

### Original Article

## Applying Evolutionary Psychology to a Serious Game about Children's Interpersonal Conflict

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**Abstract:** This article describes the use of evolutionary psychology to inform the design of a serious computer game aimed at improving 9–12-year-old children's conflict resolution skills. The design of the game will include dynamic narrative generation and emotional tagging, and there is a strong evolutionary rationale for the effect of both of these on conflict resolution. Gender differences will also be taken into consideration in designing the game. In interview research in schools in three countries (Greece, Portugal, and the UK) aimed at formalizing the game requirements, we found that gender differences varied in the extent to which they applied cross-culturally. Across the three countries, girls were less likely to talk about responding to conflict with physical aggression, talked more about feeling sad about conflict and about conflicts over friendship alliances, and talked less about conflicts in the context of sports or games. Predicted gender differences in anger and reconciliation were not found. Results are interpreted in terms of differing underlying models of friendship that are motivated by parental investment theory. This research will inform the design of the themes that we use in game scenarios for both girls and boys.

**Keywords:** interpersonal conflict, serious games, preadolescent children, gender

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## **Introduction**

Conflicts between young people at school are a source of misery to many individuals who become embroiled in them. Conflicts also tend to distract their peers' attention and divert their schools' resources from frontline education, as teachers spend time settling disputes instead of actually teaching (Winslade and Williams, 2012). Yet conflict is a cultural universal and a natural, unavoidable part of social life. It is found within non-human animal groups (Aureli and De Waal, 2000), linked as it is to the evolutionary dynamics of intraspecific competition. An evolutionary perspective, therefore, has much to contribute to an understanding of how to educate children about conflict. In this article, we discuss how evolutionary theories and research have partly informed a new approach to teaching children about interpersonal conflict, through an educational computer game developed by the SIREN (Social games for conflict REsolution based on natural iNteraction) project (Yannakakis et al., 2010).<sup>1</sup>

### *Project Background*

Because of the ubiquity of conflict and its potentially damaging effects, there has been increasing demand over the last couple of decades for educational programs that can teach children the skills they need to settle conflicts effectively themselves (Bodine and Crawford, 1998; Jones, 2004). Such programs can take many forms, including peer mediation (Johnson and Johnson, 1996), social and emotional learning (Greenberg et al., 2003), violence prevention (e.g., Bosworth, Espelage, DuBay, Daytner, and Karageorge, 2000), peace studies (Harris, 2004), and diversity awareness (e.g., Farrell, Meyer, and White, 2001). To our knowledge, the current study represents the first such approach to be built around a serious computer game. Serious games start from the idea that learning-games do not have to sacrifice the design standards or "fun factor" that are so central to high-quality computer games made for the entertainment market; essentially, they are normal games that also have non-entertainment objectives (Egenfeldt-Nielsen, 2007). Teaching children about interpersonal conflict through a serious game is particularly appropriate because they will get the chance to try out new strategies—which they might not otherwise use—in an immersive and responsive environment that is carefully controlled by the game designers and in which they cannot be physically harmed (cf. Pedersen, 1995).

Several educational games have already tackled the subject of interpersonal conflict among young people (e.g., Aylett, Vala, Sequeira, and Paiva, 2007; Bosworth et al., 2000; Memarzia and Star, 2011). SIREN will be different because as a serious game, it is designed to be a more immersive, open-ended and fun experience. It will also tackle the subject of interpersonal conflict more broadly, whereas previous educational games have tended to focus on particular aspects of conflict (such as bullying or diversity) that may lead to particular modes of aggressive response. SIREN also includes two innovative technologies for cognitive modeling of players' characteristics. Firstly, conflict resolution education in the game will be made more meaningful through dynamic narrative-based

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<sup>1</sup> See also <http://www.sirenproject.eu>, retrieved on 6 March 2012.

role-playing experiences. Watching third-person summaries of their experiences and sharing them with other students will provide children with the necessary reflection and internalization of learning objectives. Secondly, these narrative scenarios will be tagged with emotional information based on a detailed affective model of player preferences, derived from our own cross-cultural user research.

In the rest of this article, we explore how our technologies of affective modeling and dynamic narrative generation fit well with certain evolutionary theories about how conflict works. Player gender will be used as a case study of how evolutionary theory predicts specific differences in conflict-related behavior between players, which can help to inform the design of a game that can be enjoyed, and found useful, by both girls and boys. We also examine the impact of player culture on possible gender differences, since SIREN is a European project intended for release across at least four European countries. Culture is something that is often predicted to have a great impact on interpersonal conflict in theory, but the empirical literature in this area has not been able to provide a clear picture of how cultural differences actually affect conflict in the real world (Kimmel, 2006). By conducting user research in various cultural settings, we aim both to contribute to this empirical picture and to test evolutionary theories of conflict more effectively by increasing the cultural variance in the test data.

### *Children as Natural Cooperators*

Many theories of conflict start from the observation that conflict often seems to be caused by incompatible goals (Deutsch, 1973; Johnson and Johnson, 1996; Shantz, 1987; Thomas, 1992). From this perspective, children therefore need to be taught how to reconcile their own goals with other people's when these differ. In our project, we take a different view: we see human beings as members of a species that does not have to be taught to cooperate, but cooperates instinctively. This point of view has been stated particularly powerfully by Tomasello (e.g., 2009), who has argued that underpinning human language—and all other forms of cultural behavior—is a natural tendency to cooperate through shared intentionality. That is, we automatically represent—and indeed share, to some extent—the intentions and goals of other group members. The implication that children would not need to be *taught* how to cooperate was surprising to some of the partners on the project; but it is in line with literature showing that children engage in prosocial behavior from a very early age (Eisenberg, Fabes, and Spinrad, 2006; Warneken and Tomasello, 2009).

But if children are instinctive cooperators, what causes cooperation to break down? Why do certain individuals engage in conflict more frequently and in a less orderly way? We posed this question to teachers at two UK schools during preliminary micro-ethnographic work to establish the background to children's conflicts. The teachers were of the opinion that most children who had particular problems with conflict also had issues with emotion management. That is, a conflict trigger that they might otherwise ignore might set them off, and lead to a full-blown fight. According to this model, emotions normally function to support cooperation in humans, but in some individuals this process has gone awry (e.g., Davidson, Putnam, and Larson, 2000). The theme of emotion was very important to us, given our reliance on novel technology for modeling players' emotions. In

line with Ekman's (1999) theory of "basic emotions", we envisaged that interpersonal conflict would activate similar feelings in children from different societies—particularly anger and sadness—which would motivate them to act in similar ways. It still remained, however, to integrate our understanding of emotions into realistic narratives of conflict in different cultural settings.

#### *Towards a Narrative Model of Conflict*

From our review of literature on conflict resolution and our preliminary ethnographic work in the UK, we formulated a computational model of conflict, described by Cheong and colleagues (2011). This model had five main components: participants, causes, strategies (or responses), resolution, and outcomes. These components followed a broad temporal sequence: different kinds of participants (e.g., different genders) are associated with specific causes of conflict; causes precede strategies or responses for dealing with conflict; response strategies lead to certain resolution states; and in the long term, resolutions lead to outcomes (e.g., a change in relationship quality with the person with whom one has had a conflict). The temporal structure of our model reflected the novel technologies of interactive storytelling and dynamic content generation used in our game. Indeed, conflict has much in common with narrative, as Laursen and Hafen (2010) have pointed out: In both domains, "there is a protagonist and an antagonist (conflict participants), a theme (conflict topic), a complication (initial opposition), rising action (conflict behaviors), climax or crisis (conflict resolution), and denouement (conflict outcome)".

If competition and conflict are integral to narrative, as evolutionarily minded literary critics would maintain (e.g., Carroll, 2009), then this links in to another body of work—one that sees humans as natural storytellers (Dunbar, 2004). Arguably, one of the most powerful features of language is its ability to displace conflict from direct confrontation into a story that is directly shared (Ingram, Piazza, and Bering, 2009). Given this feature of language, it might well be the case that encouraging children to read stories helps them to develop effective theory-of-mind and perspective-taking (Mar, Tackett, and Moore, 2010). A computer game in which the elements of narrative are assembled dynamically, and in which children can view narratives from different perspectives, can do this even more effectively than a novel or film. The key is that engagement in the medium should be active rather than passive (see Mar et al., 2010, for the ineffectiveness of certain types of media—especially television—for enhancing perspective-taking skills).

#### *The Case of Gender*

In order to provide a rich, emotionally tagged base of conflict narratives from various cultural contexts, which could feed into the content generation system and actively engage children, we conducted extensive user requirements research in three European countries. Several complementary methods were used, but in this study we focus on just one: semi-structured interviews with children about conflicts that they had experienced with schoolmates. A full presentation of the results of the interview research is beyond the scope of this article. Here we report only on the results of testing on six hypotheses relating to participants' gender, since unlike our other hypotheses these were strongly informed by

evolutionary theory. Gender provides a useful case study of the way in which evolutionary theory, far from being a deterministic paradigm, can help us to personalize the different kinds of intervention that we use for people of different backgrounds.

Parental investment theory predicts several gender differences in interpersonal conflict (Trivers, 1972). Females should be less willing to risk physical conflict in a non-life-threatening situation, since they need to stay healthy to preserve their investment in any existing offspring (Campbell, 2007). Conversely, men face a higher risk of not finding a mate at all, and hence can afford to—and indeed may need to—take more risks in terms of intrasexual competition (Cross, 2010; Wang, 2002). Thus reviews have shown that female adolescents typically engage in much lower levels of direct aggression—though not lower levels of indirect aggression—than males (Archer and Coyne, 2005); and some have suggested that men have inbuilt psychological and even physiological mechanisms for competing with other men (e.g., Flinn, Ponzi, and Muehlenbein, 2012). Regarding the causes of conflict, the nature of intrasexual competition varies across genders, with boys tending to compete in the arena of skills and attributes—especially regarding sports and games—while girls compete more in the arena of social relations and popularity (Archer, 2009; Lombardo, 2012). Regarding conflict strategies, females should be less likely than males to engage in direct physical aggression, since males not only invest less in offspring but are also less likely to mate, and therefore have more to gain from risking physical aggressive strategies in intrasexual conflict (Campbell, 2007; Volk, Camilleri, Dane, and Marini, 2012). If anger displays serve as a credible signal of a physically aggressive response (Ekman, 1999), then anger might also be less common among females (Frodi, Macaulay, and Thome, 1977). Alternatively, females might be no less likely to feel anger, but less likely to act on anger due to fear of physical harm (Archer, 2004; Campbell, 2007). Likewise, sadness or anxiety might be more common among females since they have more to lose from conflict (cf. Frodi et al., 1977). Finally, females might conceivably be more likely to reconcile after conflict, since they have more at stake in cooperating with peers successfully (Hrdy, 2009).

## **Materials and Methods**

### *Participants*

The SIREN intervention is aimed at pre-adolescent children (aged 9–12 years), so as to bring about improvements in conflict-related behavior before children enter the “problem years” of early adolescence. Interviews were conducted in two schools in Bath, England (UK: 21 girls, 28 boys, mean age 10 years 8 months), one school in Lisbon, Portugal (PT: 21 girls, 28 boys, mean age 11 years 9 months), and two schools in Athens, Greece (GR: 14 girls, 20 boys, mean age 11 years 10 months). Opt-out informed consent forms were provided to all parents and guardians of the children concerned. The study was approved by the Ethics committee of the Faculty of Humanities and Social Sciences at the University of Bath.

### *Procedure*

The main method used was a semi-structured interview designed to elicit narrative

descriptions of conflicts that participants had witnessed or been involved in. Following the methodology of Baumeister, Stillwell, and Wotman (1990) for adults, we asked children about conflicts from three different perspectives, since perspective-taking is crucial to our narrative-based intervention in conflict resolution education (however, the differences between perspectives will not be analyzed in this article). In addition, we collected information about children's general levels of aggressiveness and victimization, using the Aggression/Victimization Scale (AVS) (Orpinas and Frankowski, 2001), and their levels of reactive and proactive aggression, using the Reactive-Proactive Aggression—Fast Track questionnaire (RPA) (Dodge and Coie, 1987; Raine et al., 2006). Children were provided with a brief description of the interview process, and their informed assent was sought for taking part. No child refused to take part. Following a brief warm-up conversation about the child's favorite game, the semi-structured interview was divided into three sections:

1. A *third-person conflict section*, in which we asked the participant to describe a conflict that he/she had witnessed between two other children at school, how the children had felt, and how it was resolved.
2. A *first-person conflict section*, in which we asked the participant to describe an occasion where he/she had gotten angry with another child in school, how the other child had felt, and how the conflict was resolved.
3. A *second-person conflict section*, in which we asked the participant to describe an occasion where another child had gotten angry with him/her in school, how he/she had felt, and how the conflict was resolved.

Following this, we administered the AVS and then a slightly modified version of the RPA scale. All the semi-structured interviews were audio-recorded and transcribed into plain text files, then later coded by three raters who were blind to the research hypotheses. Coding was for six dichotomous variables relating to the hypotheses outlined above: (a) whether a conflict was associated with playing a sport or game; (b) whether it was concerned with claims of friendship; (c) whether it included a physically aggressive response; whether feelings of (d) anger or (e) sadness were described; and (f) whether there was an eventual reconciliation. Inter-rater reliability ranged from .90 (for anger) to 1 (for physical aggression).

## **Results**

### *Plan of Analysis*

For each of the six outcome variables of interest (game-playing conflicts, friendship conflicts, physical aggression, anger, sadness, and reconciliation), we first carried out a chi-squared analysis of simple gender effects, taking the participants as the units of analysis and coding for the presence of each of the outcome variables in any of the three narratives per participant. Further analyses were carried out with individual narratives as the units of analysis. Since the error terms relating to the presence of the outcome variables in narratives by the same child were not independent of one another, we used generalized estimating equations (Hanley, Negassa, Edwardes, and Forrester, 2003) to perform an extended version of backwards stepwise regression, using narrative perspective as the within-subjects variable. We included as predictors in the regression model the four

measures of aggression/victimization described above, some demographic information (the country that the participant was from, and the age of the participant), the gender of the participant, and an interaction term between country and gender (to examine how culturally invariant the gender effects were). Correlation matrices for the non-nominal variables under analysis are tabulated below. Although the use of stepwise regression is not encouraged for purely exploratory analyses, here it was justified because while we had no closely related existing research from which to decide what predictors should be included in our model, we were mainly interested in finding out whether gender was the most significant predictor for each outcome variable. A fuller analysis of the generalized estimating equations—including the effects of narrative perspective—will be presented in a future publication.

**Table 1.** Correlations between predictor variables

	(a)	(b)	(c)	(d)	(e)
(a) Age	1	.05	-.04	-.03	.14
(b) AVS aggression score ( <i>M</i> = 0.82; <i>SD</i> = 0.90; Cronbach's alpha = .67)	.05	1	.57***	.61***	.51**
(c) AVS victimization score ( <i>M</i> = 1.32; <i>SD</i> = 1.22; Cronbach's alpha = .77)	-.04	.57***	1	.30***	.37**
(d) RPA proactive score ( <i>M</i> = 0.24; <i>SD</i> = 0.46; Cronbach's alpha = .75)	.03	.61***	.30***	1	.68**
(e) RPA reactive score ( <i>M</i> = 1.03; <i>SD</i> = 0.73; Cronbach's alpha = .81)	.14	.51***	.37***	.68***	1

Note: \*\*\*  $p < 0.001$ ;  $n = 117$

### Gender and the Causes of Conflict

In general, boys were much more likely to report conflicts in the area of game-playing, with 55% of boys ( $n = 74$ ) but only 19% of girls ( $n = 52$ ) describing conflicts to do with sports or games,  $\chi^2(1) = 16.6$ ,  $p < .001$ . A logistic regression using generalized estimating equations found that gender was the only significant predictor in the model (see Table 2). The hypothesis that girls would be more likely to report first-person conflicts around friendship relations was also well supported, with 50% of girls but only 15% of boys' stories including friendship-based conflicts,  $\chi^2(1) = 18.2$ ,  $p < .001$ . However, AVS aggression score was also a marginally significant predictor in this model; aggressive children were slightly more likely to have conflicts that centered on friendship ties.

**Table 2.** Predictors for game-playing and friendship-based conflict narratives

Outcome and Predictors	<i>B</i> ( <i>SE</i> )	<i>p</i>	95% CI (Exp( <i>B</i> ))	
			Lower	Upper
Game-playing conflicts <sup>1</sup>				
Gender <sup>2</sup>	1.88 (0.40)	.000	3.02	14.2
Friendship conflicts <sup>3</sup>				
Gender <sup>2</sup>	-1.25 (0.42)	.003	0.13	0.66
AVS aggression score	0.62 (0.31)	.050	1.00	3.43
(Intercept)	1.77 (0.42)	.000	-	-

Note: <sup>1</sup>Model QICC (Corrected Quasi-Likelihood under Independence model Criterion) goodness of fit = 260; <sup>2</sup>Female = 1, Male = 2; <sup>3</sup>Model QICC goodness of fit = 207

*Gender and Aggressive Responses to Conflict*

The hypothesis that a physically aggressive response was more likely to be reported by boys was strongly supported,  $\chi^2(1) = 14.2, p < .001$ ; physically aggressive responses were mentioned by 83% of boys ( $n = 72$ ) and 52% of girls ( $n = 52$ ). Gender was the only significant predictor in the logistic regression analysis.

Somewhat surprisingly, there was no significant impact of any of the aggression variables. To check that the collinearity of the four aggression variables was not diluting their individual impact, we ran four further stepwise aggression analyses with each subset of three of them removed from the model. However, in none of these analyses did the remaining variable in the model increase in significance as a predictor. Nor did they quite reach significance as predictors in a backwards stepwise logistic regression limited to first-person narratives only (though the RPA reactive aggression score and AVS aggression score were marginally significant predictors in the final step of this analysis, with  $p$  values of .051 and .053 respectively).

**Table 3.** Predictors for physically aggressive responses in conflict narratives

Predictors	<i>B</i> ( <i>SE</i> )	<i>p</i>	95% CI (Exp( <i>B</i> ))	
			Lower	Upper
Gender	1.33 (0.29)	.000	2.14	6.75
(Intercept)	-2.37 (0.48)	.116	-	-

Note: Model QICC goodness of fit = 324

*Gender and Feelings about Conflict*

Boys were no more likely than girls to describe feelings of anger following conflict,  $\chi^2(1) = 0.13, p = .844$ : 62% of boys ( $n = 66$ ) and 59% of girls ( $n = 46$ ) mentioned anger at some point in their accounts of conflict. Nor was gender a significant predictor in the logistic regression model. The chi-squared analysis did not support the hypothesis that girls would be more likely to feel sad about conflict, with 72% of girls ( $n = 47$ ) and 66% of boys ( $n = 67$ ) reporting feelings of sadness following conflict in at least one of their three stories,

$\chi^2(1) = 0.57, p = .541$ . However, in the logistic regression model with generalized estimating equations analyzing all three story perspectives—and thereby possessing more power—gender was a significant predictor. Age was also a significant predictor in this model, with older children being slightly less likely to refer to sadness.

**Table 4.** Predictors for angry and sad feelings in conflict narratives

Outcome and Predictors	<i>B</i> ( <i>SE</i> )	<i>p</i>	95% CI ( <i>Exp(B)</i> )	
			Lower	Upper
<b>Feeling of Anger<sup>1</sup></b>				
Country = UK * Gender = Male	-0.49 (0.62)	.005	0.05	0.58
(Intercept)	1.31 (0.54)	.000	-	-
<b>Feeling of Sadness<sup>2</sup></b>				
Age	-0.06 (0.02)	.000	0.92	0.97
Gender	-1.06 (0.30)	.000	0.19	0.63
(Intercept)	8.17 (2.17)	.000	-	-

Note: <sup>1</sup>Model QICC goodness of fit = 282; <sup>2</sup>Model QICC goodness of fit = 270

#### *Gender and Reconciliation after Conflict*

The hypothesis that girls' stories would be more likely to contain instances of reconciliation was marginally supported, with 67% of girls' conflicts ( $n = 51$ ) and 47% of boys' conflicts ( $n = 71$ ) talking about reconciliation following conflict,  $\chi^2(1) = 4.89, p = .042$ . However, logistic regression using generalized estimating equations found no significant predictors in the model (intercept:  $B = 0.92, SE = 0.21, Exp(B) = 2.50, p < .001$ ).

#### *Country-by-Country Analysis*

The logistic regression analyses showed that participant gender generally had strong effects on the kinds of stories children told about conflict, in contrast to country of origin, which never had a significant main effect or interaction effect with gender. We remained interested, however, in how well the observed gender effects generalized across countries. Therefore, we tabulated the percentages of participants from each gender who had produced narratives containing positive values for each variable in which we were interested, along with the chi-squared statistics for the gender contrasts.

No effect generalized across all three countries, probably due to the relatively low numbers of participants in each country. However, it can be seen that the trend for each contrast was in the same direction in each country (except for anger which was more commonly mentioned by boys than by girls in the UK, but vice versa in Greece).

**Table 5.** Percentages of conflict narratives containing the six predictor variables discussed above, for both girls (G) and boys (B) in each of the countries in the Study

% of narratives containing:	UK			Portugal			Greece		
	G	B	$\chi^2$	G	B	$\chi^2$	G	B	$\chi^2$
Game-playing conflicts	10	67	15.1***	22	44	2.33	29	55	2.33
Friendship-based conflicts	50	19	5.24*	39	15	3.39	64	10	11.1**
Physically aggressive responses to conflict	60	82	2.65	44	88	9.41**	50	80	3.39
Feelings of anger after conflict	56	81	3.25	60	60	0.00	62	40	1.46
Feelings of sadness after conflict	63	56	0.27	80	70	0.45	77	75	0.16
Reconciliation after conflict	65	43	2.23	53	48	0.10	86	50	4.60*
<i>n</i>	21	28	-	20	29	-	14	20	-

Note: \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

## Discussion

### *Building Gender into the SIREN Game*

In general, our results support the theory that male and female humans exhibit different patterns of interpersonal conflict, some aspects of which are relatively culturally invariant (at least within Europe), and may therefore be biologically motivated. The differences in the causes of conflict were particularly noteworthy: boys were much more likely to talk about conflicts occasioned by competitive sports or games (often team-based), whereas girls talked more about conflicts that centered on whether someone else was defined as a friend (or “best friend”) and whether they were fulfilling the obligations of friendship correctly. A limitation of our narrative-based research is that it could not uncover whether this result was due to an actual difference in the frequency of different types of conflict, or to a difference in the perceived causes of conflict. Yet, with important social categories such as conflict and friendship, the perception (and conversely, the presentation) of what happens can be as important as the actual frequency of what happens. For example, David-Barrett and colleagues (2012) found that in selecting photographs of themselves with other (same-sex) people as Facebook profile pictures, women preferred to appear with just one other friend, while men as often appeared with groups of friends. Both their and our results can be explained if friendship means fundamentally different things to men and women: for women, a reciprocal source of personal support that requires a strong bond of trust (perhaps most of all after childbirth); for men, an element of a broader coalition against rival groups of males, and an opportunity for play to hone and showcase one’s skills.

Our other robust finding was that boys were more likely than girls to describe a physically aggressive response to conflict. This is easily explained by parental investment theory, as described in the Introduction. However, one slightly puzzling aspect of this result

is that the effect was not mediated by levels of aggression, as measured by any of the aggression questionnaires administered. This is surprising given that the Aggression and Victimization Scale, in particular, specifically asked about the number of physically aggressive interactions the participant had recently had with peers. The absence of the effect was not simply due to the noise introduced by asking children to talk about conflicts they had witnessed as well as participated in, since aggressiveness was not a significant predictor even when the analysis was limited to first-person conflict narratives. It may be that the direct effect of gender on physical aggression is amplified by a cultural norm or schema dictating that for boys, a prototypical conflict includes physical aggression, whereas for girls it does not. This would be in line with a biosocial account of the effects of gender differences on behavior (Wood and Eagly, 2002), which sees biological sex differences as inescapably mediated through culture. This perspective would also explain why effects in areas for which there is not such a strong biological motivation for normative differences between girls and boys (i.e., feelings, reconciliation) only showed up in some of the cultural settings in this study.

Many studies of children's interpersonal conflict have looked at differences in the frequency of self-reported aggressive actions, or in the likelihood of aggressive action in response to hypothetical scenarios. Our study has greater depth and originality in that it quantitatively analyzes children's detailed accounts of conflict (following the methodology of Baumeister et al. (1990) for adults). Furthermore, the rich narratives that our study produced have allowed us to easily examine factors like the causes of conflict and feelings about conflict—factors that are relatively opaque to survey-based or vignette-based studies, and which tend to focus instead on the frequency of conflicts and children's strategies for resolving them. In keeping with the theme of this special issue, we also have an applied goal in mind: to use children's accounts of conflict to generate detailed scenarios for the game that will be adaptable to certain player characteristics, including gender. For example, there is not much point in including a wide variety of game-based scenarios for girls to play if these almost never appear in their real-life conflicts. Conversely, while boys sometimes do engage in friendship-based conflicts, we probably do not need to provide so many opportunities for them to experience these in the game as we do for girls. At the level of responses, too, our data can help us with game design by suggesting that boys need a greater range of directly aggressive response options (assuming each player is provided with a limited choice of scripted options at each branching point in the narrative) while girls' response options can be spread over indirect aggression, negotiation and withdrawal.

#### *How an Evolutionary Perspective Can Help to Educate Children about Conflict*

In conclusion, an evolutionary perspective has helped with developing an appropriate model of interpersonal conflict for our game in three main ways. Firstly, it reminds us that conflict is an unavoidable part of living in large social groups. Our aim, therefore, is not to eliminate or even (necessarily) to reduce conflict, but to teach children strategies to resolve conflict in mature, constructive, and relatively peaceful ways. Secondly, taking the view that humans are hard-wired for cooperation (Tomasello, 2009) has shifted our attention from teaching children how to cooperate to helping them identify the emotional conditions associated with disruption to cooperation, and how to avoid

escalating these with the response options that they choose. One of the major requirements for the game, therefore, became that it would incorporate an element of reflection on action, allowing children time—perhaps at the end of the lesson—to replay what had happened in the game from a different perspective, and helping them to stand back from their own and other’s emotions. Finally, evolutionary theory predicts clear differences between how girls and boys generate and respond to conflict. These differences have been validated in our user research, and therefore we are including gender as a salient variable in the game’s player model, which will influence—in tandem with other variables such as personality and usage history—which game scenarios (e.g., friendship-based or sports-based scenarios) are preferentially made available to players, and which responses made by players (e.g., physical aggression) are defined as more or less unusual.

The next step, which we have already begun, is to present possible scenarios and response options to children and obtain their input on how to make these more realistic and engaging. Informed by the findings presented in this article, we are conducting separate focus groups with girls and boys, in order to get a clearer idea of how differences between the two genders’ conflicts might affect their gameplay. In the future, this will allow us to further test the theoretical ideas in this article by exploring what options girls and boys choose, and which scenarios they find more intuitive. We hope that our study provides a good example of how evolutionary research can contribute to better outcomes for individual children, by moving away from a one-size-fits-all approach to conflict resolution education and towards a model where individual differences in preferred scenarios and responses are fully taken into account.

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