

Sanjuan, P., Magallares, A., Arranz, H. y Castro, A. (2023). A longitudinal study on coping and emotional well-being in cardiac patients. *Psychology, Health, & Medicine*, 28, 1916-1923. *JCR: 3.8 (Public, Environmental, & Occupational Health: 58/120, Q2)*. doi: 10.1080/13548506.2022.2163672

A longitudinal study on coping and emotional well-being in cardiac patients

Abstract

Emotions and coping play a role in the prognosis of cardiac patients. This two-wave longitudinal study aims to analyze the ability of adaptive and maladaptive coping to predict the emotional well-being of cardiac patients after controlling for their functional physical capacity. Emotional well-being (positive and negative affect), coping strategies, and functional physical capacity were evaluated both at Time 1 (n = 253) and at Time 2 (n = 186), 8 weeks later. At Time 1, positive affect was positively predicted by adaptive coping and negatively predicted by maladaptive coping, while the opposite pattern was found when negative affect was considered. At Time 2, after controlling for sociodemographic variables and for negative affect and functional physical capacity at T1, negative affect was negatively predicted by adaptive coping and positively predicted by maladaptive coping. In addition, positive affect was only predicted by adaptive coping after controlling for functional physical capacity and positive affect at Time 1. Relationships between coping and emotional well-being remain after controlling for the functional physical capacity of cardiac patients, which has a big impact on their emotional state. Finally, it is suggested that specific modules to improve coping and emotional state of cardiac patients should be included in Cardiac Rehabilitation Programs.

Key words: adaptive coping; cardiac patients; emotional well-being; maladaptive coping; negative affect; positive affect

Introduction

Coronary heart diseases (CHD) are one of the main causes of premature incapacity and death worldwide (Roth et al., 2020). In addition to traditional risk factors, such as tobacco addiction, hypertension, high cholesterol levels or obesity, studies on negative emotions have shown that these also play a role in the onset of CHD (for a meta-analysis, see Chida & Steptoe, 2009).

The vital threat that the cardiac event implies, and the deterioration of functional physical capacity (FPC), lead patients to develop negative emotions that have a harmful role in their prognosis (Meyer et al., 2019). Conversely, positive emotions seem to have a protective role for cardiovascular health (Feigal et al., 2017). Thus, people who report experiencing more positive emotions exhibit lower rates of stroke and myocardial infarction (Davidson et al., 2010). Moreover, positive emotions have been associated with greater longevity among patients with CHD (Gan, 2020).

Studies conducted with cardiac patients (CP) also show that the way people face situations is an important determinant of their emotional state. Although researchers differ on how they categorize the various forms of coping (for a review, see Skinner et al., 2003), it is common to distinguish between adaptive coping (AC: **which includes coping strategies such as active coping, planning, positive reframing, acceptance, humor, instrumental social support, and self-distraction**) and maladaptive coping (MC: **including strategies as religion, emotional social support, denial, venting, substance use, behavioral disengagement, and self-blame**), where the former strategies reduce stress and enhance well-being, and the latter strategies contribute towards physical **deterioration** and / or psychological distress (Falvo & Holland, 2018).

In relation to CP, psychological distress has been negatively related **to the use of some AC strategies as active coping and positive reframing**, and positively associated with **MC strategies as avoidance** (Blumenthal et al., 2019). Recent research has also shown that the use of **some AC strategies as active coping** is associated with a better prognosis of the disease among CP (Svensson et al., 2016). Thus, progression of chronic stable angina to acute coronary syndrome is inversely related with **the use of some AC strategies as active coping and positive reframing** (Roohafza et al., 2012). Moreover, in CP, the use of **MC strategies as avoidance** immediately after the occurrence of the cardiac event was the only significant predictor of disease severity three months later (Chiavarino et al., 2012).

In these studies, mentioned above, active coping, positive reframing and avoidance strategies have been frequently evaluated, while other strategies (e.g., self-distraction, instrumental and emotional social support) have never been considered. For this reason, in our work, we decided to analyze all the coping strategies related to AC and MC. In addition, as the emotional state of CP is largely determined by their FPC, controlling its effect is necessary in any study that seeks to analyze the factors that affect their emotional well-being (Smorti et al., 2014).

That is why we decided to analyze in this longitudinal study the ability of AC and MC to predict positive and negative affect (as a measure of emotional well-being) of patients who have recently suffered a first cardiac episode, after controlling for their FPC. According to the evidence presented, we hypothesized that, after controlling for FPC, positive affect would be positively predicted by AC strategies and negatively predicted by MC strategies. The opposite pattern of predictions was hypothesized for negative affect.

Method

Participants and procedure

Patients were recruited in the Cardiac Rehabilitation Unit of the [masked for blind review] Hospital on the day they started a Cardiac Rehabilitation Program (CRP) designed to improve their FPC. Of the 290 CP who came to the Unit and had suffered a first cardiac episode, 255 patients voluntarily chose to participate. The inclusion criteria were having suffered a first acute cardiac episode, starting a CRP (which began only after physicians indicated that exercise would not pose a risk to patients), and agreeing to participate in the study. The exclusion criteria were having a history of psychotic symptoms, suffering cognitive impairment, or having other serious chronic diseases (e.g., diabetes, cancer, or rheumatoid arthritis). When patients came to the Unit, one of the authors interviewed them to collect sociodemographic data and to rule out psychiatric disorders and cognitive impairment. Patients with other serious chronic diseases were excluded before referral to the CRP from the Cardiology Unit. The hospital's bioethics committee approved the protocol (Hulp Code PI-1273), and a voluntary written informed consent was obtained from each participant.

The CRP lasted 8 weeks, and during Week 1 [Time 1 (T1)] and Week 8 [Time 2 (T2)], the variables of interest were measured. The CRP consisted of physical exercise and relaxation as well as information on healthy lifestyles, focusing on diet, exercise habits, medication, and stress management. In each of the six weeks (from the 2nd to the 7th) of the CRP, four sessions (each lasting an hour) were held in a group format with seven to 10 participants. Two sessions were devoted to physical exercise, one to the practice of relaxation, and one to healthy lifestyles. Of the 255 patients, 2 were excluded for having a previous psychiatric history. Therefore, at T1, the sample was finally composed of 253 patients. At T2, 186 patients made the final assessment (see Table 1, for sample characteristics at T1 and T2).

INSERT TABLE 1

Measures

To measure emotional well-being, the *Positive and Negative Affect Schedule* (PANAS; Watson et al., 1988) was used. This is a 20-item instrument that assesses positive affect (10 items) and negative affect (10 items). The response scale was a 7-point Likert-type. Participants were asked to report how they had felt in the previous week. Subscale scores were calculated by averaging the scores given to each of the items of the subscales. The highest score on the subscale

indicates greater experience of positive or negative emotions. In this sample, at T1, *alpha* coefficients were .89 for positive affect and .87 for negative affect, and at T2, they were .90 for both positive and negative affect.

To measure AC and MC, the *Brief COPE-Short Form* (Eisenberg et al., 2012) was used. This questionnaire has 14 items, one for each of the coping strategies that it evaluates. Participants responded with a 7- point Likert type scale where “0” is “nothing at all” and “6” equals “totally” according to the degree to which they employ each one of the strategies set out in the items. AC included the items that assess active coping, planning, positive reframing, acceptance, humor, instrumental social support, and self-distraction, while MC included the items that assess religion, emotional social support, denial, venting, substance use, behavioral disengagement, and self-blame. Higher scores indicated greater use of each type of coping category. In our sample, at T1, *alpha* coefficients were .85 for AC and .73 for MC, and at T2, *alpha* coefficients were .90 for AC and .75 for MC.

FPC was assessed through cardiac stress tests on a treadmill. The unit to measure this capacity is the standard metabolic equivalent (MET). One MET is equivalent to the energy (oxygen) used by the body at rest, while sitting quietly or reading a book, for example. Through the cardiac stress test, the maximum number of METs reached by a patient is recorded, allowing the prediction of the activities the patient may successfully carry out. Participation in CRP has been associated with significant increases in METs (McKee et al., 2013).

Statistical analysis

To study the possible associations that clinical (time since diagnosis and METs), and socio-demographic (age, sex, educational level, occupational status, and coexistence type) variables had with emotional well-being (positive and negative affect), Pearson correlations between all these variables were calculated.

To evaluate possible changes in the variables of interest between T1 and T2, one-way repeated measures analyses of variance (ANOVA) (T1 vs. T2) were conducted with METs, AC and MC, and positive and negative affect, as dependent variables.

To analyze the ability of the coping categories to predict the emotional state of patients, different regression analyses, both at T1 and T2 and with positive and negative affect as criterion variables, were conducted. AC and MC were always introduced as predictor variables. Significant sociodemographic and clinical variables were also introduced as predictor variables, in order to control for their effects. Additionally, at T2, and to control for its effect, the corresponding affect at T1 was also introduced as a predictor variable.

Results

Regarding Pearson correlations, at T2, positive affect was significantly associated with MET-T1 ($r=.24, p<.01$). Negative affect was also significantly correlated at T2 with MET-T1 ($r=-.16, p<.05$), sex ($r=.18, p<.05$) and coexistence type ($r=-.19, p<.05$). These correlations imply

that the more METs that were reached, more positive affect and less negative affect were reported, and that men and those who did not live alone reported less negative affect. According to these correlations, the sociodemographic and clinical variables that maintained significant correlations with emotional well-being were included in the following analyses to control for their effect.

Results of the ANOVA showed that METs, after controlling for age and sex, increased significantly from T1 ($M = 7.78$, $SD = 2.61$) to T2 ($M = 10.83$, $SD = 2.54$) [$F(1,185) = 6.11$, $p < .01$, $\eta^2_p = .04$]. Moreover, negative affect, after controlling for sex, coexistence type and METs at T1, decreased significantly from T1 ($M = 1.89$, $SD = 0.85$) to T2 ($M = 1.73$, $SD = 0.89$) [$F(1,185) = 6.21$, $p < .01$, $\eta^2_p = .04$]. Other variables analyzed (AC, MC, and positive affect) showed no differences from T1 to T2 (all $ps > .23$).

Regarding the regressions conducted, as it can be observed in Table 2, at T1, AC and MC taken together remained as significant predictors of positive and negative affect. At T2, after controlling for clinical (METs) and sociodemographic (sex and coexistence type) variables, and the corresponding affect at T1, AC and MC taken together remained as significant predictors of negative affect. As it can be seen in Table 3, positive affect was only predicted by AC after controlling for METs and positive affect at T1.

INSERT TABLE 2

INSERT TABLE 3

Discussion

The main result of the present study is that AC and MC were significant predictors of emotional well-being. Specifically, at T1, positive affect was positively predicted by AC and negatively predicted by MC, while the opposite pattern was found when negative affect was considered. Of greater interest are the results at T2, since after controlling for relevant sociodemographic variables (such as sex and coexistence type) and for negative affect and FPC at T1, negative affect was negatively predicted by AC and positively predicted by MC. Positive affect was only predicted by AC after controlling for FPC and positive affect at T1. That is, our study shows that the relationship between coping and emotion remains after controlling for FPC of patients. This result implies that the use of appropriate coping strategies can prevent the development of negative emotions arising from physical impairment, as well as promoting positive emotions, which together can help improve the prognosis of patients. Therefore, we believe that CRPs, in addition to promoting physical exercise, should include specific modules to improve the way of coping/dealing with situations and to promote positive emotions. **In this regard, there is evidence that shows that most of the AC strategies may be learned (Blumenthal et al., 2019), and that positive interventions might be effective in the enhancement of emotional well-being (Roth et al., 2017).**

Studying broad coping categories (both AC and MC) has allowed us to test the relevance of some strategies for emotional well-being, some unstudied in CP, and to clarify certain coping

conceptions. In this sense, we have confirmed that self-distraction strategies are adaptive when they are used together with active coping (Shimazu & Schaufeli, 2007). It is necessary to note that the use of self-distraction promotes a proper fit when the stressful situation is long lasting, as in the case of dealing with a chronic disease. However, the use of self-distraction could be long-term associated with emotional distress when the situation requires swift action, or it is used exclusively or predominantly.

Instrumental and emotional social support are usually grouped in the same coping category, but our results corroborate the convenience of including them in different categories, since the former is associated with positive affect while the latter is associated with negative affect. Indeed, we believe that these results make sense given that the seeking for instrumental social support is aimed to solve a problem, while the seeking for emotional social support may consist in the mere alleviation of negative emotions (Litman & Lunsford, 2009).

The CRP was successful, as patients increased their functional capacity from Time 1 to Time 2, as other studies had previously found (McKee et al., 2013). Coping and positive affect did not change during this period, which was as expected, as the program does not include activities for such purposes. However, patients reported less negative affect after finishing the program, possibly as a result of the improvement of their FPC.

We believe that it is important to remark that the time span from hospitalization (or disease onset) to the beginning of the CRP was a variable that we decided to measure because of its relevance, but which did not show any relationship with the variables of interest in our study. Although all participants had suffered a first cardiac event, this does not imply that all of them have been ill for the same time (what is certain is that all of them only began the CRP after physicians indicated that exercise would not pose a risk to the patients). It could be suggested that although the patients did not have an identical health status (depends on the severity of the cardiac event) all of them reached minimum physical conditions, which may have caused the time since diagnosis to be irrelevant in this study.

This research has certain limitations that should be taken into account. Firstly, heart disease affects more men than women (Roth et al., 2020) and in our study, females were underrepresented (around 15% of our participants were women). For this reason, sex was controlled for in our statistical analyses. Finally, we believe it would have been appropriate to control the potential effects on emotional well-being of the medication that patients were taking. Despite these limitations, we believe that this study adds significant knowledge to the relationship that exists between emotions and coping in CP.

Conclusion

The main objective of this study was to analyze the ability of AC and MC to predict the positive and negative affect of patients who have recently suffered a first cardiac episode after controlling for their FPC. The results of our longitudinal study show that the relationship between coping and the emotional well-being of post-infarcted patients remains even after controlling for their FPC. According to these results, it is suggested that CRP, besides promoting physical exercise, may encourage patients to deal with negative situations in an adaptive way.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Ministry of Economy of the Authors' Country grant [masked for blind review].

References

- Blumenthal, J., Zhu, Y., Koch, G., Smith, P., Watkins, L., Hinderliter, A., Hoffman, B., Rogers, J., Chang, P., O'Connor, C., Johnson, K., & Sherwood, A. (2019). The modifying effects of social support on psychological outcomes in patients with heart failure. *Health Psychology, 38*(6), 502-508. <https://doi.org/10.1037/hea0000716>
- Chiavarino, C., Rabellino, D., Ardito, R., Cavallero, E., Palumbo, L., Bergerone, S., Gaita, F., & Bara, B. (2012). Emotional coping is a better predictor of cardiac prognosis than depression and anxiety. *Journal of Psychosomatic Research, 73*(6), 473-475. <http://dx.doi.org/10.1016/j.jpsychores.2012.10.002>
- Chida, Y., & Steptoe, A. (2009). The association of anger and hostility with future coronary heart disease. A meta-analytic review of prospective evidence. *Journal of the American College of Cardiology, 53*(11), 936-946. <http://dx.doi.org/10.1016/j.jacc.2008.11.044>
- Davidson, K. W., Mostofsky, E., & Whang, C. (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*(9), 1065-1070. <http://dx.doi.org/10.1093/eurheartj/ehp603>
- Eisenberg, S. A., Shen, B., Schwarz, E. R., & Mallon, S. (2012). Avoidant coping moderates the association between anxiety and patient-rated physical functioning in heart failure patients. *Journal of Behavioral Medicine, 35*(3), 253-261. <http://dx.doi.org/10.1007/s10865-011-9358-0>
- Falvo, D. & Holland, B. (2018). *Medical and psychosocial aspects of chronic illness and disability*. Jones & Bartlett Learning.
- Feigal, J., Boyle, S., Samad, Z., Velazquez, E., Wilson, J., Becker, R., Williams, R., Kuhn, C., Ortel, T., Rogers, J., O'Connor, C., & Jiang, W. (2017). Associations between positive emotional well-being and stress-induced myocardial ischemia: Well-being scores predict exercise-induced ischemia. *Journal of Psychosomatic Research, 93*, 14-18. <http://dx.doi.org/10.1016/j.jpsychores.2016.11.012>
- Gan, Y. (2020). Happy people live longer and better: Advances in research on subjective well-being *Applied Psychology: Health and Well-being, 12*(1), 3-6. <http://dx.doi.org/10.1111/aphw.12192>
- Litman, J. & Lunsford, G. (2009). Frequency of use and impact of coping strategies assessed by the COPE Inventory and their relationships to post-event health and well-being. *Journal of Health Psychology, 14*(7), 982-991. <http://dx.doi.org/10.1177/1359105309341207>
- McKee, G., Kerins, M., Fitzgerald, G., Spain, M., & Morrison, K. (2013). Factors that influence obesity, functional capacity, anxiety and depression outcomes following a Phase III cardiac rehabilitation programme. *Journal of Clinical Nursing, 22*(19-20), 2758-2767. <http://dx.doi.org/10.1111/jocn.12233>
- Meyer, M., Lin, F., Jaensch, A., Mons, U., Hahmann, H., Koenig, W., Brenner, H., & Rothenbacher, D. (2019). Multi-state models of transitions in depression and anxiety symptom severity and

cardiovascular events in patients with coronary heart disease. *PLoS ONE*, *14*(3), e0213334.
<https://doi.org/10.1371/journal.pone.0213334>

- Roohafza, H., Talaei, M., Pourmoghaddas, Z., Rajabi, F., & Sadeghi, M. (2012). Association of social support and coping strategies with acute coronary syndrome: A case-control study. *Journal of Cardiology*, *59*(2), 154-159. <http://dx.doi.org/10.1016/j.jcc.2011.12.001>
- Roth, G. A., Mensah, G. A., Johnson, C.O., Addolorato, G., Ammirati, E., Baddour, L. M., Barengo, N. C., Beaton, A. Z., Benjamin, E. J., Benziger, C. P, Bonny, A., Brauer, M., Brodmann, M., Cahill, T. J., Carapetis, J., Catapano, A. L., Chugh, S. S., Cooper, L.T., Coresh, J., (...), & Fuster, V. (2020). Global burden of cardiovascular diseases and risk factors, 1990-2019: Update from the GBD 2019 Study. *Journal of the American College of Cardiology*, *76*(25), 2982-3021. <http://dx.doi.org/10.1016/j.jacc.2020.11.010>
- Roth, R., Suldo, S., & Ferron, J. (2017). Improving middle school students' subjective well-being: Efficacy of a multicomponent positive psychology intervention targeting small groups of youth. *School Psychology Review*, *46*(1), 21-41. <http://dx.doi.org/10.17105/SPR46-1.21-41>
- Shimazu, A. & Schaufeli, W. (2007). Does distraction facilitate problem-focused coping with job stress? A 1 year longitudinal study. *Journal of Behavioral Medicine*, *30*(5), 423-434. <http://dx.doi.org/10.1007/s10865-007-9109-4>
- Skinner, E., Edge, K., Altman, J., & Sherwood, H. (2003). Searching for the structure of coping: A review and critique of category systems for classifying ways of coping. *Psychological Bulletin*, *129*(2), 216-269. <http://dx.doi.org/10.1037/0033-909.129.2.216>
- Smorti, M., Cappelli, F., Guarnieri, S., Bergesio, F., & Perfetto, F. (2014). Depression and cardiac symptoms among AL amyloidosis patients: The mediating role of coping strategies. *Psychology, Health and Medicine*, *19*(3), 263-272. <http://dx.doi.org/10.1080/13548506.2013.802357>
- Svensson, T., Inoue, M., Sawada, N., Yamagishi, K., Charvat, H., Saito, I., Kokubo, Y., Iso, H., Kawamura, N., Shibuya, K., Mimura, M., & Tsugane, S. (2016). Coping strategies and risk of cardiovascular disease incidence and mortality: The Japan Public Health Center-based prospective Study. *European Heart Journal*, *37*(11), 890-899. <http://dx.doi.org/10.1093/eurheartj/ehv724>
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063-1070. <http://dx.doi.org/10.1037/0022-3514.54.6.1063>

Table 1. Socio-demographic characteristics of cardiac patients

	Time 1	Time 2
<i>N</i>	253	186
Sex (% male)	85.8	84.9
Age, [<i>Mean (SD)</i>]	54.45 (9.72)	53.90 (9.99)
Time since diagnosis [<i>Mean (SD)</i>]	34,75 (32.99)	36.13 (34.35)
Occupational status (% of employed patients prior to cardiac event)	63.2	66.1
Coexistence type		
(% of patients living with their family)	93.7	94.1
Education (% of patients with elementary	26.9	24.7
secondary	32.8	36.6
and third- level education)	40.3	38.7

Table 2. Regression analyses to predict Positive and Negative Affect at Time 1 (n=253)

<i>Criterion Variable</i>	<i>Predictor Variables</i>	<i>Model</i>				
		<i>R</i> ²	<i>F</i>	<i>Df</i>	<i>β</i>	<i>t</i>
Positive Affect		.19	21.51***	2,251		
	Adaptive Coping				.48	6.54***
	Maladaptive Coping				-.22	-3.02**
Negative Affect		.19	28.92***	2,251		
	Adaptive Coping				-.21	-3.40***
	Maladaptive Coping				.47	7.59***

p*<.05 *p*<.01 ****p*<.001

Table 3. Regression analyses to predict Positive and Negative Affect at Time 2 (n=186)

<i>Criterion Variable</i>	<i>Predictor Variables</i>	<i>Model</i>				
		<i>R²</i>	<i>F</i>	<i>Df</i>	<i>β</i>	<i>t</i>
Positive Affect		.53	36.43***	4,182		
	MET-T1				.02	0.31
	Positive Affect – T1				.59	8.94***
	Adaptive Coping				.25	3.39***
	Maladaptive Coping				-.06	-0.89
Negative Affect		.52	19.42***	6,180		
	MET-T1				-.10	-1.47
	Sex				.06	0.98
	Coexistence Type				-.20	-3.03**
	Negative Affect-T1				.48	7.35***
	Adaptive Coping				-.25	-3.34***
	Maladaptive Coping				.33	4.55***

* $p < .05$ ** $p < .01$ *** $p < .001$

Notes: Sex (1=men, 2=women); Coexistence Type (1=alone, 2=accompanied)