Experiential Avoidance Predicts Positive Mood in Cardiopulmonary Rehab Patients

Jordan M. Ellis, MA, Capt, USAF, BSC;

Emily P. Midgette, BS; Alex J. Capiaghi, BS; Alexander M. Schoemann, PhD; & Matthew C. Whited, PhD

East Carolina University – Department of Psychology

Disclaimers/Disclosures

- The views expressed are those of the presenter and do not reflect the official views or policy of the Department of Defense or its Components.

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Cardiopulmonary Rehabilitation

- Cardiac Rehab improves CVD mortality and risk of hospitalization
- Pulmonary Rehab improves survival rate in some studies
- Positively impact exercise capacity and HR-QOL
- Dose of CVPR is important
  - ~36 session is the common recommendation
- Rates of attendance and completion are alarmingly low

(Anderson et al., 2016; Griffiths, et al., 2000; Hammill et al., 2010)

Depression as a Barrier to CVPR

- CVPR participation and completion are associated with improved mental health
- Higher levels of depression have been consistently linked with CVPR non-completion
- Half of non-completers have been shown to drop out within the first month
- Half of non-completers who discontinue in the first two weeks exhibit high depression scores

(Casey et al., 2008; Edwards & Sydeman, 2019; Keating, Lee, & Holland, 2011)

Experiential Avoidance

- EA may be an important mechanism related to suboptimal participation in CVPR, and CVPR may be an ideal setting to target problematic avoidance behavior
- Few studies have examined the actual momentary process by which EA strategies interact with negative mood states

Ecological Momentary Assessment

- Mobile apps provide an ideal platform for administering EMA self-report questions
- Addresses challenges related to retrospective measurement
- EMA studies have shown that EA and negative mood and stress share bidirectional relationships in college students

Study Purpose and Aims

Utilize mobile EMA to examine the dynamic relationships between negative mood, positive mood, stress, and experiential avoidance in CVPR patients

1) Assess the feasibility of mobile EMA in CVPR
2) Examine the within-person correlates, antecedents, and consequences of EA

Participants

- Recruited from Vidant Health's CVPR program (*n* = 47)
- Mean age was 62.91(*SD* = 11.36)
- Most participants were male (59.6%), Caucasian (80.1%), and enrolled in the cardiac program (85.1%)
- Average attendance was 77.5% across three weeks

Measures and Procedures

Baseline Assessment:
PHQ-9/CES-D
PSQI

1. Morning EMA Assessment
Sleep Quality Questions (6 items)

2. Afternoon EMA Assessment:
Negative Mood (6 items)
Positive Mood (2 items)
EA (5 items)
Stress (1 item)
Fatigue (1 item)

3. Evening EMA Assessment:
Negative Mood (6 items)
Positive Mood (2 items)
EA (5 items)
Stress (1 item)

14 Days of Prompts

CVPR Outcomes:
Completion Rates
Δ 6MWT
Δ BMI

Measures and Procedures

Depression Screening Limitations

- Issues with transition from CES-D to PHQ-9
- Dichotomous variable was created for participants who screened positive on PHQ-9 or CES-D (*n* = 30)
- Problems with MLM model convergence when used as moderator
- **Participants who screened positive for depression were significantly more likely to be CVPR non-completers** (80%), compared to those who did not screen positive for depression (14.2%), χ^2 (1) = 10.30, *p* = .001, φ = -.60.

Aim 1 - Feasibility

- Average number of completed EMA surveys
- Average time that participants spend on EMA surveys
- Average time it takes participants to begin a survey after receiving prompt

Results – Aim 1

- Participants completed an average of **22.13 out of 28** (78.68%; *SD* = 5.70; range = 9-28) EMA surveys
- The average time it took participants to begin a survey after receiving an alert was **34.22** minutes (*SD* = 45.24)
- The average amount of time participants spent on EMA surveys was **106.13** seconds (*SD* = 130.15, *n* = 27)

Aim 2 – Multilevel Modeling

To examine the within-person correlates, antecedents, and consequences of experiential avoidance.

Hypotheses:

- Negative internal experiences will be positively associated with EA
- Negative internal experiences will predict subsequent increases in EA
- EA will predict subsequent increases in negative internal experiences
- Opposite relationships will be observed with positive mood

Results – Aim 2

Table 1
Within-person, Within-prompt Correlates of Experiential Avoidance (n = 47)

	b	SE	*p* value	95% CI
Negative Mood	.354	.026	<.001	.303, .405
Weekday vs. Weekend	.013	.031	.683	-.048, 0.73
Positive Mood	-.258	.052	<.001	-.360, -.155
Weekday vs. Weekend	-.019	.056	.730	-.128, .090
Subjective Stress	.425	.053	<.001	.320, .529
Weekday vs. Weekend	-.004	.059	.942	-.120, .111

Note. Weekday vs. Weekend is coded as 0 = weekday, 1 = weekend. Significant at the p <.05 level.

Results – Aim 2

Table 2

Fixed Effect Next-day Lagged Models (n = 47)

	b	SE	*p* value	95% CI	-2 log likelihood
EA predicting Negative Mood	.052	.034	.122	-.014, .119	159.08
Negative Mood predicting EA	.062	.042	.135	-.020, .144	286.26
EA predicting Positive Mood	-.194	.070	.006	-.331, -.056	798.35
Positive Mood predicting EA	-.043	.026	.099	-.094, .008	285.84
EA predicting Stress	.149	.072	.037	.009, .290	853.64
Stress predicting EA	-.019	.022	.379	-.063, .024	287.67

Note. Scores for each variable were aggregated across the afternoon and evening prompt. Scores were group mean centered. Significant at the $p < .05$ level.

Results – Aim 2

Table 3

Random Effect Next-day Lagged Models (n = 47)

	coefficient	SE	*p*	-2 log likelihood
EA predicting Negative Mood				145.57
b	.020	.046	.666	
τ	.025	.013	<.001	
Negative Mood predicting EA				285.11
b	.035	.052	.507	
τ	.007	.009	.284	
EA predicting Positive Mood				798.19
b	-.212	.088	.077	
τ	.065	.153	.689	
Positive Mood predicting EA				262.21
b	-.039	.013	.746	
τ	.047	.018	<.001	
EA predicting Stress				836.65
b	.049	.130	.712	
τ	.350	.178	<.001	
Stress predicting EA				285.02
b	-.039	.028	.190	
τ	.008	.007	.104	

Note. Scores were group mean centered. Significance of random effects were determined based on -2 log likelihood ratio compared to the fixed effect model.

Results – Aim 2

Table 4

Fixed Effect Next-day Lagged Models Predicting Change in Outcome (n = 47)

	b	SE	*p* value	95% CI	-2 log likelihood
EA predicting ΔNegative Mood	-.002	.036	.538	-.094, .048	138.88
Negative Mood Previous Day	.199	.039	<.001	.122, .277	
Negative Mood predicting ΔEA	-.007	.046	.875	-.098, .083	273.63
EA Previous Day	.163	.044	<.001	.078, .250	
EA predicting ΔPositive Mood	-.182	.071	.011	-.322, -.042	797.61
Positive Mood Previous Day	.040	.044	.365	-.047, .126	
Positive Mood predicting ΔEA	-.027	.026	.457	-.017, .037	272.63
EA Previous Day	.154	.040	<.001	.076, .232	
EA predicting ΔStress	.126	.075	.094	-.021, .273	852.38
Stress Previous Day	.046	.039	.241	-.031, .122	
Stress predicting ΔEA	-.043	.023	.062	-.088, .002	270.49
EA Previous Day	.177	.041	<.001	.098, .275	

Note. Table shows lagged multi-level models predicting change in next day scores. Change in outcome was predicted by controlling for previous day scores (*j*-1) Scores for each variable were aggregated across the afternoon and evening prompt. Scores were group mean centered. Significant at the $p < .05$ level. Δ = Change in variable.

Results – Aim 2

Table 5

Random Effect Next-day Lagged Models Predicting Change in Outcome (n = 47)

	coefficient	SE	*p*	-2 log likelihood
EA predicting Δ Negative Mood				138.22
b	-.023	.012	.264	
τ	.009	.012	.417	
Negative Mood predicting Δ EA				273.57
b	-.014	.049	.458	
τ	.001	.007	.806	
EA predicting Δ Positive Mood				797.61
b	-.182	.071	.011	
τ	.000	-	.999	
Positive Mood predicting Δ EA				255.22
b	-.021	.044	.633	
τ	.039	.016	<.001	
EA predicting Δ Stress				836.58
b	.053	.133	.692	
τ	.361	.185	<.001	
Stress predicting Δ EA				270.48
b	-.046	.024	.124	
τ	<.001	.008	.920	

Note. Change in outcome was predicted by controlling for previous day scores (*j*-1). Significance of random effects were determined based on -2 log likelihood ratio compared to the fixed effect models.

Summary – Aim 2

- EA is associated with negative mood, positive mood, and stress within-person, within-response
- EA predicts next-day positive mood and change in positive mood; does not significantly vary across individuals
- EA predicts next-day stress, but this relationship is significantly variable across individuals
- Positive mood predicting next-day EA and change in EA is significantly variable across individuals

Conclusions

- Mobile EMA is a feasible data collection method for CVPR
- Fixed effects of EA on change in positive mood

Limitations

- Disease state heterogeneity
- Measurement of Stress
- Problems with depression assessment
- Timing of assessments and lag

Implications

- Psychosocial interventions in routine care
- Pay attention to positive mood
- Testing of interventions that target EA
- Build upon existing stress management programming
  - Acceptance-based strategies
  - “Stress-is-enhancing” interventions
- Further use of mobile EMA in CVPR

(Blumenthal et al., 2017; Davidson et al., 2010; Goodwin et al., 2012; Hoen et al., 2013 ; Jamieson, Nock, & Mendes, 2012; Jamieson et al., 2018)

References

Anderson, L., Oldridge, N., Thompson, D. R., Zwisler, A.-D., Rees, K., Martin, N., & Taylor, R. S. (2016). Exercise-based cardiac rehabilitation for coronary heart disease: Cochrane Systematic Review and meta-analysis. Journal of the American College of Cardiology, 67, 1–12.

Blumenthal, J. A., Sherwood, A., Smith, P. J., Watkins, L., Mabe, S., Kraus, W. E., … Hinderliter, A. (2016). Enhancing Cardiac Rehabilitation With Stress Management Training: A Randomized Clinical Efficacy Trial. Circulation, 133(14), 1341–1350.

Casey, E., Hughes, J. W., Waechter, D., Josephson, R., & Rosneck, J. (2008). Depression predicts failure to complete phase-II cardiac rehabilitation. *Journal of Behavioral Medicine, 31*, 421–431.

Davidson, K. W., Mostofsky, E., & Whang, W. (2010). Don't worry, be happy: positive affect and reduced 10-year incident coronary heart disease: the Canadian Nova Scotia Health Survey. *European Heart Journal, 31*, 1065–1070.

Edwards, B. L., & Sydeman, S. J. (2019). Depression Is Associated With Reduced Outpatient Cardiac Rehabilitation Completion Rates: A SYSTEMATIC LITERATURE REVIEW AND META-ANALYSIS. Journal of Cardiopulmonary Rehabilitation and Prevention.

Goodwin, C. L., Forman, E. M., Herbert, J. D., Butryn, M. L., & Ledley, G. S. (2012). A pilot study examining the initial effectiveness of a brief acceptance-based behavior therapy for modifying diet and physical activity among cardiac patients.

Griffiths, T. L., Burr, M. L., Campbell, I. A., Lewis-Jenkins, V., Mullins, J., Shiels, K., … Lonescu, A. A. (2000). Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial. *Lancet, 355*, 362–368.

Hammill, B. G., Curtis, L. H., Schulman, K. A., & Whellan, D. J. (2010). Relationship between cardiac rehabilitation and long-term risks of death and myocardial infarction among elderly Medicare beneficiaries. *Circulation, 121*, 63–70.

Hoen, P. W., Denollet, J., de Jonge, P., & Whooley, M. A. (2013). Positive affect and survival in patients with stable coronary heart disease: findings from the Heart and Soul Study. *The Journal of Clinical Psychiatry, 74*, 716–722.

Jamieson, J. P., Crum, A. J., Goyer, J. P., Marotta, M. E., & Akinola, M. (2018). Optimizing stress responses with reappraisal and mindset interventions: An integrated model. Anxiety, Stress, & Coping, 31(3), 245–261.

Jamieson, J. P., Nock, M. K., & Mendes, W. B. (2012). Mind over Matter: Reappraising Arousal Improves Cardiovascular and Cognitive Responses to Stress. Journal of Experimental Psychology. General, 141(3), 417–422.

Keating, A., Lee, A., & Holland, A. E. (2011). What prevents people with chronic obstructive pulmonary disease from attending pulmonary rehabilitation? A systematic review. *Chronic Respiratory Disease, 8*, 89–99.

Questions???

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ellisjo15@students.ecu.edu