms of depression and/or anxiety. They were living independently, spoke English and were enrolled in a cardiac rehabilitation phase II program.

**Setting:** Participants were recruited from four cardiac rehabilitation programs in Indiana.

**Methodology:** Quantitative, Experimental, Physiological Data

This study is a three-arm randomized control trial testing eMotion against a health education intervention matched in dose and delivery and a usual care group.

**Results:** 40 participants (42% women, 89% White) were randomized to groups. Group satisfaction was high (100% in eMotion, 86% in health education). Study protocols were revised to accommodate remote screening, consent, and data collection. The study was expanded to include a three-group design and aims to determine long-term efficacy.

**Conclusions:** Study protocols are highly satisfactory and feasible with remote data collection and intervention delivery. Full analysis of study aims are pending completion of data collection.

**Implications:** This study provided a critical first step toward full scale efficacy testing providing evidence on feasibility and satisfaction of study protocols. If effective, eMotion may be a strong

contender for adaptation to other groups recovering from acute health crises that require emotional and physical self-management.

## References:

- Allabadi, H., Alkaiyat, A., Alkhayyat, A., Hammoudi, A., Odeh, H., Shtayeh, J., Taha, M., Schindler, C., Zemp, E., Haj-Yahia, S., & Probst-Hensch, N. (2019). Depression and anxiety symptoms in cardiac patients: a cross-sectional hospital-based study in a Palestinian population. *BMC Public Health*, 19(1), 232. <https://doi.org/10.1186/s12889-019-6561-3>
- Allegrante, J. P., Wells, M. T., & Peterson, J. C. (2019). Interventions to Support Behavioral Self-Management of Chronic Diseases. *Annual Review of Public Health*, 40(1), 127-146. <https://doi.org/10.1146/annurev-publhealth-040218-044008> PMID - 30601717
- Banankhah, S. K., Friedmann, E., & Thomas, S. (2015). Effective treatment of depression improves post-myocardial infarction survival. *World Journal of Cardiology*, 7(4), 215-223. <https://doi.org/10.4330/wjc.v7.i4.215>
- Bauer, L. K., Caro, M. A., Beach, S. R., Mastromauro, C. A., Lenihan, E., Januzzi, J. L., & Huffman, J. C. (2012). Effects of depression and anxiety improvement on adherence to medication and health behaviors in recently hospitalized cardiac patients. *The American Journal of Cardiology*, 109(9), 1266-1271. <https://doi.org/10.1016/j.amjcard.2011.12.017>
- Bennett, S. J., Puntteney, P. J., Walker, N. L., & Ashley, N. D. (1996). Development of an instrument to measure threat related to cardiac events. *Nursing Research*, 45(5), 266-270. <https://doi.org/10.1097/00006199-199609000-00003>
- Boerema, S. T., van Velsen, L., Schaake, L., Tonis, T. M., & Hermens, H. J. (2014). Optimal sensor placement for measuring physical activity with a 3D accelerometer. *Sensors (Basel)*, 14(2), 3188-3206. <https://doi.org/10.3390/s140203188>
- Chu, A. H. Y., Ng, S. H. X., Paknezhad, M., Gauterin, A., Koh, D., Brown, M. S., & Müller Riemenschneider, F. (2017). Comparison of wrist-worn Fitbit Flex and waist-worn ActiGraph for measuring steps in free-living adults. *PLoS ONE*, 12(2), e0172535. <https://doi.org/10.1371/journal.pone.0172535>
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385-396. <http://ezproxy.msu.edu/login?url=http://search.proquest.com/docview/616924949?accountid=12598>
- Collins, J. E., Yang, H. Y., Trentadue, T. P., Gong, Y., & Losina, E. (2019). Validation of the Fitbit Charge 2 compared to the ActiGraph GT3X+ in older adults with knee osteoarthritis in free-living conditions. *PLoS ONE*, 14(1), e0211231. <https://doi.org/10.1371/journal.pone.0211231>

- Dibben, G. O., Dalal, H. M., Taylor, R. S., Doherty, P., Tang, L. H., & Hillsdon, M. (2018). Cardiac rehabilitation and physical activity: systematic review and meta-analysis [10.1136/heartjnl-2017-312832]. *Heart*, 104(17), 1394. <http://heart.bmj.com/content/104/17/1394.abstract>
- Difrancesco S, L. F., Riese H, Merikangas KR, Beekman ATF, van Hemert AM, Schoevers RA, Penninx BWJH. (2019). Sleep, circadian rhythm, and physical activity patterns in depressive and anxiety disorders: A 2-week ambulatory assessment study. *Depression & Anxiety*, 36(10), 975-986. <https://doi.org/10.1002/da.22949>
- Etkin, A., Büchel, C., & Gross, J. J. (2015). The neural bases of emotion regulation. *Nature Reviews Neuroscience*, 16(11), 693-700. <https://doi.org/http://dx.doi.org/10.1038/nrn4044>
- Fleury, J. (1998). The index of self-regulation: development and psychometric analysis. *Journal of Nursing Measurement*, 6(1), 3-17.
- Freedson, P. S., Melanson, E., & Sirard, J. (1998). Calibration of the Computer Science and Applications, Inc. accelerometer. *Med Sci Sports Exerc*, 30(5), 777-781. <https://www.ncbi.nlm.nih.gov/pubmed/9588623>
- Fresco, D. M., Roy, A. K., Adelsberg, S., Seeley, S., García-Lesy, E., Liston, C., & Mennin, D. S. (2017). Distinct Functional Connectivities Predict Clinical Response with Emotion Regulation Therapy [Clinical Trial]. *Frontiers in Human Neuroscience*, 11(86). <https://doi.org/10.3389/fnhum.2017.00086>
- Gallaway, P., Miyake, H., Buchowski, M., Shimada, M., Yoshitake, Y., Kim, A., & Hongu, N. (2017). Physical Activity: A Viable Way to Reduce the Risks of Mild Cognitive Impairment, Alzheimer's Disease, and Vascular Dementia in Older Adults. *Brain Sciences*, 7(2), 22. <http://www.mdpi.com/2076-3425/7/2/22>
- Gjeilo, K. H., Stenseth, R., Wahba, A., Lydersen, S., & Klepstad, P. (2007). Validation of the Brief Pain Inventory in Patients Six Months After Cardiac Surgery. *Journal of Pain and Symptom Management*, 34(6), 648-656. <https://doi.org/10.1016/j.jpainsymman.2007.01.010>
- Gross, J. J. (Ed.). (2015). *Handbook of Emotion Regulation* (Second ed.). The Guilford Press.
- Gu, G., Zhou, Y., Zhang, Y., & Cui, W. (2016). Increased prevalence of anxiety and depression symptoms in patients with coronary artery disease before and after percutaneous coronary intervention treatment. *BMC Psychiatry*, 16(1), 259. <https://doi.org/10.1186/s12888-016-0972-9>

- Henry, J. D., & Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British Journal of Clinical Psychology*, 44(2), 227-239. <https://doi.org/10.1348/014466505X29657>
- Jaarsma, T., Lesman-Leegte, I., Hillege, H. L., Veeger, N. J., Sanderman, R., & van Veldhuisen, D. J. (2010). Depression and the usefulness of a disease management program in heart failure: insights from the COACH (Coordinating study evaluating Outcomes of Advising and Counseling in Heart failure) study. *Journal of the American College of Cardiology*, 55(17), 1837-1843. <https://doi.org/10.1016/j.jacc.2009.11.082>
- Klumpp, H., Roberts, J., Kennedy, A. E., Shankman, S. A., Langenecker, S. A., Gross, J. J., & Phan, K. L. (2017). Emotion regulation related neural predictors of cognitive behavioral therapy response in social anxiety disorder. *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 75, 106-112. <https://doi.org/10.1016/j.pnpbp.2017.01.010>
- Krupp, L. B., LaRocca, N. G., Muir-Nash, J., & Steinberg, A. D. (1989). The fatigue severity scale. Application to patients with multiple sclerosis and systemic lupus erythematosus. *Archives of Neurology*, 46(10), 1121-1123. <https://doi.org/10.1001/archneur.1989.00520460115022>
- Lahtinen, M., Toukola, T., Junttila, M. J., Piira, O.-P., Lepojärvi, S., Kääriäinen, M., Huikuri, H. V., Tulppo, M. P., & Kiviniemi, A. M. (2018). Effect of Changes in Physical Activity on Risk for Cardiac Death in Patients With Coronary Artery Disease. *The American Journal of Cardiology*, 121(2), 143-148. <https://doi.org/https://doi.org/10.1016/j.amjcard.2017.10.002>
- Lovibond, S. H., & Lovibond, P. F. (1995). *Manual for the depression anxiety stress scales* (2<sup>nd</sup> ed.). Psychology Foundation of Australia.
- Luyster, F. S., Hughes, J. W., & Gunstad, J. (2009). Depression and anxiety symptoms are associated with reduced dietary adherence in heart failure patients treated with an implantable cardioverter defibrillator. *Journal of Cardiovascular Nursing*, 24(1), 10-17. <https://doi.org/10.1097/01.jcn.0000317469.63886.24>
- May, H. T., Horne, B. D., Knight, S., Knowlton, K. U., Bair, T. L., Lappé, D. L., Le, V. T., & Muhlestein, J. B. (2017). The association of depression at any time to the risk of death following coronary artery disease diagnosis. *European Heart Journal - Quality of Care and Clinical Outcomes*, 3(4), 296-302. <https://doi.org/10.1093/ehjqcco/qcx017>
- Moran, T. P., Jendrusina, A. A., & Moser, J. S. (2013). The psychometric properties of the late positive potential during emotion processing and regulation. *Brain Research*, 1516, 66-75. <https://doi.org/https://doi.org/10.1016/j.brainres.2013.04.018>

- Nelis, D., Quoidbach, J., Hansenne, M., & Mikolajczak, M. (2011). Measuring Individual Differences in Emotion Regulation: The Emotion Regulation Profile-Revised (ERP-R). *Psychologica Belgica*, 51(1), 49-91. <https://doi.org/http://doi.org/10.5334/pb-51-1-49>
- Olafiranye, O., Jean-Louis, G., Zizi, F., Nunes, J., & Vincent, M. T. (2011). Anxiety and cardiovascular risk: Review of epidemiological and clinical evidence. *Mind & Brain*, 2(1), 32-37.
- Quante, M., Kaplan, E. R., Cailler, M., Rueschman, M., Wang, R., Weng, J., Taveras, E. M., & Redline, S. (2018). Actigraphy-based sleep estimation in adolescents and adults: a comparison with polysomnography using two scoring algorithms. *Nat Sci Sleep*, 10, 13-20. <https://doi.org/10.2147/NSS.S151085>
- Roshanaei-Moghaddam, B., Katon, W. J., & Russo, J. (2009). The longitudinal effects of depression on physical activity. *Gen Hosp Psychiatry*, 31(4), 306-315. <https://doi.org/10.1016/j.genhosppsy.2009.04.002>
- Ryan, P., & Sawin, K. J. (2009). The Individual and Family Self-Management Theory: background and perspectives on context, process, and outcomes. *Nurs Outlook*, 57(4), 217-225.e216. <https://doi.org/10.1016/j.outlook.2008.10.004>
- Song, E. K. (2009). Adherence to the low-sodium diet plays a role in the interaction between depressive symptoms and prognosis in patients with heart failure. *Journal of Cardiovascular Nursing*, 24(4), 299-307. <http://ezproxy.msu.edu:2047/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2010340804&site=ehost-live&scope=site>  
Publisher URL: [www.cinahl.com/cgi-bin/refsvc?jid=455&accno=2010340804](http://www.cinahl.com/cgi-bin/refsvc?jid=455&accno=2010340804)
- Spertus, J. A., Winder, J. A., Dewhurst, T. A., Deyo, R. A., Prodzinski, J., McDonell, M., & Fihn, S. D. (1995). Development and evaluation of the Seattle Angina Questionnaire: a new functional status measure for coronary artery disease. *Journal of the American College of Cardiology*, 25(2), 333-341. [https://doi.org/10.1016/0735-1097\(94\)00397-9](https://doi.org/10.1016/0735-1097(94)00397-9)
- Strain, T., Wijndaele, K., Dempsey, P. C., Sharp, S. J., Pearce, M., Jeon, J., Lindsay, T., Wareham, N., & Brage, S. (2020). Wearable-device-measured physical activity and future health risk. *Nat Med*, 26(9), 1385-1391. <https://doi.org/10.1038/s41591-020-1012-3>
- Troiano, R. P. (2007). Large-scale applications of accelerometers: new frontiers and new questions. *Medicine & Science in Sports & Exercise*, 39(9), 1501. <https://doi.org/10.1097/mss.0b013e318150d42e>

- Van Remoortel, H., Giavedoni, S., Raste, Y., Burtin, C., Louvaris, Z., Gimeno-Santos, E., Langer, D., Glendenning, A., Hopkinson, N. S., Vogiatzis, I., Peterson, B. T., Wilson, F., Mann, B., Rabinovich, R., Puhan, M. A., Troosters, T., & consortium, P. R. (2012). Validity of activity monitors in health and chronic disease: a systematic review. *Int J Behav Nutr Phys Act*, 9, 84. <https://doi.org/10.1186/1479-5868-9-84>
- Wierenga, K. L., Moore, S. M., Liu, J., & Sattar, A. (2019). Factors Influencing the Impact of Depressive Symptoms on Physical Functional Capacity After Cardiac Rehabilitation. *Rehabilitation Nursing*. <https://doi.org/10.1097/rnj.0000000000000227>
- Wu, J., Frazier, S. K., Rayens, M. K., Lennie, T. A., Chung, M. L., & Moser, D. K. (2013). Medication adherence, social support, and event-free survival in patients with heart failure. *Health Psychology*, 32(6), 637-646. <https://doi.org/10.1037/a0028527>
- Yeom, H. A., Choi, M., Belyea, M., & Fleury, J. (2011). Psychometric evaluation of the index of self-regulation. *Western Journal of Nursing Research*, 33(2), 268-285. <https://doi.org/10.1177/0193945910378854>