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Interparental Conflict Appraisals and Adolescents' Maladaptation in Siblings: An Actor-Partner Interdependence Model

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Abstract
The aim of this study was to evaluate dyadic effects among siblings by testing an actor–partner interdependence model of associations between interparental conflict perceptions and children maladjustment. In particular, associations between siblings' perceptions of interparental conflict properties, threat, and self-blame, and general, personal, school, and social maladjustment and adolescents' family and sibling dissatisfaction were examined. The hypotheses of the study were analyzed through an Actor-Partner Interdependent Model. The sample was made up of 50 pairs of siblings recruited in Spain; older siblings' mean age was 13.3 years ($SD = 2.51$) and younger siblings' mean age was 10.4 years ($SD = 2.33$). The results emphasize the association between children's and adolescents' perception of interparental conflict and their own maladjustment (actor effect). However, the main novel contribution of this study is the analysis of partner effects for siblings in interparental conflict situations and the results highlight that they are greater for older siblings compared to younger siblings. Also, the results confirm the interdependency of siblings' perceptions of interparental conflict properties, but also the independency of threat and self-blame feelings experienced by each sibling. Results and limitations of the study are discussed.

Keywords: Siblings · Interparental conflict · Actor-partner model · Adolescents · Dyads

Highlights
- The novel contribution of this study is an Actor-Partner Interdependent Model analysis of siblings in interparental conflict
- There are greater partner effects for older siblings compared to younger siblings in interparental conflict situations
- The self-blame and threat feelings experienced by each sibling are not inter-dependent

The significant relationship between interparental conflict (IPC) and children maladjustment has been a well established fact for several decades (Amato & Keith, 1991; Grych & Fincham, 1992; Hetherington et al., 1998). Various theoretical explanations of the negative impact of IPC have identified key harmful characteristics, stressing that hostile, aggressive, unresolved, and child-related IPC is strongly associated with children maladjustment (Buehler et al., 1997; Davies & Cummings, 1994; Grych & Fincham, 1990). Grych and Fincham's (1990) cognitive-contextual model is a complete and organized theoretical framework explaining the association between IPC and children adjustment. However, there is great variability in how IPC specific characteristics affect different areas of children adjustment (individual, social, family…; Cummings & Davies, 2002). Therefore, literature should take into account not only individual variables (p.e. age, gender) but also interactional or family variables, such as the influence of other family members, like siblings, to better understand the impact of IPC on child and adolescent development (El-Sheikh et al., 2009; Lucas-Thompson & George, 2017).

The family-systems perspective is the theoretical framework on which the study is based and it emphasizes the interdependencies between family subsystems, such as sibling relationships (Cox & Paley, 2003). However, most

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research has focused primarily on parental influences in children learning process of emotional and behavioral regulation (Morris et al., 2007), and more work is needed on how other important family and contextual factors, such as siblings, peers, school, and culture affect children emotions and behaviors.

On the one hand, concerning siblings' emotional and behavioral learning, children are "infected" by the emotional and behavioral responses they observe in the emotional expressions and interactions of other family members, such as older siblings. Therefore, siblings' emotional and behavioral responses are interdependent, and there are different underlying processes to explain this mutual influence. In line with this, Morris et al. (2007) indicated that the contagion and transfer of behaviors and emotions within the different family subsystems, such as the sibling subsystem, occur through different pathways: observational emotional learning, emotional contagion, and social referencing. Firstly, the observational learning theory (Bandura, 1977) specifically suggests that children learn that certain emotions are provoked by certain situations and they observe the reactions of significant others to know how they are expected to react in similar situations (Denham et al., 1997). Secondly, the emotional contagion approach proposes that the emotions experienced by a member of the family, particularly negative emotions, may actually induce negative emotions in other family members (Saarni et al., 1998). Lastly, social referencing is another way that children learn about emotions and behaviors. Social referencing is the process of looking at another person, for example, older siblings, for information about how to respond, think or feel about an environmental event or stimulus (Saarni et al., 1998). Hence, it is clear that children model emotions and behaviors through experiences in the family; and that experiences with, and observations of, parents and siblings are essential for their emotional and behavioral learning and, consequently, their psychological adjustment and well-being.

On the other hand, the cognitive-contextual model offers solid evidence of the association between frequent, intense, violent, child-centered, and unresolved IPC and children maladjustment (Grych, Raynor, & Fosco, 2004). It also holds that, besides the objective characteristics of IPC (e.g., frequency, intensity, and resolution), children's subjective perception of their parents, especially perceived threat and self-blame, are implicated in the impact of IPC on their maladjustment (Fosco & Feinberg, 2015; Rhoades, 2008). Threat perception is the belief that IPC is a risk for the family and for their own well-being, reflecting their concern that, if IPC escalates, it can lead to divorce or be redirected towards the children. Self-blame reflects children's belief that they are responsible for and the cause of IPC (Atkinson et al., 2009; Grych & Fincham, 1990). Children's perception of threat and self-blame concerning IPC are a risk factor for maladjustment in early childhood (McDonald & Grych, 2006), mid childhood (Fosco & Grych, 2008; Gerard et al., 2005), adolescence, (Fosco & Feinberg, 2015; Grych et al., 2004), and youth (Cusimano & Riggs, 2013). Hence, the relationship between children's and adolescents' IPC perceptions and their maladjustment is relevant to their development.

However, there is evidence that siblings have different perceptions of their parents' relationship, despite being exposed to the same situation (Lucas-Thompson & George, 2017). For instance, significant differences have been found in siblings' rating of IPC (Mekos et al., 1996; Richmond & Stocker, 2003). Lucas-Thompson and George (2017) also found that siblings report interdependent conflict property appraisals but relatively dissimilar self-blame and threat appraisals. However, Lucas-Thompson and George (2017) found discrepancies between siblings' perceptions of IPC objective properties. This suggests that siblings should be included in studies on the effects of IPC in children (Richmond & Stocker, 2007), as siblings differ in their perception, understanding, and appraisal of IPC, leading to different ways of adjustment for each sibling. For example, Iturralde et al., 2013 found low correlations between siblings' levels of self-blame and threat concerning IPC, despite their similar perceptions of the objective characteristics of the IPC (e.g., frequency, intensity, and resolution). In the same line, there is evidence that the association between IPC properties and children's appraisals of it are stronger than the association between IPC and children's threat and self-blame appraisals (Grych et al., 1992; Lucas-Thompson & George, 2017; Shelton & Harold, 2008).

The literature emphasizes that children's perception of threat predicts an increase of internalizing symptoms (Fosco & Feinberg, 2015; Grych et al., 2003), whereas their perception of self-blame predicts an increase of externalizing symptoms (Davies & Forman, 2002; Grych et al., 2003). Therefore, if siblings perceive differing degrees of IPC-related self-blame and threat, the impact of IPC on each sibling's maladjustment will also be different, and this issue has not been analyzed in prior literature, so it constitutes an aim of the current study.

The above-mentioned scientific results on differences between siblings' perception of IPC suggest that it is not the objective properties of IPC itself that have a greater impact on children's maladjustment, but the subjective experience (threat and self-blame) of IPC of each child. Due to the scarcity of studies of siblings and IPC in the literature (Lucas-Thompson & George, 2017), an actor-partner analysis is a novel and ideal approach to analyze sibling interdependence in IPC perceptions, so it is included as an aim of the current study. Hence, it could be expected that the IPC perceptions of one sibling-dyad member may

influence the perceived objective properties of IPC but not the threat and self-blame appraisals of the other sibling-dyad member.

Following this perspective, concerning the influence of one child's psychological maladjustment on his/her sibling's psychological maladjustment, various studies have examined the role of older sibling as a significant model in the socialization of the other siblings in different positive and negative areas (Bandura, 2001, Whiteman et al., 2010): externalizing and internalizing behaviors (Branje et al., 2004), intimacy and control in friendship relations (Updegraff et al., 2002), academic and leisure interests (Whiteman et al., 2007), development of empathy (Tucker et al., 1999), and social skills (Stormshak et al., 1996). Specifically, older siblings can be considered a significant authority on learning how to succeed with friends, particularly in environments away from home, such as school or neighborhood (Zukow-Goldring, 2002). Although there are few works analyzing the function of siblings in academic performance, there is evidence of the role of siblings as models for academic success (Bouchey et al., 2010). Accordingly, it appears that, much like IPC perceptions, psychological maladjustment of children and adolescents may be interdependent within sibling dyads, but it has never been explored in the literature.

Given that both IPC perceptions and children maladjustment may be interdependent among siblings, it is likely that each sibling's perception of IPC is associated with the maladjustment of the other sibling-dyad member. And mentioned, models of the effects of both sibling-dyad members in the association between IPC perceptions and children maladjustment have not yet been evaluated in the literature. It is important to consider sibling dyadic effects in the associations between IPC perceptions and children maladjustment to extend research and practice with families who have more than one child.

Current Study

The current study was designed to evaluate dyadic effects among siblings by testing an actor-partner interdependence model of associations between IPC perceptions and children maladjustment, based on some past studies that pinpoint individual and family variables that could explain not only the differences, but also the interdependence of siblings' IPC appraisals (Lucas-Thompson & George, 2017). In particular, we examined the associations between siblings' perceptions of IPC properties, their threat appraisals and self-blame attributions, and their general, personal, school, and social maladjustment. Consistent with prior evidence (Iturralde et al., 2013), it was hypothesized that sibling's perceptions of IPC properties would be correlated, but not

their threat or self-blame appraisals. Moreover, given the evidence of the interdependence of siblings' maladjustment in different areas (personal maladjustment focused on internalizing and externalizing behaviors, school and social maladjustment), it was hypothesized that siblings' self-reports of maladjustment would be positively correlated. This approach is statistically based on the guidelines of Kenny et al. (2006), which emphasize that this methodology is useful to understand dyadic relations between siblings, studying two effects (actor and partner) while proper statistical allowances are made for the nonindependence in the two persons' responses. Although the quantity of actor-partner studies has recently increased (Lin et al., 2021; Yu et al., 2017; Jambon et al., 2019; Padilla et al., 2021), these relationships have never been examined in an actor-partner interdependence model design with a Spanish sample, and this is one of the main contributions of this study.

In addition, sibling relationships are interdependent in nature but the literature has hardly ever analyzed sibling interdependence, so further dyadic research approaches are required to deeply understand the dynamics of sibling interdependence in children's maladjustment and conflict perceptions. Due to the little atention of the literature to the study of sibling interdependence, although siblings share the perception of multiple variables, it is unclear to what extent the sibling's perception can be related to the outcome measure. Therefore, this actor-partner approach will help unravel each sibling's relative linkage to each other's scores (partner effects) in the perception of interparental conflict and psychological adjustment while controlling the contribution itself (actor effects).

As a result of this, it was expected to find actor and partner effects based on the models of the effects of both sibling-dyad members in the association between IPC perceptions and children and adolescents' maladjustment. Actor effects in this study refer to the extent to which IPC perceptions of one member of a sibling-dyad are associated with the maladjustment of that same dyad-member (e.g., older sibling's threat appraisal predicting older sibling's personal maladjustment). Partner effects refer to the extent to which IPC perceptions of one member of a sibling-dyad are associated with the maladjustment of the other dyad-member (e.g., older sibling's threat appraisal predicting younger sibling's personal maladjustment). It was hypothesized that actor effects would explain more percentage of the explained variance of older and younger siblings' maladjustment than would partner effects, in view of the evidence of the association of IPC in their own maladjustment (El-Sheikh et al., 2009; Lucas-Thompson & George, 2017) and based on the scarcity of the literature evidence of interdepencence of sibling IPC appraisals (Iturralde et al., 2013; Lucas-Thompson & George, 2017). Finally, there are no studies with Spanish samples that analyze sibling

emotional and behavioral learning processes in an IPC context, so this study is intended to contribute to understanding in more depth how siblings' relationships develop in Spanish families with IPC situations. In this sense, IPC is frequent in divorced families and Spain is one of the European countries with the highest increase in the divorce rate in recent decades (approx. 0.58%, IPF, 2019). Also, concerning psychological adjustment, 1% of Spanish children suffer from a mental health problem (ENSE- Encuesta Nacional de Salud España (2017)). Moreover, Oliva and Arranz (2005) founded that there were not significant differences in sibling relationships between Anglo-Saxon countries and Spain, in which family relationships are afforded great importance.

Method

Participants

Participants were 50 pairs of siblings (50 boys and 50 girls) recruited in schools in Spain from 2012 to 2013. In most cases, a boy and a girl composed the pairs of siblings (54%), whereas the number of pairs of two boys (24%) or two girls (22%) was similar. Older siblings' mean age was 13.3 years ($SD = 2.51$) and ranged from 8 to 18 years, and younger siblings' mean age was 10.4 years ($SD = 2.33$) and ranged between 7 and 16 years.

The families of these siblings had an average of 2.3 children ($SD = 0.58$). Their parents were married in 66% of the cases, remarried in 4% of the cases, divorced in 28% of the cases, and they lived together but were not married in 2% of the cases. Most of the fathers and mothers had professional or managerial jobs (36% of fathers and 36% of mothers) and the rest of the jobs were categorized as non-professional (34% of fathers and 56% of mothers). Only a few fathers worked as top executive managers (9% of fathers). In this regard, 13% of the fathers and 6% of the mothers had a self-owned business, whereas 4% of the fathers and 2% of the mothers were unemployed.

Siblings were eligible for participation if they met the following criteria: the student was enrolled in 3rd grade of Primary School up to 2nd grade of High School; participants were biological or adoptive siblings (note: there were no adoptive siblings).

Instruments

Children's Perception of Interparental Conflict Scale (CPIC-Y; McDonald & Grych, 2006). The Spanish adapted version was validated with sons and daughters whose age ranged from 7 to 18 years (Merino & Martínez-Pampliega, 2015), in contrast to the original scale, but it also replicated the original structure of the three main scales. This self-report for children and adolescents contains 22 dichotomous items ($1 = Yes$, $0 = No$) grouped into three scales: (1) Conflict Properties Scale: 11 items distributed in three subscales, Negative Interparental Conflict (6 items); Constructive Interparental Conflict (3 items); and Aggression in Interparental Conflict (2 items) (e.g., "I've seen or heard my father and my mother arguing"); (2) Threat Scale: 6 items concerning children's feelings of threat and fear related to IPC (e.g., "I get scared when my father and my mother argue"); and (3) Self-Blame Scale: 4 items measuring children's feelings of self-blame for IPC (e.g., "When my father and my mother argue, it is usually my fault"). The reliability indexes (standardized Cronbach´s alpha based on polychoric correlation matrix due to the dichotomic response style of the items) in this study were: Conflict Properties $\alpha = 0.76$; Negative Conflict $\alpha = 0.76$; Constructive Conflict $\alpha = 0.84$; Aggression $\alpha = 0.69$; Threat $\alpha = 0.91$; Self-Blame $\alpha = 0.61$.

Test Autoevaluativo Multifactorial de Adaptación Infantil (TAMAI [*Self-assessment Multifactorial Child Adjustment Test*]; Hernández, 1983). This self-report questionnaire evaluates children's general, personal, school, and social maladjustment and their dissatisfaction with their family and siblings through 175 dichotomous items ($1 = Yes$, $0 = No$). In this study, we used all six first-order scales: (1) the Personal Maladjustment Scale (39 items) encompasses self-maladjustment and maladjustment to daily life issues or a personal difficulty to accept reality, affective maladjustment, symptoms of somatization, depression (e.g., "I wish I was younger," "I would like to be born again and be different from the way I am," "I am very fearful"); (2) the School Maladjustment Scale (31 items) assesses poor learning performance and disruptive behavior in the classroom such as school aversion, not working at school, lack of school motivation (e.g., "I get bad grades," "I get tired quickly when I study or work," "I behave very badly in class"); (3) the Social Maladjustment Scale (35 items) addresses difficulties in social relationships such as social aggression, social withdrawal, social maladjustment (e.g., "I have very few friends," "I'm more at ease when I play alone," "I'd rather be with few people"); (4) the Family Dissatisfaction Scale (5 items) assesses the degree of dissatisfaction with the family climate and the interparental relationship (e.g., "My home is sad, I don't like it there," "My parents argue a lot," "There are quite a few hassles at home"); (6) the Sibling Dissatisfaction Scale (5 items) measures jealousy, quarreling, annoyance or conflicts among siblings (e.g., "I fight and get along badly with my siblings," "I wish I had no siblings and were an only child," "Sometimes I wish some sibling would disappear"). In this study, the internal reliability of the dimensions were adequate (Personal Maladjustment $\alpha = 0.82$, School Maladjustment

$\alpha = 0.83$, Social Maladjustment $\alpha = 0.75$, Family Dissatisfaction $\alpha = 0.53$, Sibling Dissatisfaction $\alpha = 0.70$).

Procedure

The principals and counselors of various schools of Spain were contacted in our search for representative financial sources (public and concerted schools) and school locations (different neighborhoods and cities). The principals of the school informed the parents about the study, and interested parents subsequently contacted the researcher via email or phone. Then, the purpose of the study was explained, ensuring confidentiality and anonymity of the data, and parents were informed that all siblings would receive 5 euros for their cooperation. We attended to all the families of all these schools who were interested in participating in the study and who met the inclusion criteria.

When contacting the schools, we explained the general goal of the study, emphasizing that the school's collaboration only consisted of passing on the information about the study to the families. Each family chose the most convenient date and time for them to participate in the study. They could participate in a classroom of their children's school or on the premises of DeustoPsych (Psychological Laboratory of the University of Deusto). Parents signed an informed consent and we informed them about the approximate duration (20–30 minutes depending on the children's age). A researcher was in the same room the whole time while the siblings were completing the questionnaires to help them, especially the younger ones, answering any questions, clarifying difficult concepts or doubts the participants might have, and helping with the reading of some items. In this way, there were no missing data.

Analytical Strategy

The Actor-Partner Interdependent Model (APIM) was applied to test the hypotheses. APIM is a model of dyadic relationships that focuses on interdependence in two-person relationships

(e.g., siblings), examining actor and partner relationships, as described above. Actor effects determine whether a sibling's IPC appraisals predict his or her own maladjustment, whereas partner effects determine whether one sibling's IPC appraisals predicts the other sibling's maladjustment.

Cook and Kenny's (2005) and Peugh et al., 2013 indications for APIM testing were followed. All models were developed using structural equation modeling (SEM) as the most adequate procedure for distinguishable dyads. The Mplus 7.0 (Muthén & Muthén, 1998–2012) program was used for all SEM analyses.

The theoretical hypotheses were modeled as displayed in Fig. 1 and Appendix A, including all the dependent variables simultaneously in the model. Specifically, IPC appraisals (i.e., threat perceptions, conflict property perceptions, and self-blame) were entered as predictors of the actor's and partner's maladjustment (as measured with the TAMAI). We controlled for gender, older and younger siblings' age, and number of siblings. All covariances between independent variables and covariances between dependent variables were entered in the model. This model is the saturated model, as it has zero degrees of freedom and it is the starting point of the APIM (Peugh et al., 2013).

The goal of the APIM procedure in SEM is to establish the most parsimonious model. The process starts with the described saturated model, which is the least parsimonious model. This lack of parsimony results from the fact that all sibling actor and partner effects are freely estimated, so the model is fully saturated, has zero degrees of freedom, and presents perfect statistical fit (see Kenny et al., 2006; Kenny & Lederman, 2010). Subsequently, alternative models were tested to increase the degrees of freedom while nonsignificantly reducing model fit (seeking a more parsimonious model). Concretely, the APIM procedure proposes two alternative nested models: the Actor and Partner Effect Models. In both models, actor and partner effect paths are fixed to be equal between siblings within each role. That is, in the Actor Effect Model, each sibling's actor effect is fixed to be equal to the other sibling's actor effect. In the

Fig. 1 Theoretical model. Solid lines indicate actor effects and dashed lines represent partner effects
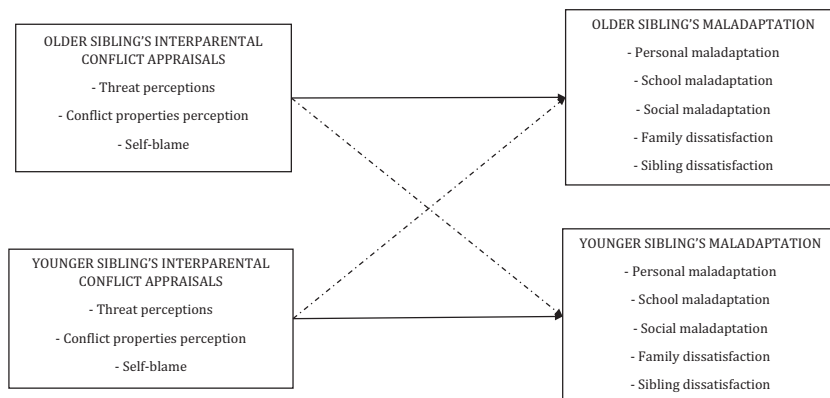
Partner Effect Model, each partner effect is fixed to be equal to the other sibling's partner effect.

All models were compared through absolute and relative fit indexes. Nonsignificant chi-square, comparative fit index (CFI), and Tucker-Lewis index (TLI) values over 0.90, and root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) values lower than 0.08 were considered indicators of good fit (Hu & Bentler, 1999). The likelihood ratio test was computed from the difference of the −2 log-likelihood between models. This difference follows a chi-square distribution with the degrees of freedom equal to the difference of model parameters. Model changes were developed based on modification indices to establish the most parsimonious APIM (Peugh et al., 2013).

Finally, following Browne et al. (2016), the impact of each actor sibling's (i.e., younger or older sibling) IPC appraisals on maladjustment is further elucidated via the decrease in variances after entering the actor or partner effects in the model for each dependent variable.

Compliance with Ethical Standards

The study was conducted in accordance with the ethical standards of the American Psychological Association (APA) for research involving humans. The parents of all participants provided informed consent to participate. All authors have approved the manuscript and agreed with its submission to Journal of Child and Family Studies and they declare no conflict of interests to publish this manuscript.

Results

Descriptive statistics are presented in Table 1, and bivariate correlations are shown in Table 2.

APIM Procedure

When testing the APIM, the saturated model (all actor and partner effects freely estimated) was computed. As a full saturated model with no degrees of freedom, model fit was: $\chi^2(0) = 0$, $p < 0.001$, CFI = TLI = 1.00, RMSEA = SRMR = 0. The saturated APIM was compared to a nested model in which all actor regression paths were constrained to equality between siblings. This model did not significantly differ in model fit compared to the saturated model, $\chi^2(20) = 23.53$, $p = 0.234$, which supports the adequacy of this alternative model. Result indices showed good model fit based on CFI = 0.99, RMSEA = 0.06, and SRMR = 0.04, but TLI was < 0.90. Modification indices suggested freeing the actor effect of IPC properties on social maladjustment. Hence, both siblings were allowed to differ in the relationship between the

Table 1 Descriptive statistics of study variables

Variable	Older sibling		Younger sibling	
	M	SD	M	SD
Age	13.30	2.51	10.40	2.33
Interparental problem appraisals				
Threat	1.90	1.97	3.48	2.09
Conflict properties	2.96	2.66	2.86	2.53
Self-blame	0.28	0.61	0.48	0.91
Maladjustment				
Personal maladjustment	8.02	4.62	9.39	5.50
School maladjustment	9.65	4.98	9.18	5.03
Social maladjustment	7.30	4.64	7.96	4.38
Family dissatisfaction	0.77	1.19	0.56	0.93
Sibling dissatisfaction	0.84	1.25	0.82	1.22

perceptions of IPC properties and social maladjustment. The addition of this parameter to the model significantly increased model fit, $\chi^2(1) = 4.30$, $p = 0.038$. Absolute and comparative model fit indices were also indicators of better fit, $\chi^2(19) = 19.23$, $p = 0.442$, CFI = 1.00, TLI = 0.99, RMSEA = 0.02, SRMR = 0.03.

As the next step of the APIM procedure, partner effects were fixed to be equal between siblings. This model was more parsimonious and did not significantly differ from the previous model, $\chi^2(20) = 26.40$, $p = 0.153$. Model fit was acceptable, $\chi^2(39) = 45.63$, $p = 0.216$, CFI = 0.97, TLI = 0.90, RMSEA = 0.06, SRMR = 0.07. Modification indices indicated the adequacy of freely estimating the partner effect of the perceptions of IPC properties on family dissatisfaction. Thus, the effect of each sibling's perceptions of IPC properties on the other sibling's family dissatisfaction was allowed to differ between siblings. The inclusion of this path increased model fit, $\chi^2(38) = 40.20$, $p = 0.373$, CFI = 0.99, TLI = 0.97, RMSEA = 0.03, SRMR = 0.06. Ratio test also indicated that this model was linked to a significant fit increment, $\chi^2(20) = 5.43$, $p = 0.020$. The results of this final model are displayed in Table 3.

Final APIM: Actor and Partner Effects

Covariances

Regarding the covariances between the independent variables, they indicated that neither the threat perceptions of older and younger siblings ($S_{xy} = 1.07$, $p = 0.086$) nor their self-blame were related ($S_{xy} = -0.01$, $p = 0.851$). By contrast, both siblings tended to share a common perception of IPC properties ($S_{xy} = 4.02$, $p < 0.001$). And regarding the covariances between the dependent variables, results indicated that personal ($S_{xy} = 5.76$, $p = 0.050$), school

Table 2 Bivariate correlations of study variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Age 1	–																
2. Age 2	0.76**	–															
Interparental problem appraisals																	
3. Threat 1	−0.17	−0.17	–														
4. Conflict P. 1	0.23	0.02	0.20	–													
5. Self-blame1	−0.22	−0.14	0.08	−0.12	–												
6. Threat 2	−0.39**	−0.55**	0.26	0.09	0.10	–											
7. Conflict P. 2	0.16	0.13	0.16	0.65**	−0.11	0.16	–										
8. Self-blame 2	−0.32*	−0.08	0.23	0.07	−0.03	0.12	0.07	–									
Maladjustment																	
9. Personal M. 1	−0.01	−0.19	0.26	0.16	0.12	0.06	−0.19	−0.06	–								
10. School M. 1	0.33*	0.01	0.13	0.44**	0.03	−0.14	0.23	−0.24	0.31*	–							
11. Social M. 1	0.22	0.12	0.16	0.31*	0.23	−0.25	−0.02	−0.15	0.56**	0.67**	–						
12. Family D. 1	0.21	0.13	0.28	0.75**	−0.14	−0.01	0.61**	0.01	0.19	0.23	0.22	–					
13. Sibling D. 1	−0.20	−0.24	0.31*	0.10	0.25	0.24	−0.08	−0.06	0.45**	0.11	0.06	0.19	–				
14. Personal M. 2	−0.28	−0.18	0.14	−0.05	0.11	0.26	0.20	0.48**	0.11	−0.08	0.04	−0.10	0.01	–			
15. School M. 2	0.09	0.08	0.14	0.15	−0.03	0.12	0.36*	0.05	0.04	0.37*	0.18	0.12	−0.01	0.36*	–		
16. Social M. 2	0.09	0.06	0.06	0.17	0.03	0.06	0.23	0.10	0.26	0.10	0.26	0.21	−0.10	0.51**	0.55**	–	
17. Family D. 2	−0.14	−0.17	0.12	0.40**	−0.03	0.22	0.55**	0.23	−0.08	0.23	<−0.01	0.37*	−0.06	0.41**	0.38**	0.28	–
18. Sibling D. 2	−0.31*	−0.18	0.13	0.12	0.12	0.30*	0.21	0.23	0.10	−0.10	<0.01	0.12	0.15	0.63***	0.39***	0.46**	0.29*

Note. 1 = older sibling, 2 = younger sibling. Conflict P. = Conflict properties; Personal M. = Personal maladjustment; School M. = School maladjustment; Social M. = Social maladjustment; Family D. = Family dissatisfaction; Sibling D. = Sibling dissatisfaction

$*p < 0.05$. $**p < 0.01$

Table 3 Non-standardized ESM coefficients of final APIM

	Personal maladjustment		School maladjustment		Social maladjustment		Family dissatisfaction		Sibling dissatisfaction	
	Older sibling	Younger sibling	Older sibling	Younger sibling	Older sibling	Younger sibling	Older sibling	Younger sibling	Older sibling	Younger sibling
Actor effects										
Threat	0.50	0.50	0.47*	0.47*	0.44*	0.44*	0.09*	0.09*	0.14*	0.14*
Conflict properties	0.63**	0.63**	0.60**	0.60**	0.66**	0.37	0.18***	0.18***	0.10	0.10
Self-blame	2.00**	2.00**	0.39	0.39	1.23*	1.23*	0.08	0.08	0.31*	0.31*
Partner effects										
Threat	0.17	0.17	−0.30	−0.30	−0.25	−0.25	−0.07	−0.07	−0.01	−0.01
Conflict properties	−0.64*	−0.64*	0.06	0.06	−0.32	−0.32	0.19***	0.05	−0.03	−0.03
Self-blame	−0.23	−0.23	−1.08*	−1.08*	−0.64	−0.64	−0.07	−0.07	−0.09	−0.09
r^2	0.31**	0.36***	0.33**	0.21**	0.24*	0.17*	0.65***	0.38***	0.19*	0.25**

Note. $*p < 0.05$. $**p < 0.01$. $***p < 0.001$

($S_{xy} = 8.80$, $p = 0.003$), and social ($S_{xy} = 5.52$, $p = 0.029$) maladjustment of older and younger siblings were related, whereas family dissatisfaction ($S_{xy} = 0.08$, $p = 0.272$) and sibling dissatisfaction ($S_{xy} = 0.14$, $p = 0.437$) of older and younger siblings were not related.

Actor effects

APIM actor effects indicated that, for both siblings, self-blame ($\beta = 2.00$, $p = 0.002$) and IPC properties ($\beta = 0.63$, $p = 0.008$) had an incremental effect on their own personal maladjustment. Also, results of actor effects on school maladjustment indicated that, for both siblings, threat perceptions ($\beta = 0.47$, $p = 0.033$) and IPC properties ($\beta = 0.60$, $p = 0.004$) were positively linked to higher school maladjustment. Regarding actor effects on social adjustment, higher threat perceptions ($\beta = 0.44$, $p = 0.047$), and higher self-blame perceptions ($\beta = 1.23$, $p = 0.029$) predicted social maladjustment for both siblings, whereas higher IPC property perceptions also predicted social adjustment but only for older siblings ($\beta = 0.67$, $p = 0.004$). Moreover, actor effects reflected equal positive effects of threat perception ($\beta = 0.09$, $p = 0.025$) and IPC property perception ($\beta = 0.18$, $p < 0.001$) on both siblings' family dissatisfaction. Sibling dissatisfaction actor effects were identical for both siblings: higher threat perceptions ($\beta = 0.14$, $p = 0.022$) and self-blame ($\beta = 0.31$, $p = 0.038$) led to increments in sibling dissatisfaction.

Partner effects

Regarding partner effects, higher IPC properties perceived by one sibling were linked to lower personal maladjustment of the other sibling ($\beta = -0.64$, $p = 0.010$) and stronger self-blame experienced by one sibling was linked to lower school maladjustment of the other sibling ($\beta = -1.08$, $p = 0.048$). However, the freely estimated partner effect indicated that the perception of IPC properties by one sibling had a different impact on the other sibling's family dissatisfaction. Concretely, the perception of IPC properties by the younger sibling significantly increased the older sibling's family dissatisfaction ($\beta = 0.19$, $p < 0.001$), whereas the older sibling's perception of IPC properties did not lead to the younger sibling's higher family dissatisfaction ($\beta = 0.05$, $p = 0.320$).
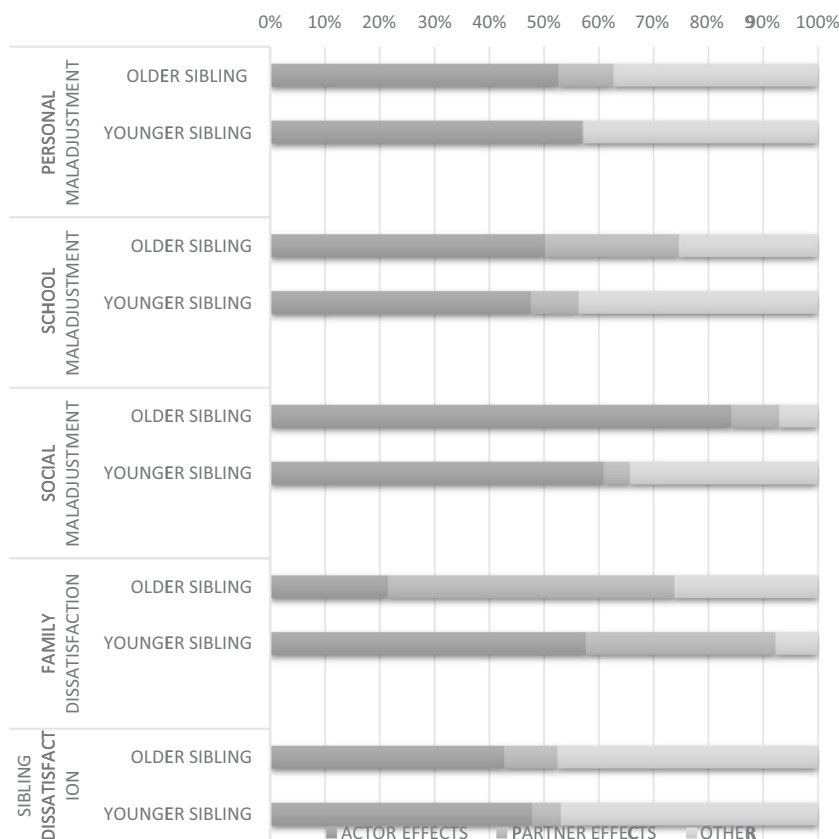
Explained variance and proportion of explained variance

Regarding the older sibling, the APIM explained 31% ($p = 0.003$) of the variance of personal maladjustment, 33% ($p = 0.001$) of the variance of school maladjustment, 24% ($p = 0.010$) of the variance of social maladjustment, 65% ($p < 0.001$) of the variance of family dissatisfaction, and 19% ($p = 0.013$) of the variance of sibling dissatisfaction.

Regarding the younger sibling, the APIM explained 36% ($p < 0.001$) of the variance of personal maladjustment, 21% ($p = 0.008$) of the variance of school maladjustment, 17% ($p = 0.023$) of the variance of social maladjustment, 38% ($p < 0.001$) of the variance of family dissatisfaction, and 25% ($p = 0.004$) of the variance of sibling dissatisfaction.

Figure 2 depicts the proportion of explained variance of siblings' maladjustment (i.e., personal, school, and social maladjustment, and family, and sibling dissatisfaction) attributable to the IPC appraisal model components as a function of sibling role (i.e., actor or partner effect). In general, the actor effects showed a higher proportion than the partner effects for both siblings except in the case of family dissatisfaction of older siblings. Moreover, in all cases, the

Fig. 2 Proportion of siblings' maladjustment attributable to interparental conflict appraisal model components as a function of sibling role. The Other model components describe the explained variance due to covariates and covariances between dependent variables

proportion of explained variance due to partner effects was greater for the older sibling than for the younger one.

Regarding personal maladjustment (older sibling: 53%; younger sibling: 57%), school maladjustment (older sibling: 50%; younger sibling: 48%), and sibling dissatisfaction (older sibling: 43%; younger sibling: 48%), both siblings showed similar relationships in between these types of maladjustment and their own IPC perceptions as specified by the actor effects.

Concerning social maladjustment, the actor effects of the IPC perceptions notably predicted both siblings' social maladjustment. These actor effects of the IPC perceptions were more important for the older sibling's own adjustment (84%) than for the younger one's adjustment (61%).

As for family dissatisfaction, older siblings' dissatisfaction was more strongly related to the younger sibling's appraisals (52%) than to their own actor effects (22%). Contrariwise, younger siblings' satisfaction was mainly explained by the actor effects (58%).

Discussion

This study was designed to evaluate dyadic effects among siblings by testing an actor-partner interdependence model

of associations between IPC perceptions and children maladjustment with a Spanish sample of sibling dyads.

First, it was hypothesized that sibling's perceptions of IPC properties would be correlated, but not their threat or self-blame appraisals, and this hypothesis is fully supported by the data of this study, which are in line with the findings of Iturralde et al. (2013). This evidence suggests that Spanish siblings tend to evaluate similarly the more objective properties of IPC such as frequency, resolution, or conflict content, but they differ in each sibling's subjective responses, such as threat and self-blame. However, these sibling differences of threat and self-blame should be more fully investigated because it is precisely children's subjective perception that is more implicated in the impact of IPC on their maladjustment (Fosco & Feinberg, 2015; Rhoades, 2008).

Second, it was hypothesized that siblings' self-reports of maladjustment would be positively correlated, based on the interdependency of psychological maladjustment of children and adolescents within sibling dyads, and the results agree with this idea and with previous studies but using a Spanish sample regarding personal (Branje et al., 2004), school (Bouchey et al., 2010, Whiteman et al., 2007), and social maladjustment (Stormshak et al., 1996; Updegraff et al., 2002; Zukow-Goldring, 2002). However, the

literature that describes the interdependence of siblings in different areas highlights the role of older siblings as significant models for younger siblings, and the results of this study are limited to reciprocal sibling relationships. The direction of these relationships should be studied in future works to analyze in more depth the social and behavioral learning processes between siblings. On the contrary, the variables of dissatisfaction with family and siblings did not covariate, so each sibling's dissatisfaction level with the family system or with siblings could be considered as a more subjective experience, and less likely to be related to the other sibling's satisfaction level.

Third, despite indications in the literature to take siblings' dyadic effects into account to better understand the processes that explain this negative impact of IPC (Richmond & Stocker, 2007), no previous studies have examined them. However, the novel results of this study pinpointed some actor and partner effects in this field. Actor effect results indicate, for both siblings, that perceived threat, self-blame, and conflict properties are associated with siblings' own maladjustment, and these results emphasize these variables as key factors to understand the negative impact of IPC on children and adolescents' maladjustment (Amato & Keith, 1991; Grych & Fincham, 1992; Hetherington et al., 1998; Fosco & Feinberg, 2015; Fosco & Grych, 2008; Gerard et al., 2005; Grych et al., 2004; Grych et al., 2003). Alternatively, results of partner effects describe the association of one sibling perception,emotion or behavior on the other sibling's perception, emotion or behavior. As a consequence of the different reciprocal mechanisms described by Morris et al. (2007) to explain the mutual impact of siblings, the IPC perception of one sibling may affect the IPC perception of the other sibling, as they share a mutual emotional and behavioral learning process to understand the family context in which they live, specifically IPC perceptions. Also, it could be derived from these underlying reciprocal processes that the way a sibling perceives and understands IPC would have an effect on how the other sibling responds and behaves.

Moreover, the results of partner effects describe, for both siblings, compensation effects, as self-blame or conflict by perceived one sibling predicted lower personal and school maladjustment in the other sibling. These buffering effects of the siblings in the children's perception and emotional response to IPC has been little discussed in the literature (Long & Forehand, 1992; Martínez-Pampliega et al., 2009), and these studies do not focus only on the children's perception of IPC or on the self-blame that they experience. However, a recent study by Iturralde et al. (2013) provides evidence of this compensation effect of the siblings, which manifests especially in children's feelings of self-blame and anxiety in the face of IPC. The authors of this study were surprised to find this buffering effect not only in positive sibling relationships but also in negative ones. These authors explained this compensation effect based on the children's need to balance the self-blame as a response to IPC through the siblings' relations. Also, the threat response seems to play no compensation role for siblings in IPC situations, either in the study of Iturralde et al. (2013) or in the current study. Despite evidence of this promising compensatory model that classifies siblings as possible protective factors against interparental conflict even when sibling perceptions are negative, few investigations have explored the subject.

Moreover, the perceived properties of IPC also seem to play different roles just for the older sibling. On the one hand, the older sibling's perceived negative properties of IPC are positively associated with his/her social maladjustment and this effect does not appear for younger siblings. This result is line with the literature that describes that older/younger sibling status moderates the association between exposure to IPC and children or adolescent maladjustment, because parents might feel more inclined to display their conflict in front of older siblings (Richmond & Stocker, 2003). On the other hand, the younger sibling's perceived negative properties of IPC are positively associated with the older sibling's family dissatisfaction. In this case, the more destructive IPC aspects perceived by the younger sibling lead to a decrease in the older sibling's satisfaction with his/her family. This result can be explained through the accountability that the older sibling often assumes for family conflicts (Pike et al., 2005; Soli et al., 2009), and it seems that older siblings support greater emotional baggage from IPC than younger siblings.

Lastly, it was hypothesized that actor effects would explain more percentage of the variance of older and younger siblings' maladjustment than would partner effects, given the evidence of the association of IPC in their own maladjustment (El-Sheikh et al., 2009; Lucas-Thompson & George, 2017). In that sense, the results confirm this hypothesis because they show that, except for the explanation of the family dissatisfaction of older siblings, all other aspects of children maladjustment and dissatisfaction are explained to a greater extent by actor effects than by partner effects (Fig. 2). However, this research has found that the younger/older status differences describe larger partner effects for older siblings, and this can be explained due to the greater emotional baggage that older siblings support in IPC situations because they are affected not only by their own perceptions, but they are also more affected by their younger siblings' perceptions. This sibling interdependence effect has never been explored previously in the literature with an actor-partner analysis in a Spanish sample, so this constitutes a novel research line to examine sibling emotional and behavioral learning in more depth.

Finally, the study has several limitations that should be mentioned. On the one hand, the sample size is not negligible, given that we used fraternal dyads of children and adolescents, but its increase for the next studies would allow the separate analysis of fraternal relations and socialization processes in childhood and adolescence, as well as increasing the statistical power of the analysis. In this last regard, power analysis indicated an average power of 0.57 to detect significant actor and partner effects. The power ranged between 0.29 and 0.98 depending on the effect size, so the sample had the power to detect large effects, but it is important to note that small effects may go undetected (Ackerman, & Kenny, 2016). Moreover, the age range of the sample was too broad, and its size recluded the analysis of the differences in the acquisition of cognitive and emotional resources in older-aged siblings as they matured from an evolutionary perspective. In this sense, their ability to perceive and respond emotionally to stressful family situations acts as a self-protector and a protector of their younger siblings. Other studies indicate that the age of the siblings is positively associated with the acquisition of more constructive resolution strategies, as fraternal interactions become more egalitarian with time (Burhmester & Furman, 1990), although the existing results do not always point in the same direction (Recchia & Howe, 2009). Also, gender sibling analysis could be an interesting future line to explore whether actor-partner effects differ depending on the gender composition of the sibling dyad. On the other hand, future studies would benefit from longitudinal designs that would allow making causal inferences to explain siblings' adjustment in IPC situations.

Also, as two informants are included in the APIM, this research design allows testing bidirectional sibling effects while accounting for the interdependence inherent in dyadic relationships, and this is a sophisticated statistical method to understand the dynamics of sibling interactions. However, the procedure was developed through self-reported measures, which can inflate common method variance. So, future studies could include objective indicators of conflict or observational measures of children adjustment.

In conclusion, the current study emphasizes the association between children's and adolescents' perception of IPC and their own maladjustment (actor effect), as it appears in the literature, but it represents the first actor-partner analysis in a sibling-dyad Spanish sample. However, the main novel contribution of this study is the analysis of partner effects for siblings in IPC situations, and the results highlight that they are greater for older siblings compared to younger siblings. Moreover, in line with previous studies, the results of this study confirm the interdependence of siblings' perceptions of interparental conflict properties, but also the independence of threat and self-blame feelings experienced by each sibling. Hence, actor-partner statistical approach contributes to confirm the interdependence of siblings' perceptions of interparental conflict properties, according to the reciprocal learning processes proposed by Morris et al. (2007), and it has also emphasized the independence of threat and self-blame feelings experienced by each sibling proposed by the cognitive-contextual theoretical framework (Grych et al., 1992; Lucas-Thompson et al., 2017; Shelton & Harold, 2008). So, we consider that these findings help us to better understand the mechanisms that explain the impact of IPC and sibling interdependence on their sons' and daughters' well-being.

Therefore, according to these results, we suggest some practical implications: for children's adequate adaptation, their perception of IPC is very important to understand the adaptation of each family member, and specially sibling interdependence should not go unremarked. Furthermore, it would appear based on study findings that the the way in which children's threat and self-blame appraisals are addressed warrants careful clinical consideration. For example, it would be an adequate clinical approach to help parents learn to express conflicts in less threatening ways and not within earshot of the child (Mueller et al., 2015). This clinical approach would not only reduce children's perception of threat and self-blame, but aslo maintain a safe home environment (Cummings & Schatz, 2012). Also, older siblings are at greater risk of negative impact from IPC than younger siblings (Volling et al., 2015), and this represents a potential risk factor to bufffer in family interventions by clinicians.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request

Code Availability

No materials were needed to carry out this study

Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Ethical Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Universidad de Deusto (ETK-15/17-18).

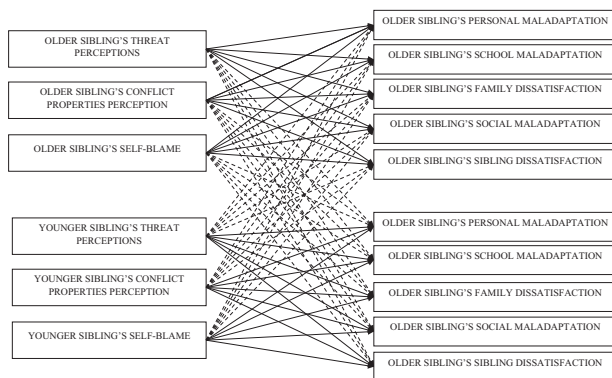**Informed Consent** Written informed consent was obtained from the parents.

APPENDIX A

Actor and Partner Effects of the Unrestricted APIM Model

In this model, solid lines indicate actor effects and dashed lines represent partner effects.

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