

## Academic Effects of the Prestige Oil Spill Disaster

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The effect of a large scale oil spill disaster on the academic achievement and classroom behavior of children and adolescents who lived on the Galician coast (Spain) is studied from an ecological perspective. 430 participants divided into three age groups of 5, 10, and 15 years of age, were studied. The participants came from three areas differently affected by the disaster. Dependent variables were academic achievement and classroom behavior of the participants after the Prestige disaster. Degree of exposure and other protective or risk factors were investigated as well. Repeated measures ANOVA to assess the main effects of the oil spill and hierarchical regression analyses to assess the contribution of the protective/vulnerability factors were performed. The results indicate that the effects of the disaster were relatively scarce. Some protective factors accounted for a certain degree of variance of different schoolroom behaviors. These results point to the intervention of protective factors in the adaptation to the disaster.

*Keywords:* ecological perspective, protective factors, risk factors, disasters, academic consequences.

Se estudia desde una perspectiva ecológica el efecto que el desastre provocado por un gigantesco vertido de petróleo ha tenido sobre el rendimiento académico y la conducta en el aula de niños y adolescentes que vivían en la costa de Galicia (España). Se estudiaron 430 participantes divididos en tres grupos de, 5, 10 y 15 años. Los participantes provenían de tres áreas que fueron afectadas en grado diferente por el desastre.

Las variables dependientes estudiadas fueron el rendimiento académico y el comportamiento en el aula de los participantes después del desastre del Prestige. El grado de exposición y otros factores de riesgo o protectores fueron también investigados. Se realizaron análisis de varianza (ANOVA) de medidas repetidas para evaluar los efectos más importantes del vertido de petróleo y análisis de regresión jerárquica para evaluar la contribución de los factores protectores o de vulnerabilidad.

Los resultados indican que los efectos del desastre fueron relativamente escasos. Algunos factores protectores explicaron un cierto grado de varianza de diferentes comportamientos en el aula. Estos resultados señalan la intervención de factores protectores en la adaptación al desastre.

*Palabras clave:* perspectiva ecológica, factores protectores, factores de riesgo, desastres, consecuencias académicas.

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The purpose of the present research is to study the effect of the *Prestige* oil spill near the Galician coast (Spain) on children's academic achievement and schoolroom behavior. The identification and intervention of a series of individual, family and social protective factors which may have lessened the impact of the disaster are also studied.

The interest in the impact of disasters on children and adolescents is relatively recent, and it has risen because of the influence of developmental perspective on the analysis of psychological consequences of disasters. The first studies of children experiencing disasters date back to the middle of the last century (Treadwell-Deering & Hanisch, 2002). Recently, a rise in the number of published papers on the topic has occurred as a result of the many natural disasters which have taken place in the last few years as well as the increase of terrorist attacks worldwide.

A disaster is defined as a sudden and calamitous event causing great damage, loss, or destruction, and, typically, having an impact on the lives of a great number of people involved. These events are therefore traumatic and usually outside the scope of normal experience. However not all types of disasters have equivalent effects on the population. The definition of disasters adopted by the authors coincide with that of Vogel & Vernberg (1993), in which political violence, neglect, abuse or family violence are excluded from the category of disaster, although they also share elements with disasters, and may produce similar traumatic reactions on victims.

One major differentiation has been established between natural, technological, and human-caused disasters. Children seem to react differently to them, with human-caused disasters producing more injurious effects than natural ones (Green & Lindy, 1994; AAP Work Group on Disasters, 1994; Hagan et al., 2005). At the same time, children's reasoning clearly distinguishes between natural and man-made disasters (Kahn, 1997). Those disasters which are chronic or produce dramatic changes in social environment also seem to have graver consequences on individuals than those which are punctual and do not affect the social and natural environment (Hagan et al., 2005).

The study of the consequences of disasters is a difficult task because there are many methodological problems for establishing causal relationships between disasters and their emotional and behavioral effects. This can only be carried out in prospective studies in which investigators systematically observe the outcome under scope in a population both before and after the event (Durkin, Khan, Davidson, Zaman, & Stein, 1993). Disasters may have effects of different levels: physical effects, psychological effects, interactional effects and environmental (natural and/or social) effects. In some cases, disasters have had an important physical effect on the health of individuals, or have caused physical injury and death, as in the case of earthquakes or floods. Loss of property and destruction is also very frequent in certain types of natural disasters, such

as floods, earthquakes, bushfires and hurricanes. In many cases this forces the relocation and displacement of victims. In other cases, the most important effects are psychological. Previous studies have found a diversity of effects which may range from those mildly affecting psychological development to those causing serious emotional post traumatic stress disorders (PTSD) (Lonigan, Shannon, Taylor, Finch, & Sallee, 1994; Veenema & Schoreder-Bruce, 2002). Finally, the most important consequences in some cases have affected the natural environment (oil spills, chemical contamination...) or social relationships (Palinkas, Downs, Petterson, & Russell, 1993). Nevertheless disasters usually cause multiple level effects; such was the case of the Chernobyl nuclear accident, in which, in addition to serious health effects, psychosocial effects were also important for the affected population who had to be relocated (Barnett, 2007; Bromet et al., 2000).

### *Theoretical Framework*

From an ecological perspective (Bronfenbrenner, 1979), psychological development cannot be considered without taking into account the interactions between children and the context where children live. Children's development is not only influenced by the *micro-system*, the closest context to the children (family, school, playground, hospital...) and the *mezzo-system*, the relationships between the children's micro-systems, but also by the *exo-system*, or social setting which may influence children and offers assets or resources to them and their families (local government, parents' place of work, social services, mass-media, relatives, neighborhood, etc.), and the *macro-system*, which concerns the culture, social beliefs, attitudes, traditions, and laws of the wider society.

The adoption of a developmental ecological perspective is of absolute concern when the consequences of disasters are to be interpreted (Murray & Hudson-Barr, 2006). The effect of a disaster not only depends on its characteristics, but also on the previous characteristics of the microsystem, mezzosystem, exosystem and macrosystem (Bronfenbrenner, 1979). If a disaster takes place, the quality of these contexts may or may not play an important role offering assets, protection, and reducing risks. The developmental ecological approach is also adequate to plan intervention programs in case of a disaster (Hoffpauir & Woodruff, 2008).

From a resiliency perspective, individuals may surmount threat and adversity and show positive adaptations thanks to protective processes occurring over time and involving individual, family and larger socio-cultural influences, which interplay in complex ways (Wright & Masten, 2005). Both ecological and resilience perspectives are complementary to explain how assets and protective factors moderate the effects of disasters and result in adaptive processes. Correlates or predictors of positive adaptations against risk (Wright & Masten, 2005) are commonly termed protective factors, assets, compensatory factors, or promotive factors.

In contrast, there are vulnerability factors which encompass those indices that exacerbate the negative effects of the risk condition, and make positive adaptations to disasters difficult (Luthar, 2006).

#### *Vulnerability and protective factors in disasters.*

The following protective/vulnerability factors were described to have an effect on children's and adolescents outcomes to disasters.

#### *Degree of exposure*

Factors related to each other such as the level of exposure and proximity to the disaster or the degree of exposure have been consistently reported as determinants for the magnitude of the responses children show. The severity of exposure to disaster has also been an aggravating factor in PTSD and other reactions of psychological distress (anxiety, depression) reported in cases of huge bush fire in school children (McDermott & Palmer, 2002), sniper attack on their elementary school (Pynoos et al., 1987), shipping disaster in adolescence (Udwin, Boyle, Yule, Bolton, & O'Ryan, 2000), hurricanes (Lonigan et al., 1994; La Greca, Silverman, Vernberg, & Prinstein, 1996; Osofsky, Osofsky, & Harris, 2007), and in the case of the Exxon Valdez oil spill in Alaska (Palinkas et al., 1993).

#### *Gender differences*

With regards to gender differences, inconsistent results have been found. Some studies inform of greater vulnerability in females to different types of disaster indicated, for example, by higher anxiety and emotional distress (Guarnaccia, Canino, Rubiostepic, & Bravo, 1993; Lonigan et al., 1994) and higher PTSD symptoms (Green et al., 1991; La Greca et al., 1996; Udwin et al., 2000). Other studies, however, did not find gender differences in relation to reactions to disasters (McDermott & Palmer, 2002; Pynoos et al., 1987). And at least one study has even reported a greater increase in anxiety scores in males than in females (Burke, Borus, Burns, Millstein, & Beasley, 1982).

#### *Developmental stages*

Children and adolescents process stressful events in a way different from that of adults. Some authors have described the typical reactions to disasters according to developmental stages and those psychological characteristics of children and adolescents that may determine these reactions (see for example, Deering, 2000; Leavitt, 2002; Williams, 2007). Of interest to the aims of the present research are the following effects: problems of academic achievement reported in school aged children (6-12 years of age), problems in social relationships and problems of

concentration reported in adolescents, as well as avoidance of new activities, lack of interest, withdrawal and apathy in preschool, school age and adolescent children (Beauchesne, Kelley, Patsdaughter, & Pickard, 2002; Deering, 2000; Hagan et al., 2005; Leavitt, 2002; Lubit, Robine, de Francisci, & Eth, 2003; Williams, 2007; Osofsky et al., 2007). Cognitive processes such as attention span, concentration capacity and capacity for arraying events in sequence may also be negatively affected by disasters (Gaffney, 2006).

It has been generally assumed that adolescents are more vulnerable to disasters than preschool or school aged children (Fischhoff, Nightingale, & Iannotta, 2001) because of their capacity to understand the events and their possible consequences, particularly in cases of loss of relatives, friends or devastation (Wright & Masten, 2005), and because adolescents are experiencing a period of complex transitions and greater independence from parents (Deering, 2000; Williams, 2007).

Infants and toddlers have very little understanding of world events occurring around them. They are however sensitive to the mood and responsiveness of their care-givers and any disruptions to their routines. Among the symptoms found among infants and toddlers are anxiety and sadness, regression, loss of sphincter control, loss of verbal skills, temper tantrums, whining and avoidance of new activities and detachment. (Deering, 2000; Hagan et al., 2005).

Preschool-aged children (3-5) often demonstrate the experience of trauma through play, expressing trauma-related themes and aggressive behavior. Sleep disturbances and regressive behaviors such as separation anxiety, enuresis, loss of verbal skills, temper tantrums, whining, avoidance of new activities, have often been observed among preschool children. They may also become withdrawn or apathetic or exhibit somatization and behavioral problems, fears, generalized anxiety, sleepwalking, sleep talking and restless sleep (Deering, 2000; Hagan et al., 2005; Lubit et al., 2003; Williams, 2007). Post traumatic stress disorder (PTSD) (50%), followed by oppositional defiant disorder (ODD) (33.8%), attention deficit hyperactivity disorder (ADHD) (25%), major depressive disorder (MDD) (21.4%), and separation anxiety disorder (SAD) (14.7%) were the most common disorders found by Scheeringa and Zeanah (2008) among preschool children ( $n = 70$ ) following hurricane Katrina. Most of these disorders had an onset post-Katrina: PTSD (94.3%), MDD (60%), ODD (56.5%) and SAD (50%), excepting ADHD (29.4%). ODD and SAD showed high rates of concurrent onset with PTSD. The children studied were severely impacted psychologically by hurricane Katrina, although approximately two thirds of the sample had evacuated before the storm.

School-aged children (6-12) tend to focus on specific details of the tragedy and on personal safety. Fear, sleep disturbances or nightmares are frequent. Some may suffer disruptions in their appetite, lapse into a variety of anxiety,

depressive and somatic disorders, and manifest obsessions about details of trauma, avoidance of social activities at school, fluctuations in behavior, and disruptions in academic performance (Beauchesne et al., 2002; Deering, 2000; Leavitt, 2002; Lubit et al., 2003; Williams, 2007). Cognitive processes such as attention span, concentration capacity and capacity for arraying events in sequence may also be negatively affected by disasters (Gaffney, 2008).

The psychological response to disaster among adolescents most closely resembles that of adults; symptoms of depression and anxiety predominate. Adolescents' sense of security and hope for the future may also be threatened. Adolescents are a particularly vulnerable group, because they are experiencing a period of complex transitions. The interference with identity development in adolescence can lead to significant behavioral and emotional problems throughout their lives. Adolescents may try to mask or withhold symptoms of adjustment reactions. Some of them respond to disaster by engaging in risk-taking behavior as mechanisms of coping with traumatic stress, and may become unusually aggressive and oppositional, may retreat from others, or may enter precipitously into adult activities such as marrying or quitting school to work. Disasters that result in a loss of lifestyle or loved ones can result in sudden shifts in relationships, concentration problems, eating disturbances, sleep problems and nightmares, somatization, withdrawal, apathy, and depression. (Deering, 2000; Hagan et al., 1997; Leavitt, 2002; Lubit et al., 2003; Williams, 2007).

### *Coping styles*

Coping styles such as social withdrawal, self-blaming, and emotional regulation seem to be associated with more severe reactions to disasters, while children who seek social support and engage in cognitive restructuring tend to show higher levels of resilience (Jeney-Gammon, Daugherty, Finch, Belter, & Foster, 1993; La Greca et al., 1996). In line with these results, Freedy, Shaw, Jarrell, & Masters (1992) have proposed that those coping strategies that restore resources available to victims of disaster reduce distress.

### *Family influences*

The attention to family characteristics as protective or aggravating factors has been focused on parent's reactions or structural dimensions (Hagan et al., 2005; Vogel & Vernberg, 1993). Severity of parental reactions to disasters as well as family climate of irritability and distress have been widely reported as important variables which determine the severity and longevity of children's reactions (Green et al., 1991; McFarlane, 1987; Swenson et al., 1996; Udwin et al., 2000). On the contrary, intact families with a high educational level seem to play a protective role (Guarnaccia et al., 1993; Vogel & Vernberg, 1993), while children

without family are more vulnerable (Sapir, 1993). Further investigation is needed with attention to family process dimensions such as parenting styles or family relationship patterns.

### *Relocation effects*

Evacuation and relocation has been found to have a negative impact on the severity of symptoms (McDermott & Palmer, 2002; Scheeringa & Zeanah, 2008), probably because of the loss of social supports, the distress produced by the evacuation, or the sight of their devastated homes after the disaster. Separation from parents, frequently associated with evacuation, has been reported to cause strong reactions in babies and young children, constituting a stressful situation for them (Deering, 2000; Osofsky et al., 2007), which may produce more persisting symptoms (McFarlane, 1987).

### *Community resources and social support*

Lower levels of social support, and particularly low support from teachers, have been found to be associated with higher PTSD symptoms (La Greca et al., 1996), while good standards of social services available to families alleviate distress (Murray & Hudson-Barr, 2006; Vogel & Vernberg, 1993). As Wright and Masten (2005) point out, to date there has been little systematic investigation of culturally based protective processes in resiliency research. Of particular relevance for the present research, Sabucedo, Arce, Ferraces, Merino, and Durán (2009) found that adult population of the same area of the present study got high scores in a scale of perceived social support and satisfaction with the financial aid received, even in those cases of high degree of exposure to the disaster. As the authors indicate (Sabucedo et al., 2009), this scenario is very different from those encountered in other technological disasters (such as that of the Exxon Valdez), in which the affected groups did not have this support and resources available. The study conducted by Sabucedo et al., (2009) indicate the effectiveness of certain exo-system and macro-system variables as protective factors that prevented the population from showing psychological or clinical reactions to the Prestige disaster.

### *Risk Factor: The Prestige disaster.*

The 13th of November 2002, the *Prestige*, a 77,000-ton oil tanker, full of petroleum, suffered a fissure due to a strong storm as well as its inadequate safety conditions, and the ship finally sank 133 miles from the Galician coast the 19<sup>th</sup> of November. The 17<sup>th</sup> of November, 50 kms of the Galician coast had already been affected by the first black tide. A second black tide took place after the sinking of the ship. Efforts were made by the government and sailors to protect the coast from the oil spill, but by the

20<sup>th</sup> of November, 290 km of the coast had been affected by the thick oil spill. The spill from the *Prestige* continued for several weeks after the sinking of the vessel. Apart from the dramatic ecological impact of the *Prestige*'s sinking in a very rich area in terms of the variety and quantity of fish, shellfish, and bird species, the oil spill endangered the work of around 120,000 Galician people who directly or indirectly make a living from fishing activities: fish canning factories, ice factories, transportation companies, ship suppliers, fishing tackle providers, fish sellers, etc. The *Prestige* disaster also had an important impact on tourism. The government prohibited fishing activities in the areas affected, and gave a wage or compensation to sailors and ship owners until the areas were open again to fishing (García, 2003). Loss of properties, family separation, or relocation, which usually have negative consequences, did not exist in the *Prestige* disaster.

The economic effects of the catastrophe were mitigated, however, by the important means provided by the government and an extremely wide movement of solidarity in all Spain, with thousands of volunteers coming to the Galician coast to help with the cleanup campaign (García, 2003). Many different organizations (universities, hospitals, factories, etc.) organized volunteer help for the cleanup project. The government provided adequate clothes and instruments for the project, and spent 210 million Euros on the recovery of the coast and the 786 beaches affected. Fortunately, about 1 year after the disaster, fishing activity was again restored in the most affected area (and even earlier in those not so badly affected), and the negative effects on the wellbeing of the population and the natural environment were much lower than expected. The high level of satisfaction with the financial settlement seemed to play an important role in the perceived effects of this disaster, and this, in turn, had consequences on mental distress (Murphy, 1989; Sabucedo et al., 2009). In this regard, the possible consequences of the *Prestige* crisis were mitigated by the actions taken.

In contrast to other similar situations, such as the Exxon Valdez sinking in Alaska (Palinkas et al., 1993), social relationships among the local population or among the local population and people coming from other regions to help in the cleanup activities were not problematic at all; all the contrary. The reaction of the population took place in a general climate of criticism towards the attitude of the government, because of its inadequate management of the crisis, and this contributed to a more adequate governmental response later (García, 2003).

Relevant to the present research is the fact that there were different degrees of exposure to the disaster depending on the geographical situation of the towns (see the Method section for more details) given that the magnitude of the consequences and family proximity to the disaster are considered to be influential factors in determining their effects (Conway, Bernardo, & Tontala, 1990; Hagan et al.,

2005; McDermott & Palmer, 2002; Murphy, 1989; Vogel & Vernberg, 1993).

Previous experience of the Galician people with other shipwrecks throughout the last 25 years must help to develop adequate strategies which may have contributed to develop a kind of resiliency derived from the social context (Sameroff & Rosenblum, 2006).

### *Aims*

The challenge of the present study, which may be considered a school-based study (La Greca, 2006), is that of identifying those personal, family or contextual variables which may contribute to lessen (protective factors) or exacerbate (vulnerability factors) the effect of the oil spill (risk) on the sample studied, and how they interact (see the constructs of the variables below).

Resiliency is defined on the basis of external adaptation criteria (outcomes): academic achievement and classroom behavior, measured before and after the disaster as described in the method section. These indicators are considered as appropriate for being studied with school age children (Luthar, Cicchetti, & Becker, 2000). Resiliency is considered to exist if dependent variables (academic achievement and classroom behavior) remain stable before and after the *Prestige* disaster as a result of the effect of protective factors and assets.

Distance from the oil spill as well as the professional activity of the parents (related to fishing or not) may be considered as risk factors in the present research. In addition, three sets of factors or assets implicated in the development of resilience are taken into consideration (Luthar et al., 2000): 1) personal characteristics of the children themselves (developmental level and coping strategies), 2) aspects of their families (parents' education, family cohesion and adaptability), and 3) characteristics of the wider social environments (context), coming from the exosystem and the macrosystem, as reported in the description of the *Prestige* disaster. This last group of characteristics is also considered in the interpretation of the results, although their direct effect can only be studied in cross-cultural comparisons, which are difficult to perform in such kinds of disasters.

### *Hypotheses*

There are three hypotheses guiding the present research:

1) There will be a higher effect of the disaster on those participants who live in the most affected areas.

2) Adolescents are at more serious risk than the other groups of preschool and primary aged children given their higher capacity of understanding the consequences of the oil spill and the higher vulnerability associated with this developmental stage.

3) Personal and family (microsystem) factors will have diverse protective effects on the capacity of recovery from the disaster.

## Method

### Participants

A total of 430 participants aged between 5 and 16 and their parents, from 23 localities along the Galician coast were selected. 98% of the sample came from two parent families. The participants were contacted through public schools from those 23 localities, which were selected from the three sampling zones of the study (see below), depending on their degree of exposure to the oil spill. Eight students from every school and each of the three age groups or educational levels (see below) were asked to participate. Half of them had a father whose professional activity was directly related to fishing, and the other half did not. A balanced sample in relation to gender distribution was also a concern. The former criteria were not always met for different reasons: in some cases the school did not have the three educational levels, or there were not always children from each of the specified groups (fathers' professional activities and gender) willing to participate. Participation was voluntary and not paid.

The children were classified in three age groups: a preschoolers group of 106 children between 5 and 6, a primary school-aged group of 177 children aged between 10 and 11, and an adolescent group of 147 students between 15 and 16 years of age. The children were contacted through schools located in the above mentioned 23 localities, and previous consent was obtained from school administrators and parents. As indicated above, the participants varied according to their place of residence (geographical zone) and their parents' profession, two critical variables to be analyzed. The distribution of the sample regarding these dimensions may be observed in Table 1.

### Measures

*Outcomes/dependent variables:* Two types of outcomes were evaluated: academic achievement and teachers' ratings on children's classroom behavior, which are among the typically explored outcomes in resilience research with children, usually assessed through others' reports (teachers, parents or classmates) (Luthar, Sawyer, & Brown, 2006).

Academic achievement of the school-aged children and adolescents was determined as the sum of the academic qualifications (grades) in school records obtained during the academic years previous to and after the spill. Therefore, academic achievements from the year previous to the disaster and after the disaster were gathered for comparison. (There are no qualifications for preschool children in the Spanish educational system). It is interesting to note that the academic qualifications for the school records were given in June, that is to say, seven months after the oil spill, and they reflect the marks obtained throughout the entire course in which the oil disaster took place. The sum of all academic qualifications was obtained for 10 and 15 year-old participants. 10 year-old children could get a score between 1 and 4 in each subject matter (7 subjects in all). The total score could therefore vary between a minimum of 7 and a maximum score of 28. 15 year-old adolescents could get a score between 1 and 5 in each subject matter (10 subjects in all). Therefore the total score could vary between 10 and 50 points.

Classroom behavior of the preschool, school-aged children and adolescents was reported by their teachers, by answering the Classroom Behavior Inventory (CBI) (Schaefer & Edgerton, 1978). The teachers were asked to rate the children's classroom behavior at the time of the research and, retrospectively, one year before the disaster (the teachers were almost always the same on both occasions, and if not, the tutor passed the form on to a teacher from the year before). The CBI is a questionnaire composed of five subscales, namely intelligent behavior (verbal intelligence, creativity, curiosity), extroversion/introversion, considerateness/hostility (to others), independence/dependence (on the teacher), task orientation/distractibility. Internal consistency and inter-rater reliability reported for the inventory were .87 and .73, respectively. The authors also informed of a multiple correlation of .81 with four subtests of verbal intelligence and academic achievement. Cronbach's  $\alpha$  values found in our sample were similar to those reported for the original validation study: .80, .87, and .78 for the groups of 5-6, 10-11 and 15-16 years of age, respectively, for the results obtained in the CBI applied after the disaster, and practically identical results were found for the CBI applied in relation to the year previous to the disaster.

Table 1  
Sample distribution regarding gender, geographical zone and parents' profession

Age	Gender		Geographical zone			Parents' profession		N
	Boy	Girl	1	2	3	Fishing activity	Non-fishing activity	
5-6 years	52	54	21	45	40	45	61	106
10-11 years	78	99	34	77	66	86	91	177
15-16 years	51	96	36	39	72	70	77	147

Note. 1 = Least affected zone; 2 = Moderately affected Zone; 3 = Most affected Zone.

*Protective/vulnerability factors:* The protective/vulnerability factors considered in the present research were the following.

*Degree of exposure* to the oil spill disaster as an index of risk was measured through the place of residence of the participants (proximity). Places of residence were sorted according to the severity of exposure to the spill. The least affected localities pertained to the shore of Lugo province (Zone 1); localities from the Rías Baixas were moderately affected by the oil spill (Zone 2); finally, the most affected areas corresponded to localities situated in the so-called Costa da Morte (Zone 3 in the study). The validity of this classification was confirmed by the application of a 6 item questionnaire adapted from Palinkas et al., (1993) ( $\chi^2_{(4)} = 22.57, p \leq .001$  for the relationship between degree of exposure and zone). The authors informed that the exposure index derived from the questionnaire was found to have an internal consistency reliability of .74 and .73 for Native-Americans and Euro-Americans respectively. It was also associated with the post-spill prevalence of generalized anxiety disorder ( $\chi^2_{trend} = 27.01, p < .001$ ), PTSD ( $\chi^2_{trend} = 10.50, p < .001$ ) and depressive symptoms ( $\chi^2_{trend} = 4.72, p < .05$ ).

The second index of risk was the relation of *parents' professions* with fishing activities. Those parents with jobs directly related to fishing (sailors, ship owners, fish sellers) were expected to be more affected by the disaster than those parents with professions not directly related with fishing.

Data on *family characteristics* as a protective or vulnerability factor were also obtained. First, parents' educational level was registered as an index of family socioeconomic status. The parents were sorted into two groups according to their education: (1) primary education, (2) secondary education or higher. Second, the Family Adaptability and Cohesion Evaluation Scales (FACES-II) (Olson, Bell, & Portner, 1982) were applied to the parents to obtain data about family relations as well. It comprises 16 items on cohesion (perceived closeness) and 14 items on adaptability (co-responsibility). Olson, Portner, & LaVee (1985) reported internal consistency estimates for cohesion and adaptability of .87 and .78, respectively, and test-retest reliability coefficients of .83 for cohesion and .80 for adaptability. They also registered high correlations between family health and cohesion ( $r = .93$ ) and adaptability ( $r = .79$ ). Cronbach's  $\alpha$  values obtained in our study were .65, .61, and .63 for the groups of 5-6, 10-11 and 15-16 years of age, respectively, for the actual situation of the FACES-III, and .72, .65, and .59 for the same age groups, respectively, for the ideal situation of the FACES-III.

Finally, another possible *personal protective/vulnerability factor*, *coping strategies* of the 2 oldest groups were assessed with the Coping Scale for Children and Youth (CSCY) (Brodzinsky et al., 1992). The preschool group could not be evaluated on this factor, since the test can be only applied to children who can read and have certain metacognitive abilities. The children completed the forms in small groups with the tutor or the interviewer. The scale comprises four

subscales, namely assistance seeking, problem solving, cognitive avoidance and behavioral avoidance. The two former may be considered approximation to the problem strategies, while the two latter are evasive strategies. The authors reported adequate internal consistency across coping subtypes, ranging from .70 to .81. The pattern of correlations obtained by the authors between the CSCY and a similar measure of coping strategies supports its construct validity. Brodzinsky et al., (1992) also demonstrated that the CSCY was positively related to the Kidcope, a similar measure of coping strategies. Internal consistency calculated through the Cronbach alpha index reached .57 both for children aged 10-11 and those aged 15-16 years.

### *Procedure*

A year after the disaster, children were contacted through their schools. A previously trained interviewer was sent to each center. Informed consent was obtained from the parents of the participants. Instruments were joined in a booklet and were administered by the interviewer or the academic tutor. The teachers completed the CBI, the parents the FACES-III, and the children (10-11 years of age, and adolescents) the CSCY. Academic results were gathered from the academic records, and additional information (place of residence, father's profession, etc.) was gathered from the tutor in most cases.

## Results

Prior to the analyses, the data were screened for missing responses and outliers. As the number of cases with missing data were minimal, the analyses were performed omitting those cases where data was missing.

### *1. Effects of the disaster on academic achievement and school behavior in relation to degree of exposure and age (hypotheses 1 and 2).*

First, multivariate analysis of repeated measures 2 x 3 x 2 to establish the effect of age (academic level) and gender on each of the dimensions measured by the CBI before and after the Prestige was performed. The within groups factor was the participants' schoolroom behavior before and after the disaster, and the between groups factors were the academic course (preschoolers, primary school aged, and adolescents) and gender (boy, girl). No difference in schoolroom behavior before and after the Prestige disaster was found. Significant effects of the academic course were found for all the dimensions of the CBI. No effect of gender on the schoolroom behavior of the participants was found. No significant interactions between factors were found. Therefore, separate analyses of each academic course and joint analyses of boys and girls together are justified. The

means, standard deviations, and F values of repeated measures ANOVA 2 (before and after measures) x 3 (zone) x 2 (parents' activities) are shown for preschool children (Table 2), primary school aged children (Table 3) and adolescents' groups (Table 4).

As can be observed in Table 2, there was no general effect of the disaster on the preschool children, since no significant difference was found before and after the Prestige oil spill in all the dimensions measured by the CBI, excepting independence  $F_A(1, 95) = 4,92, p < .05$ . In the case of independence, the scores after the disaster were a bit higher than before (particularly in the most affected zone), which is contrary to the idea of a pernicious effect of the disaster. In the case of consideration to others there was an interaction between zone and parents' profession: children of parents who have a non-fishing professional activity from the most affected zone showed higher levels of consideration than children whose parents had fishing related jobs  $F_{BxC}(2, 93) = 4,72, p < .05$ . Post hoc Bonferroni adjustment did not find any significant difference between pairs.

The results shown in Table 3 indicate that there was an effect of the disaster on the consideration to others in primary school aged children. Children got lower scores (that is to say, higher hostility to others) in this dimension after the Prestige than before  $F_A(1, 126) = 5.91, p < .05$ . In addition school aged children from the moderately affected zone got significantly higher results than their peers from the least affected zone  $F_B(2, 126) = 4.76, p < .01$  in this dimension, which means that children from the least affected zone showed higher levels of hostility than children from zone

2. Post hoc Bonferroni adjustment found significant differences between children from Zone 2 and Zone 3.

The results found for the adolescents group are shown in Table 4, and they point to a higher effect of the Prestige disaster on this age group when compared to the other groups. First, academic scores are lower after the Prestige than before the accident  $F_A(1, 51) = 5.18, p < .05$ . This result points to a consequence of the oil spill disaster on the academic achievement of the adolescents group. In general terms, the group of adolescents showed higher results in different dimensions of the CBI after the Prestige disaster than before: intelligent behavior  $F_A(1, 123) = 15.51, p < .001$ , extroversion  $F_A(1, 123) = 6.85, p < .01$ , and independence  $F_A(1, 124) = 3.75, p < .05$ .

There was an interaction effect of factor A (before-after), B (zone) and C (parents' profession) on independence: adolescents from zones 2 (moderately affected) and 1 (least affected) and with non fishing parents got higher scores than adolescents with fishing parents, and the differences obtained before and after the Prestige were higher; on the contrary, differences between adolescents from different families (fishing/non fishing related) from zone 3 (most affected) were minimal  $F_{AxBxC}(2, 124) = 3.44, p < .05$ . An interaction between factor A and B is observed for independence scores as well, with higher differences before and after the Prestige in the adolescents from zone 2 (moderately affected) than in adolescents from the other zones  $F_{AxB}(2, 124) = 4.85, p < .01$ . No significant differences between pairs were found when Bonferroni post hoc analyses were applied.

Table 2  
CBI mean scores (SD) for preschoolers before and after the spill (factor A), by places of residence (factor B) and parents' profession (factor C), and F value

Zone:	least affected zone		moderately affected zone		most affected zone		F
	fishing	non fishing	fishing	non fishing	fishing	non fishing	
Intelligent behavior							
Before	35,66 (10,23)	39,26 (7,16)	32,91 (8,23)	35,79 (6,31)	33,07 (12,00)	38,04 (11,24)	
After	35,66 (10,23)	39,26 (7,16)	33,00 (8,26)	35,89 (6,27)	33,14 (11,72)	38,43 (11,21)	
Extroversion							
Before	32,50 (5,00)	32,00 (4,22)	29,16 (6,19)	29,94 (5,96)	32,35 (7,22)	32,54 (7,46)	
After	32,50 (5,00)	32,00 (4,22)	29,54 (5,52)	30,52 (5,45)	32,92 (6,45)	33,08 (7,15)	
Consideration							
Before	29,80 (5,58)	27,86 (5,05)	27,78 (4,53)	26,44 (3,64)	25,35 (4,37)	29,87 (4,54)	$F_{BxC}(2, 93) = 4,72^{**}$
After	29,80 (5,58)	27,86 (5,05)	27,86 (4,47)	26,44 (3,64)	25,57 (4,58)	29,91 (4,61)	
Independence							
Before	30,33 (6,74)	29,06 (7,52)	28,50 (5,51)	29,83 (4,86)	29,92 (5,44)	31,69 (8,07)	$F_A(1, 95) = 4,92^*$
After	30,33 (6,74)	29,06 (7,52)	28,90 (5,37)	30,11 (4,77)	30,57 (5,57)	31,76 (7,92)	
Task orientation							
Before	27,60 (9,09)	25,86 (6,59)	25,91 (5,89)	28,05 (4,52)	23,14 (6,33)	28,32 (8,39)	
After	27,60 (9,09)	25,86 (6,59)	29,16 (5,77)	28,05 (4,52)	23,42 (6,66)	28,52 (8,05)	

\*  $p < .05$ . \*\*  $p < .01$



Table 3

Academic achievement and CBI mean scores (SD) for school-aged children before and after the spill (factor A), by places of residence (factor B) and parents' profession (factor C), and F values

Zone:	least affected zone		moderately affected zone		most affected zone		F
	fishing	non fishing	fishing	non fishing	fishing	non fishing	
Academic achievement							
Before	13,66 (0,88)	13,47 (1,50)	13,21 (1,51)	13,51 (1,31)	13,73 (0,73)	13,67 (1,02)	
After	13,83 (0,57)	13,23 (1,39)	13,50 (1,21)	13,74 (0,63)	13,50 (1,13)	13,67 (0,86)	
Intelligent behavior							
Before	36,66 (8,80)	34,50 (10,72)	31,37 (8,38)	35,16 (11,13)	35,13 (10,03)	36,08 (7,86)	
After	36,44 (9,23)	34,00 (10,70)	30,75 (8,36)	35,03 (11,52)	34,45 (9,72)	35,75 (7,45)	
Extroversion							
Before	30,70 (4,66)	30,07 (4,89)	30,28 (5,57)	32,37 (4,86)	31,08 (6,96)	29,89 (5,76)	
After	30,30 (4,90)	30,00 (5,18)	29,96 (5,40)	32,48 (4,77)	30,69 (6,91)	29,60 (5,64)	
Consideration							
Before	30,20 (2,74)	29,71 (4,61)	30,96 (5,71)	31,20 (5,39)	27,30 (7,54)	28,11 (5,17)	$F_A(1, 126) = 5,91^*$
After	29,80 (3,61)	29,57 (4,51)	30,62 (5,67)	30,56 (5,53)	26,86 (7,78)	27,61 (5,60)	$F_B(2, 126) = 4,76^{**}$
Independence							
Before	28,45 (3,77)	27,94 (5,51)	27,43 (5,97)	30,32 (6,74)	28,26 (6,87)	28,69 (6,70)	
After	28,36 (3,90)	27,82 (5,89)	27,28 (5,66)	29,92 (7,07)	28,00 (6,75)	28,03 (7,24)	
Task orientation							
Before	27,50 (3,45)	27,47 (5,75)	25,54 (7,22)	28,58 (8,99)	27,95 (8,44)	26,64 (6,99)	
After	27,50 (3,80)	27,64 (6,07)	25,90 (7,22)	28,48 (9,00)	27,42 (8,35)	26,20 (7,53)	

\*  $p < .05$ . \*\*  $p < .01$

Table 4

Academic achievement and CBI mean scores (SD) for adolescents before and after the spill (factor A), by places of residence (factor B) and parents' profession (factor C), and F values

Zone:	least affected zone		moderately affected zone		most affected zone		F
	fishing	non fishing	fishing	non fishing	fishing	non fishing	
Academic achievement							
Before	29,66 (17,78)	35,33 (12,58)	27,50 (3,53)	40,57 (9,57)	31,40 (11,70)	35,60 (11,44)	$F_A(1, 51) = 5,18^*$
After	28,33 (18,77)	32,00 (14,42)	28,50 (6,36)	38,00 (10,44)	29,13 (10,79)	31,50 (10,24)	
Intelligent behavior							
Before	11,90 (3,85)	14,20 (3,17)	11,25 (2,79)	12,40 (3,79)	12,09 (2,91)	12,51 (3,31)	$F_A(1, 123) = 15,51^{***}$
After	12,36 (4,45)	13,58 (3,60)	12,37 (2,68)	12,46 (3,70)	12,40 (2,90)	12,68 (3,24)	$F_{A \times C}(1, 123) = 8,39^{**}$
Extroversion							
Before	14,75 (3,79)	16,65 (2,68)	14,06 (3,35)	12,64 (3,83)	14,53 (3,67)	13,42 (3,29)	$F_A(1, 123) = 6,85^{**}$
After	14,66 (3,62)	16,80 (2,83)	14,50 (3,30)	13,07 (4,19)	14,87 (3,61)	13,60 (3,33)	$F_B(2, 123) = 3,36^*$
Consideration							
Before	16,91 (2,35)	17,10 (2,65)	14,62 (3,86)	16,93 (2,93)	15,21 (3,51)	14,97 (3,77)	$F_B(2, 124) = 3,16^*$
After	16,83 (2,32)	17,05 (2,50)	14,56 (4,21)	16,86 (3,02)	15,31 (3,44)	14,97 (3,77)	
Independence							
Before	12,50 (4,37)	14,35 (3,06)	11,68 (2,02)	13,46 (3,85)	13,00 (2,59)	13,11 (3,36)	$F_A(1, 124) = 3,75^*$
After	12,41 (4,23)	14,35 (3,06)	12,68 (2,67)	13,60 (3,79)	12,90 (2,56)	13,17 (3,29)	$F_{A \times B}(2, 124) = 4,85^{**}$
Task orientation							$F_{A \times B \times C}(2, 124) = 3,44^{**}$
Before	11,66 (3,42)	13,55 (3,03)	11,37 (2,72)	12,73 (3,76)	12,18 (3,08)	12,91 (4,23)	
After	12,00 (4,13)	13,40 (2,83)	12,06 (3,04)	12,66 (4,27)	12,12 (3,08)	13,08 (4,11)	

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

Differences between intelligence behavior scores before and after the Prestige disaster were higher for the subjects with parents with fishing related activities  $F_{A \times C}(1, 123) = 8.39, p < .01$ , which indicates the existence of an interaction effect between parents' professional activities and factor A (before and after).

In addition there was an effect of the zone for extroversion and consideration. Participants from the least affected zone scored higher on extroversion than the rest  $F_B(2, 123) = 3.36, p < .05$ , and higher on consideration than adolescents from the most affected zone  $F_B(2, 124) = 3.16, p < .05$ . Significant differences in extroversion between Zone 1 and Zone 2, and between Zone 1 and Zone 3 were found when Bonferroni post hoc analyses were applied. Significant differences in consideration were also found between Zone 1 and Zone 3.

## 2. Effects of the protective factors (hypothesis 3).

To evaluate the effect of demographic, psychological and family factors on changes in school performance and schoolroom behavior a series of hierarchical regression analyses were carried out. School adjustment indexes after the Prestige disaster (academic achievement, intelligent behavior, extroversion, consideration, independence, and task orientation) served as criterion variables. Predictor variables were the following: Step 1 school adjustment indexes before the disaster; Step 2 coping strategies (assistance seeking, problem solving, cognitive avoidance and behavioral avoidance); Step 3 parents' education (in ascending order); Step 4 family cohesion and adaptability; Step 5 geographical zones in ascending order of degree of exposure; Step 6 activity of parents' occupation (fishing/non-fishing related).

For preschool children, the overall proportions of variance explained by school adjustment indexes before the disaster (step 1) reached very high and significant levels: intelligent behavior ( $\Delta R^2 = .993, p < .001, \beta = .997$ ), extroversion ( $\Delta R^2 = .939, p < .001, \beta = .976$ ), considerateness ( $\Delta R^2 = .992, p < .001, \beta = .996$ ), independence ( $\Delta R^2 = .978, p < .001, \beta = .989$ ), and task orientation ( $\Delta R^2 = .990, p < .001, \beta = .995$ ).

The only additional factor which reached significant effect for this age group was cohesion (step 3), which accounted for a low proportion of variance of extroversion ( $\Delta R^2 = .008, p < .05, \beta = -.068$ ).

Similarly, for primary school aged children very high proportions of variance were explained by the same school adjustment indexes measured before the disaster (step 1): academic achievement ( $\Delta R^2 = .477, p < .001, \beta = .691$ ), intelligent behavior ( $\Delta R^2 = .931, p < .001, \beta = .965$ ), extroversion ( $\Delta R^2 = .928, p < .001, \beta = .963$ ), considerateness ( $\Delta R^2 = .913, p < .001, \beta = .955$ ), independence ( $\Delta R^2 = .911, p < .001, \beta = .954$ ), and task orientation ( $\Delta R^2 = .919, p < .001, \beta = .958$ ).

In addition, a few other factors contributed to explain the variance of criterion variables to some degree. Adaptability (step 4) contributed to explain the variance of intelligent behavior ( $\Delta R^2 = .004, p < .05, \beta = -.076$ ); considerateness was explained to some degree at step 2 by cognitive avoidance ( $\Delta R^2 = .004, p < .05, \beta = .046$ ) and behavioral avoidance ( $\Delta R^2 = .004, p < .05, \beta = -.042$ ); independence was explained to some degree by cognitive avoidance ( $\Delta R^2 = .008, p < .05, \beta = .068$ ) and behavioral avoidance ( $\Delta R^2 = .008, p < .05, \beta = -.065$ ) at step 2, and by parents' professional activity at step 6 ( $\Delta R^2 = .003, p < .05, \beta = -.060$ ).

Variance of the criterion variables in the adolescents group was mainly explained by school adjustment measures before the Prestige disaster (step 1) once again: academic achievement ( $\Delta R^2 = .843, p < .001, \beta = .918$ ), intelligent behavior ( $\Delta R^2 = .909, p < .001, \beta = .953$ ), extroversion ( $\Delta R^2 = .929, p < .001, \beta = .964$ ), considerateness ( $\Delta R^2 = .956, p < .001, \beta = .976$ ), independence ( $\Delta R^2 = .911, p < .001, \beta = .954$ ), and task orientation ( $\Delta R^2 = .900, p < .001, \beta = .949$ ). However, the variance of adolescents' academic achievement was also explained by problem solving at step 2 ( $\Delta R^2 = .046, p < .05, \beta = -.201$ ), parents' educational level at step 3 ( $\Delta R^2 = .017, p < .05, \beta = .132$ ), and occupational activity of parents at step 6 ( $\Delta R^2 = .017, p < .05, \beta = -.141$ ).

There was no effect of protective factors on schoolroom behaviors for this age group.

## Discussion

The oil spill seemed to affect the different age groups in different ways. Preschool children were hardly affected by the disaster. In any case, the only difference found was in independence, in which preschool children had higher scores after the Prestige oil spill than before. This cannot be considered a negative effect at all, and it may be that the improvement in this measure is related to a developmental change not necessarily related to the disaster. The characteristics of the disaster (with no home destruction or evacuation) and the type of measures make a difference between the results we found and those of Scheeringa and Zeanah (2008). The low scores found in consideration to others in preschool children whose parents had fishing related professions coming from the most affected zone do not reveal any effect of the Prestige disaster, but probably only pre-existing differences with their peers whose parents do not have fishing related professions.

The impact of the disaster had consequences on social behavior of primary school children: their hostility grew after the disaster, which may point to problems of social adjustment.

Probably, the gravest effects of the disaster were observed in adolescents. Their academic scores decreased

significantly after the Prestige oil spill, which indicates a negative effect of the disaster on their academic achievement, which agrees with previous proposals (Wright & Masten, 2005). In contrast, the significant increase in the scores of intelligent behavior, extroversion and independence after the disaster point to no direct negative effect of the disaster on the schoolroom behaviors of the adolescents. However, an effect of the degree of exposure may be observed in the dimension of independence, since the increase of the scores in independence were significantly higher after the disaster in adolescents from zones 1 (least affected) and 2 (moderately affected) whose parents had non fishing related jobs as compared to adolescents from zone 3 (most affected). This result would indicate a minimal effect of the zone of residence and the activity of the parents (degree of exposure): those children with families lesser affected and living in the less affected areas would show a higher increase of independence behavior than children from the most affected area.

Independence scores increased more after the disaster in those adolescents from zone 2 (moderately affected) than from the other zones. In zone 2 there was an interesting social reaction on part of the population, who were able to organize themselves as a group to protect the coast from the black tide. Unlike other zones, dependence on external help (governmental help and volunteers coming from other places) was much lower, and solidarity and independence within the group were much higher. Our suggestion is that this social experience may have had a positive impact on the adolescents from zone 2. It is worth noting that the combined effect of factor A (before/after) and B (zone) reaches significance only for the group of adolescents, who are more sensitive to those moral actions and had a higher capacity than younger children to draw lessons from experience.

Intelligent behavior significantly grew after the Prestige disaster in adolescents whose parents had fishing related jobs. In any case, the outcome is not negative at all, and may reflect a resilience effect, probably related to the government help to their families, who received a wage during the time of the forced stoppage of their professional activity.

In addition to these direct or combined effects of the disaster reported above, a few other differences were found in preschool, school age children and adolescents associated to the zone factor or a combination of zone and parents' professions that are not relevant in the discussion of the effects of the oil spill.

No gender differences were found in the outcomes before and after the Prestige oil spill. This result supports former studies where no gender differences were found in the reactions to catastrophes (McDermott & Palmer, 2002; Pynoos et al., 1987).

In relation to the protective effect of personal or family factors, the findings are not very relevant for preschool

children. At this age, the only factor which contributed to some degree in the outcomes after the disaster was family cohesion, which explained 0.8% of the variance of extroversion, a measure that did not show the effects of the oil spill. This result means that children from families with close relationships, strong emotional links and with a sense of belonging tend to be more extroverted than the others.

At primary school age, family factors, adaptability in particular or parents professional activity, and coping strategies, such as behavioral avoidance and cognitive avoidance, had a limited effect on several dimensions of schoolroom behavior, such as intelligent behavior, considerateness, or independence, as the results of the hierarchical regression analyses show. These results indicate a very limited protective effect of these factors on several of the schoolroom behaviors. The results found for adolescents are slightly different from those observed in primary school age children. No effect of coping strategies or family factors was observed on schoolroom behavior measures. However, the variance of academic achievement, an outcome affected by the disaster, was partly explained by problem solving (0.4%), parents' educational level (1.7%) and parents' occupational activity (1.7%). These results mean that those adolescents who have a tendency towards adopting problem solving strategies to cope with problems (make an effort to find a solution), and whose parents have a high educational level (secondary education or more) and do not have a fishing related job, have slightly more probabilities of getting higher academic scores, while the opposite is true for those adolescents with opposite characteristics (low problem solving strategies, parents with low educational level, and with fishing related jobs). Therefore, those factors may play a role for adolescents in relation to risks for bad academic performance as a consequence of the disaster.

Thus, the results found give support to the hypothesis that personal and family (microsystem) factors may have effects on the capacity of recovery from the disaster. Although, in general, the effects of certain coping strategies and family characteristics were very modest for preschool and primary school age children in relation to schoolroom behavior, these factors nevertheless had impact on the academic achievement -but not schoolroom behavior- of the adolescents.

Support was also found for the hypothesis that adolescents are at more serious risk than the other groups of preschool and primary aged children, since there were more effects of the oil spill on their outcomes than for any other group. In addition, combined effects of the disaster, zone of residence and parents' profession (degree of exposure) were also found for this age group, indicating adolescents' higher vulnerability to the disaster. Therefore, the hypothesis that there would be graver effects of the disaster on all those participants who lived in the most affected areas could not be confirmed in general terms, given

that this factor had a limited effect on the independence and intelligent behavior of only the adolescents most affected by the disaster.

In all, the results found indicate a relatively reduced effect of the oil spill. This was true probably thanks to the action of protective factors which favored resiliency. Some of them had diverse effects, as has been already observed. Other protective factors, such as social support and financial aid (Sabucedo et al., 2009), probably had a widespread impact, since they correspond to the macrosystem and exosystem context. The adoption of a developmental ecological perspective is of absolute concern when the consequences of disasters are to be interpreted (Murray & Hudson-Barr, 2006), and the influence of macrosystem and exosystem factors have to be taken into account. In the case of the *Prestige* disaster, the economic, social and technical measures adopted by the government would not have been possible in a less developed country. The payment of a salary to those most directly affected by the oil spill, for instance, would not have been possible in a developing country. These measures seriously mitigated the economic and social consequences of the *Prestige* disaster. On the other hand, the reactions of the entire society to the disaster, and the admirable movement of solidarity, enhanced positive social relationships, in contrast to what has sometimes occurred previously in similar situations (Palinkas et al., 1993). This has also possibly had an effect on children and adolescents. The limited effect of the disaster found in the present research probably reveals the existence of a resiliency effect in the population most directly affected by the disaster, which was probably due to the positive reaction of the entire society, constituting a clear example of community resiliency (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008) or resiliency derived from the social context (Sameroff & Rosenblum, 2006). Obviously, the effects of these culturally based factors are difficult to evaluate and to date there has been little systematic investigation of these protective processes in resiliency research as Wright and Masten (2005) pointed out. A direct effect of those protective factors pertaining to the macrosystem and the exosystem can only be tested in cross-cultural comparisons, which are difficult to perform in such kinds of disasters.

### Conclusions

The study indicates that one year after, the *Prestige* disaster hardly had consequences. In any case, consequences were greater for adolescents, whose academic achievement was slightly affected, and, to a lesser extent, for primary school age children who showed an increase in hostility. In addition a few personal, family and contextual protective factors were identified. These factors had diverse effects depending on the outcomes assessed, and the age of the participants.

The social reaction spawned by the *Prestige* disaster may have acted as a community resilience factor that alleviated the negative consequences that were expected at first. We could probably learn from this experience to try to prevent negative consequences when dealing with other similar disasters in the future.

Ideally, the study of the consequences of a disaster should be performed over a period of time, with different occasions of measurement, in order to get a better description of the evolution of the adaptation to the disaster by each participant. However, the sudden irruption of any disaster makes the design of studies of its effects difficult, as well as the planning of intervention (La Greca & Silverman, 2009). All societies, and advanced societies in particular, are in need of plans to prevent the effects of disasters (Osofsky et al., 2007).

### Limitations

It is possible that if other outcomes had been assessed, and the effects of other protective factors studied, we could have obtained a more complete picture of the consequences of the catastrophe.

We also have to take into consideration that measurements of schoolroom behavior before the *Prestige* were given in a retrospective way by the teachers of the participants. Undoubtedly this fact reduces the validity of the results. There may also be limitations related to the instruments used to assess the variables under study.

In addition, as this is a correlation study, associations between variables cannot be taken as definite causal links between them.

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