

Emotional and immunological impact of marital loss on men and women

Impacto emocional e inmunológico de la pérdida de la pareja en hombres y mujeres

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Abstract

Background: This work analyzed whether psychological variables (depression and anger) and physiological variables (Immunoglobulin A) are related to each other in the context of partner loss, focusing on the influence of sex.

Method: Three groups of 100 participants were included: widowed, divorced, and a control group (50% men; age between 30 and 60 years). To assess psychological variables, two inventories were used and the technique of radial immunodiffusion was used to measure IgA.

Results: Widowed and divorced people appeared to be less healthy, more depressed, and angrier than the control group. IgA and psychological variables were inversely related. Women appeared to be more depressed after divorce while men were more depressed after being widowed. Men were angrier in both situations.

Conclusions: This study shows the interrelation of psychological and physical indicators in the context of partner loss and the influence of sex on it.

Keywords: Divorce; Widowhood; Health; Emotions; Immunoglobulin A

Resumen

Antecedentes: El objetivo de este trabajo fue estudiar la relación entre variables psicológicas (depresión e ira) y variables fisiológicas (Inmunoglobulina-A) en el contexto de la pérdida de pareja, tomando en consideración el sexo.

Método: Se incluyeron tres grupos de 100 participantes: viudos, separados y un grupo control (50% hombres, edad entre 30 y 60 años). Se usaron dos cuestionarios para evaluar las variables psicológicas y la técnica de inmunodifusión radial para medir la cantidad de IgA.

Resultados: Los viudos y divorciados mostraron menor cantidad de IgA y más depresión y enfado que el grupo control. Se encontró una relación inversa entre IgA y las variables psicológicas. Las mujeres mostraron más depresión tras el divorcio mientras que los hombres estaban más deprimidos tras enviudar. En ambas situaciones, los hombres mostraron más enfado.

Conclusiones: Este estudio muestra la interrelación entre indicadores psicológicos y fisiológicos y la influencia del sexo tras la pérdida de pareja.

Palabras clave: Divorcio; Viudez; Salud; Emociones; Inmunoglobulina-A

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Introduction

Situations that are defined as life events that involve emotional losses, (including the death of or separation from significant ones) are usually considered to be highly related to psychological problems (Zautra, 2003), psychopathological reactions (Ko, Kua, and Fones, 2001; Kposowa, 2000; Margraf and Poldrack, 2000; Simon, 2002), a decrease in immune competence (Ader, 2003; Chochinov and Holland, 1990; Kiecolt-Glaser et al. 1997; Wadee, Kuschke, Kometz, and Berk, 2001), and even with the onset and recurrence of physical illnesses.

Previous research on the psychological reactions and implications of these life events has found differences among the different types of marital loss groups (widowed and divorced) and control groups (Cardenal, Sánchez-López, and Ortiz-Tallo, 2005). People who experienced a marital loss presented more unhealthy personality traits and more negative emotions (such as depression and anxiety) than people in control groups.

On other note, immunological factors have been associated with stressful situations. Studies have indicated that some physiological indicators are related to psychological variables and vice versa. This is the case for Immunoglobulin A (IgA) an immunological marker that has been positively related with emotion regulation and with the positive evolution of psychological therapy (Bongard, Hodapp, and Rohrmann, 2008; Euler, Schimpf, Henning, and Brosig, 2005). In contrast, it has been inversely related with variables that indicate psychological imbalance, such as burnout indicators (Gómez-Alcaina, Montero-Marín, Demarzo, Pereira, and García-Campayo, 2013) or stress responses (Guéguinou et al., 2012).

The chief conclusions of the literature on these topics are listed below, taking into account the central focus of the present paper: the study of IgA, depression, and anger in men and women after marital loss.

IgA in the divorced and widowed

The first studies that noted the influence of psychological stressors on the immune system focused on the death of the spouse and the grief that may afflict the person. A decrease in the response of lymphocyte T, which is stimulated by A and PHA, was found in 26 adults six weeks after being widowed but was not found in a non-widowed control group (Bartrop, Lazarus, Luckhurst, Kiloh, and Penny, 1997). Other authors have shown a significant decrease in the lymphocytic response in the presence of mitogens A, PHA, and PWM in 15 males after the death of their wives. During 14 months of monitoring, a gradual increase was found in the lymphocytic proliferation, although this increase did not reach the levels prior to the death of the spouses (Scheleifer et al., 1983). Moreover, in a group of women who lost their husband between one and four months prior, a 50% decrease in NK activity was detected (Irwin, Daniels, Smith, Bloom, and Weigner, 1987). Low NK activity has been linked to high levels of depression in women whose husbands are being treated for lung cancer. This suggests that the loss of the spouse could be associated with immunological depression and depressive or anxious symptoms. Epidemiologic studies support these results and note that widowed people are at higher risk of disease and mortality in the first months after the loss of the spouse (Murphy, Gundy, and Kalogirou, 2007).

Regarding divorce there are different types of evidence. The outcomes of research indicate that low scores in immunity appear when a stressful situation, such as unemployment or divorce, occurs (Geiser, 1989). This shows how emotional unrest, along with individual differences, and social support could influence the effects of stress on the immune system. Psychosocial, neuroendocrine, and biochemical factors interact and influence the immune system. One of the classic studies of Kiecolt-Glaser's team (1987) on this issue analyzed women who had lost or divorced their husbands in the previous six months. The authors found that women had lower levels of T helper cells and NK, lower lymphocytic responses in the presence of mitogens, and higher levels of antibodies to fight the herpes virus. Furthermore, women who still were in love with their (ex-) husbands felt more depressed and lonely, which more strongly affected their immunity.

Although the results are significant, the majority of the studies are retrospective and transversal, and thus, there is not suitable evidence to conclude that significant clinical changes are related to psychological factors. Thus, interdisciplinary communication in psychoimmunological research is required.

Another study using auto-reports and blood samples in married and divorced men showed that those separated and divorced felt more sadness and loneliness, and reported more recent illnesses than married people (Kiecolt-Glaser, Kennedy, Markoff, and Fisher, 1988). Additionally, these people had significantly lower values in the two indexes linked to immunologic function (antibody titers to two herpes viruses).

In a marital relationship, psychological stress, poorer immunologic function (measured according to the antibody Epstein-Barr virus), and a lower ratio of helper/suppressor cells, are related to a poorer marriage quality. Subjects who were separated or divorced for one year and had made the decision about separation were less distressed and had better outcomes regarding immunological functions (Kiecolt-Glaser et al., 1987). Therefore, the key to understand the complex relationship among loss, immunological system, and psychological variables might be to look at the distress that this loss causes rather than to the loss itself.

Many studies have reached similar conclusions with women. One study evaluated the physiological markers of 40 females for evidence of chronic stress (one group of divorced and one control group; Powell et al., 2002). The authors found that the first group had higher levels of evening salivary cortisol and more testosterone in the first urination of the day, which is related to higher levels of stress and anxiety (Powell et al., 2002).

Overall, different results and evidence indicate that people who face a stressful situation, such as being divorced or widowed, have deficiencies that indicate a decrease in functional ability of the immune system, as assessed by immunological parameters (Bayés and Borrás, 1999). Studies in recent decades have shown that transition from being married to being widowed or divorced, are related to different health problems indicators (Graham, Christian, and Kiecolt-Glaser, 2006; Liu and Umberson, 2008).

Epidemiological studies indicate an increase and progression of infectious diseases in persons who have coped with vitally stressful situations, such as a loss of or separation from loved ones. Thus, the key factor that determines immunological disorders could be not only the break-up of the couple but also the psychological effects, which involve anxious and depressive responses. These consequences depend on how the subject understands, perceives, and copes with the stressful situation (Bayés and Borrás, 1999). It seems well established that losing a loved one has effects on both the psychological well-being and the immune system.

Influence of sex on mental and physical health in divorced and widowed people

Major studies of divorced and widowed people have found higher levels of somatization, more psychological distress, and higher incidence of mental disorders according to the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV; APA, 1994; Ko et al., 2001; Metrikin, Dermatis, and Bunt, 2003; Ritsner and Ponizovsky, 2003). This relationship appeared particularly strong in divorced or widowed women (Villaverde, García, De la Fuente, and Benítez, 1999).

Marks and Lambert (1998) performed a multivariate analysis showing that the process of being divorced or widowed is related to more negative effects on psychological well-being in women than in men. On the contrary, Kposowa (2000) found a risk of suicide that was twice as high in divorced than in married men. No significant differences were found in suicide risk based on marital categories for women. Results in this line were also reported by Kendler, Thornton, and Prescott, (2001). Studying twins of both sexes, these authors concluded that men were more sensitive to depressive effects of divorce and break-ups, and women were more vulnerable to consequences of close context troubles (e.g., marital fights). No discrepancies of major depression prevalence by sex were explained because of different ratios of reactions to stressful events. In studies with patients affected with heart illness, coronary illness, physical disability, and widowhood/divorce, these circumstances were related to depression among men but not among women (Ahto et al., 1997)

We can summarize that there is clear evidence for difficulties (both psychological and physical) after marital loss. In comparison, divorced and widowed men show higher percentages of depression, alcoholism, and more suicides than single and married men (Power, Rodgers, and Hope, 1999; Kposowa, 2000). However, having into account the evidence on symptoms of depression and anxiety in women after marital loss, it is likely that they are also at risk of suffering psychological disorders. It is necessary to clarify this possible differential sex effect and its causes (Muhammad and Gagnom, 2010).

Nowadays, many people experience the death of their spouse and divorce has become a much more common experience. Scientific data about these phenomena need to be studied, as they intervene in various settings (e.g., medical, psychological, workplace) and at various levels (prevention and treatment).

Therefore, the purpose of this work was to shed some light on the experience of losing a loved one by first, analyzing whether psychological variables (depression and anger) and physiological variables associated to immunology (IgA) are related. Second, we aimed to study the roles and implications of IgA, depression, and anger in people who suffered a partner loss compared to people who did not; and third, we explored whether there were sex differences in depression, anger, and IgA levels in widowed and divorced people.

The hypotheses, according to the existent literature, were as follows:

1. Immunoglobulin A (IgA) levels will be correlated in an inverse way with depression and anger levels: Higher levels of IgA will be related to lower levels of depression and anger.
2. Variables that indicate psychological difficulties, such as depression and anger, will be correlated.
3. According to the existing literature, there will be differences between men and women in their levels of anger and depression after marital loss.
4. People who have experienced the loss of significant others, by either death or divorce, will have lower IgA levels and higher depression and anger scores than the control group.

Method

Participants

There were three groups of participants in this study:

Control group: was comprised of 100 healthy individuals (50 men) without chronic stress, randomly selected from the Spanish population, ranging from 30 to 60 years of age ($M = 44.85$, $SD = 10.37$).

Divorced group: was comprised of 100 individuals (50 men) who had experienced the loss of a significant other by either separation or divorce in the previous six months. They were randomly selected from the Spanish population, ranging from 30 to 60 years of age ($M = 34.13$; $SD = 7.15$).

Widowed group: was comprised of 100 individuals (50 men) who had suffered the death of their spouse in the previous six months. They were randomly selected from the Spanish population, ranging from 30 to 60 years of age ($M = 48.68$, $SD = 10.42$).

All groups had middle socioeconomic status.

The population pool, from which the representative sample was extracted by means of random sampling, was obtained by random selection from the municipalities of Málaga (Spain; Malaga, Alhaurín de la Torre, Fuengirola, Benalmádena, Marbella, and Antequera), respecting the previously established ratios of sex and age. To determine the socioeconomic level, samples were selected from neighbourhoods where the social status level was considered middle (according to the local standard) and whose economic characteristics were similar to those of the general population. The professional profiles of the three groups were diverse, including qualified professionals, service employees, office workers, technicians, managers, and drivers or machine operators (See table 1).

Table 1
Participants' characteristics

	N (males)	Age (SD)	Studies (%)				Socioeconomic status
			No studies	Primary	High school	College	
Divorced	100 (50)	34.13 (7.15)	5.8	16.1	30.1	48	Middle
Widowed	100 (50)	46.68 (10.42)	-	25.8	43	31.2	Middle
Control	100 (50)	44.85 (10.37)	-	12.6	32.2	55.2	Middle

Instruments

To assess depression, the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, and Erbaugh, 1961) was used. We used the Spanish adaptation by Conde, Esteban, and Useros (1976). The Spanish instrument (21 items) shows high test-retest reliability ($r = .80$) and internal consistency ($\alpha = .85$). The use of this inventory is appropriate even in nonclinical populations because it offers an accurate mental health index and is inversely related to personality variables that are typical of personal well-being: self-esteem, emotional stability, and openness, for example.

The Spanish version of the State-Trait Anger Inventory (Spielberger, 1988), adapted by Miguel-Tobal, Casado, Cano-Vindel, and Spielberger (1997), was used to assess anger. This instrument (49 items) provides scores with very satisfactory psychometric characteristics. Trait Anger ($\alpha: .82$) measures the general disposition to feel anger and is composed of Anger Temperament ($\alpha: .84$) and Angry Reaction ($\alpha: .75$). The State Anger subscales were not employed.

To assess physiological variables, the technique of radial immunodiffusion (RID), which allows for the quantification of present antigens, was used to measure the immunological index of immunoglobulin A (IgA) in biological fluids, in this case the saliva (Mancini, Carbonara, and Heremans, 1965). The technique consists of collecting saliva samples using plates containing monospecific antibodies in a gel. Thus, a precipitate settles with antibody-antigen complexes. When a halo forms, the diameter of the ring of precipitation is directly proportional to the concentration of antigens in the specimen. Finally,

each halo diameter (concentration) is read directly in accordance with the RID references table. Higher levels of IgA in saliva indicate more immunocompetence.

Procedure

Participation in this study was voluntary and no compensation was offered. Participants were contacted either by phone or personally. They were assessed individually and asked to sign up a consent form with all the information about the study. A team of psychologists specialised in psychological assessment administered the surveys under the supervision of the research team director. The instructions were similar for all participants; they were explained that we wished to collect psychological information to offer psychological support to divorced and widowed people. The surveys included an interview regarding questions about experience of both acute and chronic stress.

Saliva samples were collected and subsequently analyzed in a laboratory for clinical analysis. The reading and assessment of levels of immunoglobulin A (IgA) were conducted by Dr. Morell (specialist in Immunology) using the radial Immunodiffusion technique.

Samples of 7.3 ml. of saliva were collected from each subject in wells containing antigen-antibody dilutions. The process consisted of the antigen dissemination with the application of a specific gel. After this process, a concentric halo of precipitate (a circle) was detected in each well. The size of the halo in the well grew to reach a balance between the formation and the disappearance of these complexes. The incubation time to ensure that the size of the full halo had been reached was 48-56 hours.

After the diffusion, the diameters of the rings were determined using a watchmaker magnifier and a dark background. For each ring diameter obtained, the value was equated with the reference table (the table directly converted the diameters of the rings to protein concentration).

Data Analysis

First, a Pearson correlation analysis was used to examine the relationship between IgA, depression, and anger. Then, a multivariate comparative design (MANOVA) was carried out to analyze the differences among the mentioned variables. The dependent variables were IgA, depression, and anger. Sex and group condition (widowed, divorced, and control) were the independent variables.

Results

A Pearson correlation analysis showed a moderate negative correlation between the physiological variable IgA and the psychological variables: depression ($r_{xy} = -.40$; $p < 0.001$) and anger ($r_{xy} = -.31$; $p < 0.001$); therefore, high levels of IgA were associated with low scores in depression and anger. Additionally, depression and anger were positively associated ($r_{xy} = .57$; $p < 0.001$) with each other.

The MANOVA results for IgA, depression and anger with Pillai's trace statistic were significant for the group condition [$F(6, 326) = 35.58$; $p < .001$] and for the interaction between the sex and group conditions [$F(6, 326) = 3.80$; $p = .001$] but not for the sex variable [$F(3, 162) = 2.62$; $p = .06$].

For the dependent variable IgA, the analysis showed a statistically significant model that explained 43% of the variance. The results for the variable "group" (widowed, divorced, and control) were significant [$F(2, 162) = 66.14$; $p < .001$]. Sex and the interaction between the sex and group conditions were not significant. The means, standard deviations, and pairwise mean differences for IgA are presented in Table 2, regarding post hoc comparisons.

Table 2
Means, standard deviation and mean differences for Immunoglobulin A

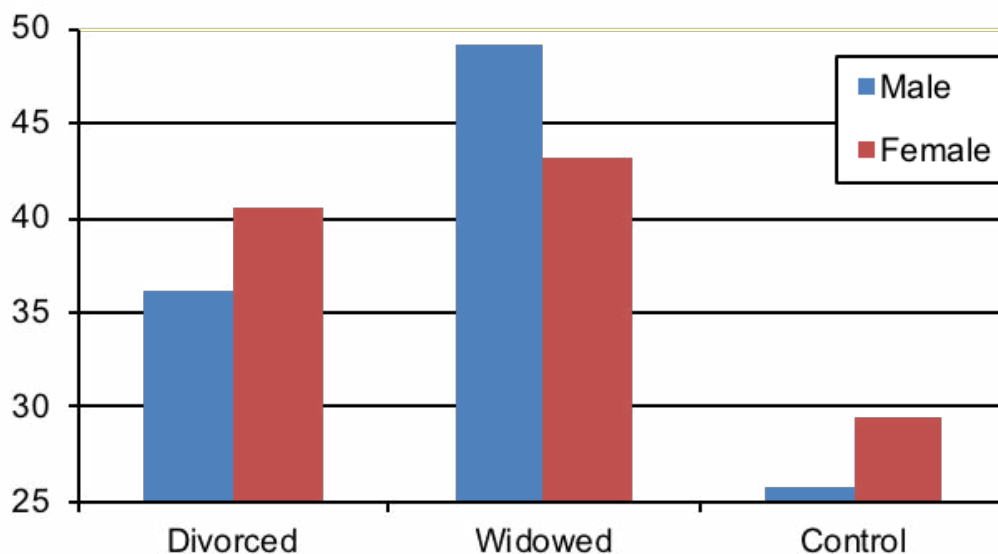
Group	Mean	SD	Mean differences	
			Widowed	Control
Divorced	17.97	2.68	4.56	40.76*
Widowed	13.41	3.12		45.32*
Control	58.73	25.42		

* $p < .05$

For the dependent variable, depression, the analysis showed a statistically significant model that explained 46% of the variance. The group condition was significant [$F(2, 162) = 66.06$; $p < .001$]. The post hoc comparisons between the groups (divorced, widowed, and control) are presented in Table 2, which shows that the control group obtained lower scores on depression than the other two groups (widowed and divorced) and that divorced people scored lower than widowed people. The sex variable was not significant. The interaction between sex and group conditions for depression was significant [$F(2, 162) = 6.31$; $p = .002$]. Figure 1 shows the means for each group condition in males and females separately.

For widowed people, males scored higher than females in depression, but in the divorced and control group, females presented more depression than males.

Figure 1
Depression means for males and females in each group condition



Finally, for the dependent variable anger, the analysis showed a statistically significant model that explained 34% of the variance. The group condition was significant [$F(2, 162) = 39.50; p < .001$]. The post hoc comparisons between group conditions (divorced, widowed, and control) are presented in Table 3, which shows that the control group obtained lower scores than the other two groups (widowed and divorced), and no significant differences were found between widowed and divorced people. The effect of the sex variable was not significant. The interaction between sex and the control group for anger was significant [$F(2, 162) = 79.81; p = .02$].

Table 3
Means, standard deviations and mean differences for Depression

Group	Mean	SD	Mean differences	
			Widowed	Control
Divorced	38.40	10.88	-7.75*	11.47*
Widowed	46.15	7.01		19.22*
Control	26.92	8.21		

* $p < .05$

Next, you can see Table 4 shows means, standard deviations and mean differences for Anger

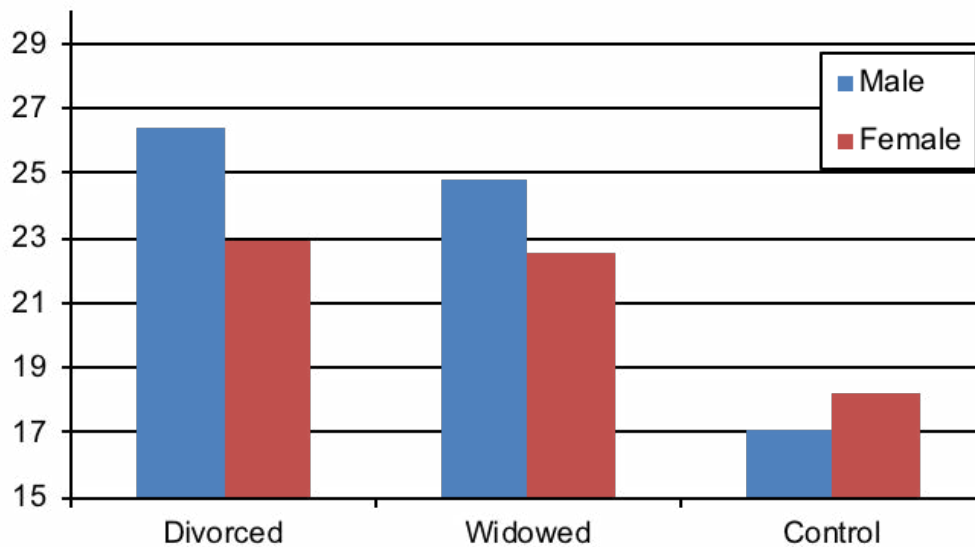
Table 4
Means, standard deviations and mean differences for Anger

Group	Mean	SD	Mean differences	
			Widowed	Control
Divorced	24.62	4.97	0.95	6.99*
Widowed	23.68	5.12		6.04*
Control	17.64	3.48		

* $p < .05$

Figure 2 shows the means for each group condition in males and females separately. For widowed and divorced people, males scored higher than females in anger, but in the control group, females presented more anger than males.

Figure 2
Anger means for males and females in each group condition



Discussion

The main aim of this work was to analyze whether psychological and physiological variables were related to each other after a marital loss, to study the implication of these variables in people who had suffered a partner loss compared to people who did not, and to explore whether there were sex differences in the variables analyzed.

It was expected that the immunological marker (IgA levels) would be correlated in an inverse way with depression and anger. The results were in line with this prediction and a moderate negative association between the IgA and depression and anger was found; therefore, high levels of IgA were associated with low scores in depression and anger. Depression and anger were also associated, as expected. Other studies have reported an inverse relationship between IgA and variables that indicate psychological problems (Gómez-Alcaina et al., 2013) or stress responses (Guéguinou et al., 2012).

On the contrary, it was expected that people who experienced the loss of significant others would have lower IgA levels and higher depression and anger scores than the control group. This hypothesis was also confirmed by the results. The control group scored significantly higher than the divorced and widowed group on IgA. This means that people who suffered the loss of their partner in the previous six months had worse levels of immunological markers than those who had not experienced this stressful situation, independently of their sex. Suffering loss explained 43% of the IgA test results according to the statistical analysis. Other authors have found similar results, where the marital transition, specifically from being married to being widowed or divorced, was related to different health deficiencies (Graham et al., 2006; Hughes and Waite, 2009; Liu and Umberson, 2008). Fewer studies have analyzed the differences between people who have experienced this loss and those who have not, but some comparisons in epidemiologic studies also match with the result presented here (Bayés and Borrás, 1999).

Regarding depression, the widowed group scored higher than the divorced group, and both groups scored significantly higher than the control group. This result has been reported by other studies that found higher levels of somatisation (Metrikina et al., 2003), along with more psychological distress (Ritsner and Ponizovsky, 2003), and a higher incidence of mental disorders (Ko et al., 2001) in widowed and divorced people compared with a control group.

Taking into account the sex variable, we found that, for widowed people, males scored higher than females on depression, however, we found an interesting inverse pathway in the divorced and the control group, where females presented more depression. It seems that, regarding the depression symptoms, women experience more difficulties when facing a divorce, while men become more depressed when facing widowhood. Different studies have found diverse results on sex differences in depression when studying people who experienced marital loss. In general, most of the studies show that men are particularly at risk. Comparing divorced and widowed with married and single men, the former group showed higher percentages of depression and alcoholism, with many more suicides (Power et al., 1999;

Kposawa, 2000). Other authors have found that widowers had higher rates of psychiatric disorders than widows (Rasul, Stansfeld, Davey-Smith, Hart, and Gillis, 2001). These authors explained this result as due to differences in the way that men and women adjust to loss. It is possible that women would be more able to call upon emotional and other resources from social networks, which may be important in adjustment to widowhood.

Finally, for the anger variable, the control group obtained lower scores than the other two groups, and no significant differences were found between widowed and divorced people, as expected. This result is aligned with previous studies, such as the one by Cardenal et al. (2005), who also reported that people who had experienced a marital loss presented more unhealthy personality traits, more emotions related to anger, and more maladaptive coping styles than the control group.

The interaction between sex and control group for anger was significant. When males and females experienced a partner loss, males who were divorced or widowed in the previous six months experienced higher anger levels (compared to the control group) than women.

In sum, this study found that people who have suffered a marital loss in the previous six months suffers a decrease of some immunological markers (IgA) and are more depressed and angrier than people who did not go through this stressful situation. The physiological variable (IgA) and depression and anger were moderately related one to each other in an inverse way: the higher the IgA, the lower the levels of depression and anger. This study shows the interrelation of psychological and physical indicators, pointing to a complex relationship among the effects of a stressful event and the physical and emotional adjustment. Moreover, taking sex differences into account, women appeared to be more depressed after a divorce while men appeared more depressed after being widowed. However, men were angrier than women in both situations. Further research is needed to explain these differences on the way men and women cope with a marital loss. A tentative explanation could lie on the nature of the loss. Divorce can be seen as the end of a stressful situation (a non-working marriage) and thus, although divorce is a stressful event, it would be experienced in a more positive way by men, compared to widowhood. Being widowed could bring more feelings of loneliness and hopelessness to men, explaining their higher levels of depression. Also, it is commonly reported in the literature that men are less likely to look for social support, which may smoothens the psychological distress. It seems clear that women experience these events (divorce and widowhood) in a different way with divorce being harder for them. Aspects such as the custody of the children, the change of status, and the feelings of failure could be (presumably) beyond their experiences. It is definitely necessary to look to individual differences to understand these processes. We think that social competence and cultural roles implicit to men and women are important to this understanding.

One of the main strengths of this work is the sample (100 people in each of the three groups). It has been showed that stressful events as divorce and widowhood directly affect the levels of immunological markers (IgA) and cause depression and anger. Also, we found that IgA is inversely related to depression and anger and also important differences between men and women when facing a marital loss: men appeared more depressed when widowed and women when divorced. In both cases, men were angrier. Some limitations attributable to this study are that variables potentially relevant (such as healthy habits or being currently in a romantic relationship) were not controlled. For future studies, it will be interesting to perform prospective studies as well as to analyze whether the years of relationship as well as the age influence the experience of divorce/widowhood. Mediation analyses could shed some light on the mechanisms through which stressful events affect immunological response. Which illnesses are people with low IgA more prompted to? Have widowed and divorced people higher prevalence of any specific illness? How is the social network influencing the experience of becoming widow or divorced? Is the coping style mediating between the stressful event and the depression, anger, and levels of IgA? How strong and in which direction is the relationship between IgA and psychological variables? These are some of the questions arisen from this study and we encourage future research to answer them. From our point of view, acknowledging that IgA, depression, and anger are related in an inverse way; and that men and women experience different levels of depression and anger after a marital loss is a good first stone towards the future evidence on this topic.

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