Reflect, (re)act and interact: the roles of shame, guilt and social access in adolescent aggression

Broekhof, E.

Broekhof, E., Bos, M. G. N., & Rieffe, C. (submitted).

The roles of social emotions and social access in the development of aggression;
A longitudinal study in adolescents with and without hearing loss.

Chapter 6

The Roles of Social Emotions and Social Access in the Development of Aggression: A Longitudinal Study in Adolescents with and without Hearing Loss

ABSTRACT

This longitudinal study examined how social emotions (shame, guilt) and social access contribute to the development of reactive and proactive aggression in adolescence. Using a quasi-experimental design, adolescents with and without hearing loss (n = 80; *M*age = 11.9; n = 227; *M*age = 11.6 respectively, range 9-16y) completed self-reports on three occasions (9 months interval). Mixed model analyses revealed that aggressive behaviour decreased with age, whereas shame and guilt peaked in adolescence. Adolescents with hearing loss showed protracted development for guilt. In both groups, shame contributed to an increase in reactive aggression, whereas guilt contributed to a decrease in proactive aggression. These longitudinal associations highlight the unique role that shame and guilt play in the development of aggression.

INTRODUCTION

Aggression is any form of behaviour that has the goal of harming or injuring someone else (Bushman & Anderson, 2001). Although levels of aggression remain relatively stable throughout the life span, there seems to be a temporary increase during adolescence (e.g., Petersen, Bates, Dodge, Lansford, & Pettit, 2015). Aggressive adolescents are at a higher risk for psychopathology and social maladaptation, including delinquency, substance abuse, and peer rejection (Barnow, Lucht, & Freyberger, 2005; Martin-Storey, Serbin, Stack, Ledingham, & Schwartzman, 2011; Ostrov & Crick, 2007). The role of social emotions (e.g., shame and guilt) has often been emphasized in the etiology of aggression (Malti & Krettenauer, 2013). Social emotions can be thought of as "gate keepers" for a better society (De Waal, 2009). For example, anticipation of the negative feeling of guilt is usually enough to prompt an individual to think twice before harming someone else. In other words, these social emotions tend to make us behave within the limits set by society, and as "good citizens" who respect other peoples' integrity and possessions. Yet the relation between the development of social emotions and the development of aggression in adolescents is currently unknown.

A contributing factor to the relation between social emotions and aggression is one's degree of access to the social world. Adolescents with hearing loss face a unique developmental situation, providing an opportunity to examine the role of social access through quasi-experimental techniques. Most adolescents with hearing loss grow up in a predominantly hearing world, with hearing families. Communication is generally less frequent and of a lower quality, between children with hearing loss and their hearing family members or care-givers (Ambrose, Walker, Unflat-Berry, Oleson, & Moeller, 2015). These adolescents therefore have fewer opportunities to engage in either explicit or incidental learning, due to the limits their hearing loss imposes on overhearing others in noisy environments, on language skill development, and on the overall level of communication (Lederberg, Schick, & Spencer, 2013; Tomblin et al., 2015). Consequently, these communication difficulties affect the social-emotional adjustment of these children.

Social emotions can only be learned within a social environment through observation, modelling, and verbal transmission (Eisenberg, 2000). Therefore, the development of social emotions could prove challenging for those with limited social access, as is the case for adolescents with hearing loss. In the present study, we compared adolescents with and without hearing loss, to examine the role of social access in the development of aggression. The aims of the present study were to examine and compare (1) the development of aggression and social emotions in adolescents with and without hearing loss, and (2) the extent to which social emotions contribute to the development of aggression in each group.

Two subtypes of aggression

Research on aggression differentiates between reactive aggression and proactive aggression, due to underlying differences in motives (Cima, Raine, Meesters, & Popma, 2013; Kempes, Matthys, de Vries, & van Engeland, 2005). Reactive aggression is a defensive response to perceived provocation or threat. This hot-tempered, impulsive type of aggression is accompanied by negative affective states, such as frustration and anger. In contrast, proactive aggression is goal-oriented, and motivated by the desire to obtain a desired outcome (Bandura, 1973; Dollard, Doob, Miller, Mowrer, & Sears, 1939). It occurs in the absence of provocation and emotional arousal.

Previous studies generated support for a differential link between reactive and proactive aggression, respectively, and children's social information processing (SIP model: Arsenio, Adams, & Gold, 2009). That is, a bias in interpreting social cues predicts the development of reactive aggression, but not proactive aggression. In particular, misinterpreting others' intentions as hostile in ambiguous or benign social situations relates to higher levels of reactive aggression (Dodge & Coie, 1987; Orobio de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002). In contrast, proactive aggression is linked to biases toward instrumental over interpersonal goals, and to positive expectations about obtaining instrumental goals by means of aggression (Hubbard, Dodge, Cillessen, Coie, & Schwartz, 2001).

A higher incidence of aggression has been reported in adolescents with hearing loss (e.g., Chao et al., 2015; Van Eldik, 2005).Yet these studies did not differentiate between reactive and proactive aggression. Adolescents with hearing loss may be at higher risk for developing reactive aggression, because they attribute twice as many hostile intentions to story characters in ambiguous and benign social situations as their hearing peers (Torres, Saldana, & Rodriguez-Ortiz, 2016). Furthermore, adolescents with hearing loss also seem to infer that relationships are not necessarily harmed by anger or aggression (Rieffe & Terwogt, 2006; Torres et al., 2016). In contrast to hearing peers, adolescents with hearing loss did not think their friendships would be jeopardized if they were to express their anger in a peer conflict situation (Rieffe & Terwogt, 2006). In a study by Torres and colleagues (2016), adolescents were shown videos in which a protagonist acted aggressively towards a peer. Adolescents with hearing loss thought that their peers would be less inclined to reject them if they were to display aggressive behaviour, compared to their hearing peers.

The experience of shame and guilt

Whether children and adolescents anticipate positive emotions (e.g., happiness) or negative emotions (e.g., shame or guilt) following imagined moral transgressions is an important predictor of aggression (Arsenio, Preziosi, Silberstein, & Hamburger, 2012;

Krettenauer & Eichler, 2006). The expectation that wrongdoers will experience positive emotions is associated with higher levels of aggression, while the expectation that one will experience negative emotions following a moral transgression turns aggression into a less desirable behavioural alternative (for a meta-analysis see Malti & Krettenauer, 2013). The happy victimizer phenomenon occupies a well-known childhood phase in the development of emotion attributions. Although children around the age of four acknowledge that moral transgressions are wrong, they nevertheless attribute solely positive feelings to the wrongdoer (Arsenio, Gold, & Adams, 2006). In middle childhood, children start to anticipate negatively charged self-conscious emotions (e.g., shame and guilt) to the wrongdoer, due to an increased focus on others' emotions and perspectives (Sokol & Chandler, 2003). However, longitudinal studies indicate that emotion attributions following moral transgressions are still developing during adolescence. Negative emotion attributions become more frequent throughout adolescence and early adulthood (Krettenauer, Colasante, Buchmann, & Malti, 2014; Nunner-Winkler, 2009).

Results of cross-sectional studies examining the link between aggression and shame attributions (i.e., the fear of being negatively evaluated by others) in adolescents have been inconsistent. Some studies have indicated that shame is an unpleasant emotion, and mere anticipation of shame prevents aggressive behaviours (Olthof, 2012; Roos, Salmivalli, & Hodges, 2011). However, others have found that shame attributions are related to higher levels of aggression (Stuewig, Tangney, Heigel, Harty, & McCloskey, 2010). Yet the distinction between reactive and proactive aggression could explain these inconsistent findings regarding shame. Given that ashamed individuals feel judged, and are worried about damage to their image in front of others, they may react with hostility and aggression toward disapproving others, as a means of protecting self-esteem and reinforcing a sense of superiority (Thomaes, Stegge, Olthof, Bushman, & Nezlek, 2011). This would hint at an increase in reactive aggression. However, in the absence of feeling 'attacked' by others, shame could evoke a feeling of having harmed one or more others, thus contributing to a decrease of proactive aggression.

Guilt attribution (i.e., feeling responsible for harm caused to another) in response to wrongdoing is consistently associated with lower levels of aggression in cross-sectional studies (e.g., Stuewig et al., 2010). Guilt attributions reflect the anticipation that one's actions have negative consequences for others. This consideration, combined with the anticipated unpleasantness of guilt, makes it less likely that adolescents will behave immorally or aggressively (Malti, 2016). Moreover, this consequential analysis is more likely to occur in unprovoked situations. Therefore, higher levels of guilt are linked to lower levels of proactive aggression, specifically (Chaux, Arboleda, & Rincón, 2012; Frick, Cornell, Barry, Bodin, & Dane, 2003).

To examine whether the development of shame and guilt attribution co-occurs with the development of aggression, longitudinal studies are needed. However, longitudinal studies examining a possible role for shame and guilt attribution in the development of aggression in adolescence are scarce. One study by Roos and colleagues (2014) assessed self-reported shame- and guilt-proneness and peer-nominated aggression at two time points, with a six-month interval. Although shame and guilt were both related to lower levels of aggression at the first measurement occasion, these emotions did not forecast changes in aggression over time (Roos et al., 2014).

Shame and guilt in adolescents with hearing loss

To experience social emotions, one must be able to understand others' perspectives and feeling states. But children with hearing loss are known for their Theory of Mind difficulties, which have been shown to persist into adolescence (Gonzalez, Quintana, Barajas, & Linero, 2007; Ketelaar, Wiefferink, Frijns, Broekhof, & Rieffe, 2015). Not surprisingly, these impairments are also related to children's communication skills (Netten et al., 2017). Overall, children without hearing loss who participated in more talk about others' perspectives achieved higher levels of moral reasoning (Dunn, Brown, & Maguire, 1995). Thus, communication about the social world around the child is crucial to the development of social emotions. But many children with hearing loss cannot access this kind of full communication. Few cross-sectional studies have indicated a lower level of shame and guilt in adolescents with hearing loss (Ketelaar et al., 2015; Peterson, 2016).

The present study

In this longitudinal study, adolescents between 9 and 16 years old, with and without hearing loss, completed self-report questionnaires on three measurement occasions. An advantage of this quasi-experimental longitudinal design was that we could examine the role of social emotions alongside the role of social access (i.e., through group comparisons) in the development of aggression.

The first aim of this study was to compare the levels and development of aggression and social emotions between adolescents with and without hearing loss. We expected higher levels of reactive and proactive aggression, and lower levels of social emotions in adolescents with hearing loss compared to their hearing peers (Chao et al., 2015; Ketelaar et al., 2015; Peterson, 2016). For both groups, we hypothesised increases in the level of reactive and proactive aggression (Petersen et al., 2015). In addition, we expected shame and guilt to increase throughout adolescence (Krettenauer et al., 2014), but at a slower pace in adolescents with hearing loss, as compared to hearing adolescents.

The second aim of this study was to examine the extent to which social emotions

contributed to the prediction of reactive and proactive aggression in adolescents with and without hearing loss. Based on previous cross-sectional studies, we expected shame to contribute to an increase in reactive aggression (Thomaes et al., 2011), and both shame and guilt to contribute to a decrease in proactive aggression (Chaux et al., 2012; Frick et al., 2003). Finally, we expected these relations to be similar in adolescents with hearing loss and without hearing loss.

METHOD

Participants

80 adolescents with hearing loss and 227 adolescents without hearing loss participated in this study (see Table 1). The data presented here are part of a longitudinal study on the social-emotional development of adolescents with hearing loss. Cross-sectional studies were previously presented for example by Kouwenberg and colleagues (2012) and Theunissen and colleagues (2011). Detailed information on the population with hearing loss that is studied longitudinally can be found in Broekhof and colleagues (2018).

Adolescents with hearing loss were recruited via ENT departments of hospitals, special needs schools, speech and hearing centres, and magazines or websites. Inclusion criteria for adolescents with hearing loss were an unaided hearing loss of at least 40dB in the better ear, detected pre- or perilingually. Adolescents without hearing loss were recruited from primary and secondary schools in the Netherlands. Inclusion criteria for both adolescents with and without hearing loss were 1) age between 9 and 16 years at Time 1 (T1), 2) normal intellectual functioning, 3) no diagnosed developmental disabilities or learning difficulties, and 4) living in the Netherlands or the Dutch speaking part of Belgium. The two groups did not differ in terms of terms of age at T1, gender distribution, IQ, language, or parental education level (see Table 1).

Materials

Instrument for Reactive and Proactive Aggression (IRPA) Self-Report (Rieffe et al., 2016): Adolescents were asked to report their aggressive behaviours from the previous four weeks on a three-point scale (1 = never, 2 = sometimes, 3 = often). The questionnaire consisted of two scales: reactive and proactive aggression. Aggressive behaviours were defined as three forms of physical aggression (i.e., kicking, hitting and pushing) and two forms of relational aggression (i.e., name calling and picking fights). To differentiate between reactive and proactive aggression, adolescents were asked to report on their motives: there were three reactive motives (i.e., "I was mad", "I was bullied", or "I struck back") and three proactive motives (i.e., "I wanted to be mean", "I took pleasure out of

Table 1. Demographic characteristics of participants.

	HL	Hearing
No. of participants	80	227
Age in years at T1		
Mean (*SD*)	11.91 (1.62)	11.63 (1.38)
Range	9.17-15.75	9.08-14.75
Gender – *n* (%)		
Male	37 (46.3)	96 (42.3)
Female	43 (53.8)	131 (57.7)
IQ score (*SD*)	10.19 (2.67)	10.61 (2.48)
Language score (*SD*)	10.29 (3.30)	10.32 (2.30)
Parental education level† (*SD*)	3.21 (.72)	3.17 (.66)
Type of education – *n* (%)		
Regular education	48 (60.0)	227 (100.0)
Special education	32(40.0)	0
Communication mode – *n* (%)		
Dutch Sign Language /Sign Supported Dutch	28 (35.0)	
Spoken Language only	52 (65.0)	
Type of amplification - *n* (%)		
Hearing aid	53 (66.3)	
Cochlear implant (CI)	27 (33.3)	
Hearing loss in best ear – *n* (%)		
40-60 dB	20 (25.0)	
61-90 dB	18 (22.5)	
> 90 dB	36 (45.0)	
Unknown	6 (7.5)	

†The highest level of education of each parent was categorized on a scale ranging from one to four. Social economic status was calculated by averaging these two scores. *Abbreviations:* HL: Hearing loss; SD: Standard Deviation; T = Time.

it", or "I wanted to be the boss"). Total scores were calculated per scale. The internal consistencies of the scales were sufficient, ranging from .67 to .92 (see Table 1 of the Supplementary Appendix for Cronbach's alphas).

Brief Shame and Guilt Questionnaire (BSGQ; Novin & Rieffe, 2015): Adolescents were asked to imagine themselves occupying a described scenario, and asked to rate how ashamed or guilty they would feel on a three-point scale (1 = not at all, 2 = a little, 3 = a lot). The questionnaire consisted of 12 social emotion-eliciting vignettes. In six vignettes, participants were asked to indicate how ashamed they would feel, and in the

other six, they were asked how guilty they would feel (e.g., Shame: "You get a very bad grade in school"; Guilt: "There is one cookie left in the cookie jar. You quickly put it in your mouth. Now your friend does not have a cookie"). Total scores were calculated per scale. The internal consistencies of the scales were sufficient, ranging from .68 to .81 (see Table 1 of the Supplementary Appendix for Cronbach's alphas).

Procedure

We administered self-report questionnaires to participants at all three time points with intervals of approximately 9 months (Interval T2-T1: $M = 9.3$ months; $SD = .91$; Interval T3-T2: $M = 9.9$ months; $SD = 1.15$). Questionnaires were administered individually in a quiet room at the participant's school or home. Participants were seated in front of a computer, and questions were presented one by one. For adolescents with hearing loss, all instructions and questions were accompanied by a video providing a translation in Dutch Sign Language. We emphasized that we would keep all their answers confidential. We obtained parental informed consent and ethical approval of Leiden University for the study.

Statistical Analyses

To compare levels and development of aggression and social emotions between adolescents with and without hearing loss, we used Linear Mixed Models (LMM) to deal with the nested structure of our data (i.e., within-child measures). This analytic technique is also appropriate for datasets with missing data (Singer & Willett, 2003). Information about missing data in this study is reported in Table 2 of the Supplementary Appendix. First, we assessed general group differences, the development of our study variables over time, and whether these developmental trajectories differed between adolescents with and without hearing loss. Using a formal modelling procedure, we fitted an unconditional means model with a fixed and random intercept. In the next step, we added group (i.e., 0 = without hearing loss, 1 = with hearing loss). In addition, we added age (centered around 9.08 years, youngest participant of the current sample) and examined three models of change: linear, quadratic, and cubic models, respectively. We added a random slope effect for the best age model, but this did not improve model fit for any model. In the last step, we added interaction with group to assess differences between groups in developmental trajectories. Preferred models had lower Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values. To compare whether AIC and BIC values of a subsequent model were significantly lower, the AIC and BIC values of this model were compared to the values of the model of the previous step (i.e., nested models differing one degree of freedom) using a log likelihood ratio test.

Second, LMM models were used to assess whether shame and guilt contributed to the linear development of reactive and proactive aggression. First, we used baseline levels (i.e., score at T1) and change levels (i.e., change over time: T1-T1, T2-T1, and T3-T1), and included the best fitting age-model, group and gender (0 = boy, 1 = girl) in the analyses. In the second step, interactions with Group were added. Again, we made a comparison between nested models by comparing AIC and BIC values (i.e., significant lower values indicate better fit). All analyses were performed in SPSS version 24.0. Graphs were made in R version 3.4.3 using the Ggplot2 function.

RESULTS

Intraclass correlations

Intraclass correlations (ICC) were calculated to test nesting of observations within individuals across the three time points. We used a two-way mixed effects model with a measure of absolute agreement and interpreted average measures. ICC were good with values of .760 for reactive aggression, .732 for proactive aggression, .765 for shame, and .787 for guilt. Pearson correlations between the averages of all study variables (i.e., of T1, T2, T3) are displayed in the Supplementary Appendix.

Developmental trajectories and group differences

The outcomes for the best fitting model of the multilevel analyses are displayed in Table 2 (see Supplementary materials Table 3 for an overview of all fitted models). Individual variation is observed in the intercepts of reactive aggression, proactive aggression, shame, and guilt (see Figure 1 of the Supplementary materials).

Reactive aggression and proactive aggression were both best explained by a negative linear age-model, indicating that both types of aggression decreased over time (see Figure 1A and 1B). We found no group differences for reactive aggression (b = .97, p = .084), but adolescents with hearing loss displayed higher levels of proactive aggression (b = 1.47, p < .001) compared to hearing adolescents (see Table 2).

The developmental trajectories of shame and guilt were best explained by a quadratic age-model. As can be seen in Figure 1C and 1D, this suggests that shame and guilt peak in early adolescence. Moreover, for guilt, the optimal fitting model also included an age (quadratic) x group interaction, indicating that guilt peaks later in adolescents with hearing loss compared to adolescents without hearing loss (see Figure 1D). As expected, adolescents with hearing loss reported lower levels of shame (b = -.93, p < .001) and lower levels of guilt (b = -.2.53, p < .001; see Table 2).

Table 2. Linear mixed models examining group differences and the developmental trajectory of reactive aggression, proactive aggression, shame, and guilt.

Best fitting model	AIC/BIC	Intercept (se)	Group (se)	Age linear (se)	Age quadratic (se)	Group x Age (se)
Reactive aggression	4759/4769	20.92 (.51)***	.97 (.56)	-.38 (.13)**	-	-
Proactive aggression	3971/3981	16.77 (.30)***	1.47 (.33)***	-.23 (.08)**	-	-
Shame	3741/3751	12.28 (.40)***	-.93 (.31)**	1.25 (.22)***	-.16 (.03)***	-
Guilt	3558/3568	13.15 (.36)***	-2.53 (.56)***	.80 (.20)***	-.12 (.03)***	.36 (.14)*

Note. Abbreviations: AIC = Akaike information criterion; BIC = Bayesian Information Criterion. Group: 0 = hearing, 1 = hearing loss.
*$p < .05$, **$p < .01$, ***$p < .001$.

Table 3. Results of the linear mixed model on the effect of social emotions on aggression.

	Reactive aggression		Proactive aggression	
Fixed effects				
Intercept	6.701***		14.824***	
Age	- .219		- .114	
Group	.010		.094**	
Gender	- .600		.934	
	Baseline	**Change**	**Baseline**	**Change**
Reactive aggression	-	-	.253***	.243***
Proactive aggression	.714***	.629***	-	-
Shame	.174#	.183*	- .004	- .029
Guilt	.005	.038	- .239***	- .179***
Random effects				
ID	10.98		4.35	
AIC/BIC	4572.78/4582.12		3785.80/3795.14	
df	12		12	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$; gender: 0 = boys, 1 = girls. #$p = .058$
Note. Adding group interactions with shame and guilt did not improve both models.

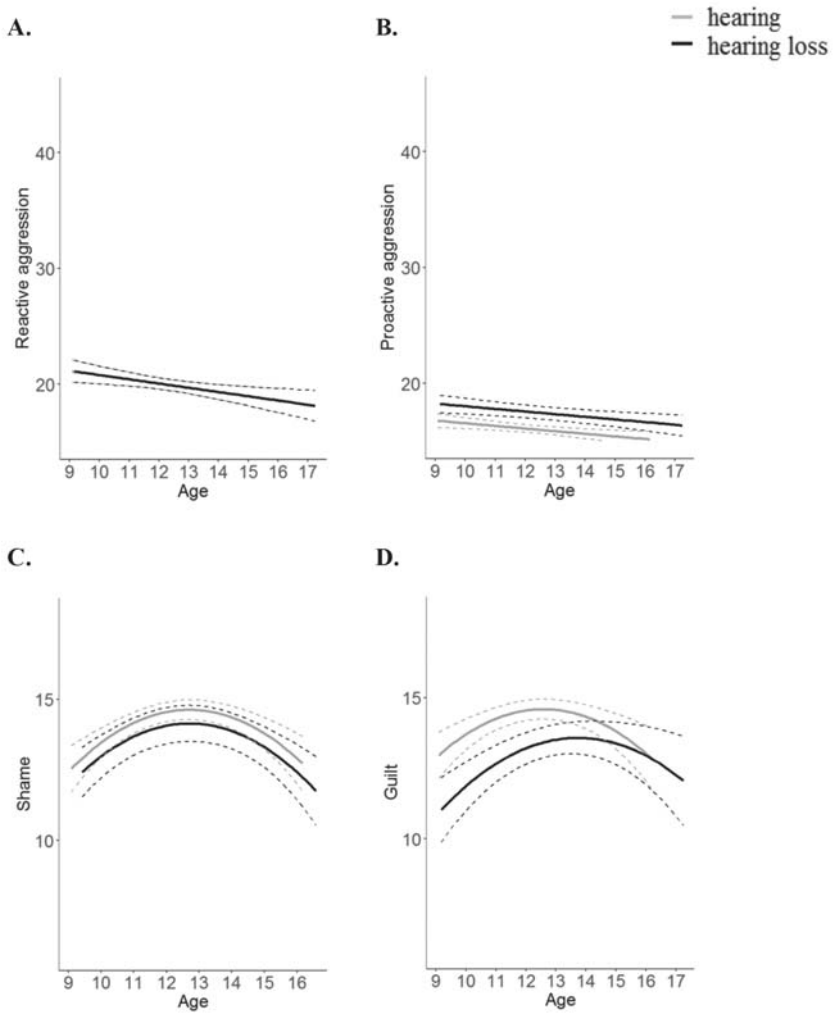

Figure 1. Longitudinal graphic representation of the predicted values based on the optimal fitting model for **1A.** reactive aggression, **1B**. proactive aggression, **1C**. shame, and **1D.** guilt. Lines for hearing adolescents are displayed in grey and lines for adolescents with hearing loss are presented in black. Dotted lines represent 95% confidence interval.

Risk and protective factors for the development of reactive and proactive aggression

LMM models were used to examine the predictive value of shame and guilt for the linear development of aggression. For both reactive and proactive aggression, the model without interactions fitted the data best.

As shown in Table 3, the change level for shame contributed to an increase in reactive aggression, controlling for proactive aggression. So, an increase in shame relative to T1 was associated with an increase in reactive aggression. In addition, the baseline level of shame also marginally contributed to an increase in reactive aggression (p = .058).

For proactive aggression, the baseline level and change in guilt contributed to a decrease in proactive aggression, controlling for reactive aggression (see Table 3). So, higher levels of guilt and an increase in guilt relative to T1 were associated with a decrease in proactive aggression.

DISCUSSION

Adolescence is an important transition phase from childhood to adulthood, marked by increasing responsibility to regulate one's own behaviour, and growth in social awareness (for reviews see Blakemore, 2008; Farley & Kim-Spoon, 2014). Externalizing behaviours peak during adolescence and social emotions become part of everyday social exchange (Lansford, 2018; Petersen et al., 2015; Zeman, Cassano, Perry-Parrish, & Stegall, 2006). However, very few studies have examined the development of specific types of aggression during adolescence, or how social emotions contribute to the development of adolescent aggression (Barker, Tremblay, Nagin, Vitaro, & Lacourse, 2006; Roos et al., 2014). In the current three-wave longitudinal study, we tested: 1) the development of reactive aggression, proactive aggression, and social emotions across adolescence, and 2) the longitudinal contribution of social emotions to the development of both types of aggression. To assess the role of social access in these developmental patterns and interrelations, we compared adolescents with and without hearing loss.

The present study yielded several main findings, which are discussed below. Reactive and proactive aggression declined throughout adolescence. When examining how levels of self-reported social emotions contributed to this linear development, we found that higher levels of shame were related to increasing levels of reactive aggression over time, whereas increasing levels of guilt were related to decreasing levels of proactive aggression. These outcomes highlight the importance of differentiating between specific types of aggression in relation to guilt and shame. The developmental trend of aggression and the longitudinal associations of social emotions with aggression applied to both adolescents with and without hearing loss. However, the influence of social access became apparent through higher levels of proactive aggression and lower levels of social emotions in adolescents with hearing loss. In addition, although social emotions peaked in early adolescence in both groups, guilt peaked later in adolescents with hearing loss, compared to their peers without hearing loss.

Aggression

The finding that reactive and proactive aggression linearly declined over time did depart from our expectation. Nevertheless, this is partly in line with previous studies

examining the development of aggression, specifically. Based on large scale longitudinal studies on the development of externalizing behaviours, it was concluded that aggression increases during adolescence, as compared to middle childhood and adulthood (Lansford, 2018; Petersen et al., 2015). Yet, these studies often examined an aggregate score for antisocial and risk taking behaviours that included aggression, but also delinquency, disobedience, and disruptive behaviour. While aggression merely involves behaviours that inflict harm to others (e.g., pushing, fighting, and name calling), antisocial behaviours include many behaviours that are socially undesirable, but do not necessarily harm anyone. The scarce number of studies in which the development of aggression is examined specifically reported either stability over time (Barker et al., 2006; Kokko, Pulkkinen, Huesmann, Dubow, & Boxer, 2009) or a decrease in aggression during adolescence (Barker et al., 2006; Bongers, Koot, van der Ende, & Verhulst, 2004; Vierikko, Pulkkinen, Kaprio, & Rose, 2006). Aggregating aggression in the broader classes of risk taking and antisocial behaviours possibly contaminated earlier conclusions, which stresses the need for future studies in the developmental course of aggression (Tremblay, 2000).

Risk and protective factors in the development of aggression

Importantly, we show that more shame is uniquely associated with higher levels of reactive aggression, and more guilt is uniquely associated with lower levels of proactive aggression. Moreover, a decrease in shame contributed to a decrease in reactive aggression, whereas an increase in guilt contributed to a decrease in aggression over time. These findings support the need for longitudinal research, as changes in social emotions contribute to changes in aggression over time. In addition, these findings highlight the importance of differentiating between reactive and proactive aggression in relation to shame and guilt. Possibly due to the distinction between these two types of aggression, we were able to confirm with a longitudinal design that shame and guilt are influential in the development of these specific types of aggression. A previous longitudinal study used only an aggregate score of reactive and proactive aggression (Roos et al., 2014), potentially masking the unique longitudinal associations evident when reactive and proactive aggression are examined separately since our findings now also indicate that shame is unrelated to proactive aggression and guilt is unrelated to reactive aggression.

Our finding that adolescents with higher levels of shame reported increasing levels of reactive aggression adds to previous cross-sectional studies. The main theory about the path from shame to aggression posits that exposing adolescents to a shameful event initiates fury, paving the way for aggressive behaviours (Thomaes et al., 2011). It is beyond dispute that ashamed individuals are in a highly aroused state, either

experiencing elevated levels of social pain or anger, hence shame's link to reactive aggression (Lewis, 1971).

It was unexpected that shame played no discouraging role in the development of proactive aggression (Olthof, 2012). This might be caused by conceptual overlap, i.e., the shared variance of guilt and shame. Correlations to test this hypothesis confirm that shame correlated with proactive aggression when guilt was not included in the analysis to parse out this shared variance (see Table 4 of the Supplementary Appendix). This confirms that shame is only negatively associated with lower levels of proactive aggression when guilt is not accounted for.

To the best of our knowledge, this study is the first to confirm longitudinally that more guilt (higher initial and increasing levels) contributed to a decrease in proactive aggression. That is, adolescents with higher levels of guilt are less inclined to behave aggressively without being provoked, because of the negative emotional consequences of aggressive behavior for themselves. As expected, there were no longitudinal associations between guilt and reactive aggression. There are several possible explanations why guilt attributions are not related to the development of reactive aggression. Previous research has indicated that emotionally aroused individuals are more likely to act impulsively, reflected by a preference for instant small gratification, even in the face of a delayed negative consequences (Peters, Vastfjall, Garling, & Slovic, 2006; Sohn et al., 2015). Thus, if one feels provoked by someone, it is more tempting to retaliate, even if one anticipates consequential guilt. At the same time, from middle childhood onwards, individuals judge aggression to defend oneself (i.e., reactive aggression) as more morally justifiable than aggression to obtain selfish instrumental goals (i.e., proactive aggression; Jambon & Smetana, 2014). Anticipating the consequences of engagement in reactive aggression would therefore result in less intense guilt attributions, as compared to engagement in proactive aggression, minimizing the protective influence of guilt for reactive aggression.

The unique associations of shame with reactive aggression and guilt with proactive aggression were similar in adolescents with and without hearing loss. Thus, the level of social access does not seem to alter the role of social emotions on the development of aggression. Can lower levels of social emotions therefore explain the higher incidence of proactive aggression in adolescents with hearing loss? Similar to the hearing group, lower levels of guilt were linked to the development of higher levels of proactive aggression in adolescents with hearing loss. Given that levels of guilt were lower for children with hearing loss, it is not surprising that these adolescents were indeed found to have a higher level of proactive aggression. In contrast, we found that higher levels of shame are related to higher levels of reactive aggression. With lower levels of shame, compared to their hearing peers, adolescents with hearing loss do not seem to be at risk for the development of reactive aggression.

Developmental patterns of shame and guilt

Guilt and shame peak in early adolescence: the reported intensity of both guilt and shame increase from preadolescence to early adolescence and decrease thereafter into middle adolescence. This quadratic pattern is compatible with studies showing that peer sensitivity is highest around early adolescence (e.g., Steinberg, 2008). Fear of peer rejection, or a strong desire to belong to a peer group, could foster perspective taking abilities and the willingness to behave in accordance with social norms and values (Newman, Lohman, & Newman, 2007; van Hoorn, van Dijk, Meuwese, Rieffe, & Crone, 2016). Early adolescents seem particularly reluctant to harm another peer, or to behave incompetently in the presence of others, indicating higher levels of shame and guilt in this adolescent phase (Reimer, 1996).

Adolescents with hearing loss showed lower levels of social emotions in general, and a more protracted development of guilt, compared to adolescents without hearing loss. This finding highlights the need for social learning. In order for social emotions to arise, there must be an appreciation for the perspectives and feelings of others and an appreciation for social rules and standards (Tangney & Dearing, 2002). Children and adolescents with hearing loss are found to be less aware of others' perspectives and feelings, due to less access to the social world (Jones, Gutierrez, & Ludlow, 2015; Ketelaar et al., 2015). Consequently, adolescents with hearing loss may not foresee the negative evaluations of others, or any negative emotional consequences for others as a result of their aggressive behaviour, making it less likely that guilt and shame will occur.

It remains speculative why the developmental pace of guilt peaks later in adolescents with hearing loss, whereas the developmental pace of shame is in line with adolescents without hearing loss. An explanation may lie in the differences between shame and guilt. Whereas shame is focused on oneself in light of a negative evaluation by others, guilt is focused on the other, thus requiring stronger perspective taking capacity. It could be that the switch from perspective taking with a focus on the self to perspective taking with a focus on the other is more challenging for adolescents with less access to the social world. Future studies need to unravel whether adolescents with less access to the social world could benefit from training in perspective taking abilities, in order to prevent lower levels of social emotions and a slower developmental pace for guilt.

Limitations and strengths

The present study has several strengths, but there are also some limitations that need to be addressed. First, the levels of aggression were generally low in our adolescent sample, as is frequently observed in studies with non-clinical samples (see Figures 1A and 1B; Barker et al., 2006; Roos et al., 2014). Nevertheless, there was sufficient intra-

and inter-individual change to map developmental changes in aggression, and to examine the contribution of shame and guilt to these changes in aggression. Second, this study relied solely on self-report measures, increasing the risk for common-method variance bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Future studies should use varying measurement methods and sources by also including observational measures or peer reports.

Among the strengths of this study is the longitudinal design, with three measurements in early adolescence and approximately 9 months in between. It enabled us to map developmental changes in aggression, and to examine the longitudinal contribution of social emotions to these changes. Another strength of this study is that we adopted a quasi-experimental design, including a large sample of adolescents with hearing loss. This unique approach made it possible to study the role of social access on the development of aggression and social emotions.

CONCLUSION

The current longitudinal study showed that adolescents with and without hearing loss engage in less reactive and proactive aggression as they mature from early to middle adolescence. However, reported levels of proactive aggression are elevated in adolescents with hearing loss. In addition, shame and guilt peaked in early adolescents but adolescents with hearing loss reported lower levels of these social emotions compared to hearing peers. These group differences emphasize the important role of access to the social world in the development of social emotions.

Our study suggests that shame is an important risk factor in the development of reactive aggression, whereas guilt is an important protective factor in the development of proactive aggression for both adolescents with and without hearing loss. Future studies should determine whether promoting perspective taking with the focus on others, as is characteristic for guilt, as opposed to perspective taking with the focus on the self as is characteristic for shame, could provide means for developing interventions that successfully prevent aggressive behaviour in adolescence.

REFERENCES

Ambrose, S. E., Walker, E. A., Unflat-Berry, L. M., Oleson, J. J., & Moeller, M. P. (2015). Quantity and quality of caregivers' linguistic input to 18-month and 3-year-old children who are hard of hearing. *Ear and Hearing, 36*, 48S-59S. doi:10.1097/AUD.0000000000000209

Arsenio, W. F., Adams, E., & Gold, J. (2009). Social information processing, moral reasoning, and emotion attributions: Relations with adolescents' reactive and proactive aggression. *Child Development, 80*(6), 1739-1755. doi:10.1111/j.1467-8624.2009.01365.x

Arsenio, W. F., Gold, J., & Adams, E. (2006). Children's conception and displays of moral emotions. In M. Killen & J. Smetana (Eds.), *Handbook of moral development* (pp. 581-609). Mahwah, NJ: Erlbaum.

Arsenio, W. F., Preziosi, S., Silberstein, E., & Hamburger, B. (2012). Adolescents' perceptions of institutional fairness: Relations with moral reasoning, emotions, and behavior. *New Directions for Youth Development, 2012*(136), 95-110. doi:10.1002/yd.20041

Bandura, A. (1973). *Aggression: A social learning theory analysis*. New York, NY: Prentice-Hall.

Barker, E. D., Tremblay, R. E., Nagin, D. S., Vitaro, F., & Lacourse, E. (2006). Development of male proactive and reactive physical aggression during adolescence. *Journal of Child Psychology and Psychiatry, 47*(8), 783-790. doi:10.1111/j.1469-7610.2005.01585.x

Barnow, S., Lucht, M., & Freyberger, H. J. (2005). Correlates of aggressive and delinquent conduct problems in adolescence. *Aggressive Behavior, 31*(1), 24-39. doi:10.1002/ab.20033

Blakemore, S. J. (2008). The social brain in adolescence. *Nature Reviews Neuroscience, 9*(4), 267-277. doi:10.1038/nrn2353

Bongers, I. L., Koot, H. M., van der Ende, J., & Verhulst, F. C. (2004). Developmental trajectories of externalizing behaviors in childhood and adolescence. *Child Development, 75*(5), 1523-1537. doi:10.1111/j.1467-8624.2004.00755.x

Broekhof, E., Bos, M. G. N., Camodeca, M., & Rieffe, C. (2018). Longitudinal associations between bullying and emotions in deaf and hard of hearing adolescents. *Journal of Deaf Studies and Deaf Education, 23*(1), 17-27. doi:10.1093/deafed/enx036

Bushman, B. J., & Anderson, C. A. (2001). Is it time to pull the plug on the hostile versus instrumental aggression dichotomy? *Psychological Review, 108*(1), 273-279. doi:10.1037/0033-295X.108.1.273

Chao, W. C., Lee, L. A., Liu, T. C., Tsou, Y. T., Chan, K. C., & Wu, C. M. (2015). Behavior problems in children with cochlear implants. *International Journal of Pediatric Otorhinolaryngology, 79*(5), 648-653. doi:10.1016/j.ijporl.2015.02.006

Chaux, E., Arboleda, J., & Rincón, C. (2012). Community violence and reactive and proactive aggression: The mediating role of cognitive and emotional variables. *Revista Colombiana de Psicología, 21*(2), 233-251.

Cima, M., Raine, A., Meesters, C., & Popma, A. (2013). Validation of the Dutch reactive proactive questionnaire (RPQ): Differential correlates of reactive and proactive aggression from childhood to adulthood. *Aggressive Behavior, 39*(2), 99-113. doi:10.1002/ab.21458

De Waal, F. (2009). *The age of empathy: Nature's lessons for a kinder society*. London, UK: Souvenir Press.

Dodge, K. A., & Coie, J. D. (1987). Social-information-processing factors in reactive and proactive aggression in children's peer groups. *Journal of Personality and Social Psychology, 53*(6), 1146-1158. doi:10.1037/0022-3514.53.6.1146

Dollard, J., Doob, C. W., Miller, N. E., Mowrer, O. H., & Sears, R. R. (1939). *Frustration and aggression*. New Haven, CT: Yale University Press.

Dunn, J., Brown, J. R., & Maguire, M. (1995). The development of childrens moral sensibility: Individual-differences and emotion understanding. *Developmental Psychology, 31*(4), 649-659. doi:10.1037/0012-1649.31.4.649

Eisenberg, N. (2000). Emotion, regulation, and moral development. *Annual Review of Psychology, 51*, 665-697. doi:10.1146/annurev.psych.51.1.665

Farley, J. P., & Kim-Spoon, J. (2014). The development of adolescent self-regulation: Reviewing the role of parent, peer, friend, and romantic relationships. *Journal of Adolescence, 37*(4), 433-440. doi:10.1016/j.adolescence.2014.03.009

Frick, P. J., Cornell, A. H., Barry, C. T., Bodin, S. D., & Dane, H. E. (2003). Callous-unemotional traits and conduct problems in the prediction of conduct problem severity, aggression, and self-report of delinquency. *Journal of Abnormal Child Psychology, 31*(4), 457-470. doi:10.1023/A:1023899703866

Gonzalez, A., Quintana, I., Barajas, C., & Linero, M. J. (2007). The role of age and oral lexical competence in false belief understanding by children and adolescents with hearing loss. *Volta Review, 107*(2), 123-139.

Hubbard, J. A., Dodge, K. A., Cillessen, A. H., Coie, J. D., & Schwartz, D. (2001). The dyadic nature of social information processing in boys' reactive and proactive aggression. *Journal of Personality and Social Psychology, 80*(2), 268-280. doi:10.1037//0022-3514.80.2.268

Jambon, M., & Smetana, J. G. (2014). Moral complexity in middle childhood: Children's evaluations of necessary harm. *Developmental Psychology, 50*(1), 22-33. doi:10.1037/a0032992

Jones, A. C., Gutierrez, R., & Ludlow, A. K. (2015). Confronting the language barrier: Theory of mind in deaf children. *Journal of Communication Disorders, 56*, 47-58. doi:10.1016/j.jcomdis.2015.06.005

Kempes, M., Matthys, W., de Vries, H., & van Engeland, H. (2005). Reactive and proactive aggression in children - A review of theory, findings and the relevance for child and adolescent psychiatry. *European Child and Adolescent Psychiatry, 14*(1), 11-19. doi:10.1007/s00787-005-0432-4

Ketelaar, L., Wiefferink, C. H., Frijns, J. H. M., Broekhof, E., & Rieffe, C. (2015). Preliminary findings on associations between moral emotions and social behavior in young children with normal hearing and with cochlear implants. *European Child and Adolescent Psychiatry, 24*(11), 1369-1380. doi:10.1007/s00787-015-0688-2

Kokko, K., Pulkkinen, L., Huesmann, L. R., Dubow, E. F., & Boxer, P. (2009). Intensity of aggression in childhood as a predictor of different forms of adult aggression: A two-country (Finland and the United States) analysis. *Journal of Research on Adolescence, 19*(1), 9-34. doi:10.1111/j.1532-7795.2009.00579.x

Kouwenberg, M., Rieffe, C., Theunissen, S. C., & de Rooij, M. (2012). Peer victimization experienced by children and adolescents who are deaf or hard of hearing. *PLoS One, 7*(12), e52174. doi:10.1371/journal.pone.0052174

Krettenauer, T., Colasante, T., Buchmann, M., & Malti, T. (2014). The development of moral emotions and decision-making from adolescence to early adulthood: A 6-year longitudinal study. *Journal of Youth and Adolescence, 43*(4), 583-596. doi:10.1007/s10964-013-9994-5

Krettenauer, T., & Eichler, D. (2006). Adolescents' self-attributed moral emotions following a moral transgression: Relations with delinquency, confidence in moral judgment and age. *British Journal of Developmental Psychology, 24*, 489-506. doi:10.1348/026151005x50825

Lansford, J. E. (2018). Development of aggression. *Current Opinion in Psychology, 19*, 17-21. doi:10.1016/j.copsyc.2017.03.015

Lederberg, A. R., Schick, B., & Spencer, P. E. (2013). Language and literacy development of deaf and hard-of-hearing children: Successes and challenges. *Developmental Psychology, 49*(1), 15-30. doi:10.1037/a0029558

Lewis, H. B. (1971). Shame and guilt in neurosis. *Psychoanalytic Review, 58*(3), 419-438.

Malti, T. (2016). Toward an integrated clinical-developmental model of guilt. *Developmental Review, 39*, 16-36. doi:10.1016/j.dr.2015.11.001

Malti, T., & Krettenauer, T. (2013). The relation of moral emotion attributions to prosocial and antisocial behavior: A meta-analysis. *Child Development, 84*(2), 397-412. doi:10.1111/j.1467-8624.2012.01851.x

Martin-Storey, A., Serbin, L. A., Stack, D. M., Ledingham, J. E., & Schwartzman, A. E. (2011). Self and peer perceptions of childhood aggression, social withdrawal and likeability predict adult substance abuse and dependence in men and women: A 30-year prospective longitudinal study. *Addictive Behaviors, 36*(12), 1267-1274. doi:10.1016/j.addbeh.2011.07.043

Netten, A. P., Rieffe, C., Soede, W., Dirks, E., Korver, A. M. H., Konings, S., . . . Decibel-Collaborative-study-group. (2017). Can you hear what I think? Theory of mind in young children with moderate hearing loss. *Ear and Hearing, 38*(5), 588-597. doi:10.1097/AUD.0000000000000427

Newman, B. M., Lohman, B. J., & Newman, P. R. (2007). Peer group membership and sense of belonging: Their relationship to adolescent behavior problems. *Adolescence, 42*(166), 241-263.

Novin, S., & Rieffe, C. (2015). Validation of the brief shame and guilt questionnaire for children. *Personality and Individual Differences, 85*, 56-59. doi:10.1016/j.paid.2015.04.028

Nunner-Winkler. (2009). Moral motivation from childhood to early adulthood. In W. Schneider & M. Bullock (Eds.), *Human development from early childhood to early adulthood* (pp. 91-118). New York, NY: Psychology Press.

Olthof, T. (2012). Anticipated feelings of guilt and shame as predictors of early adolescents' antisocial and prosocial interpersonal behaviour. *European Journal of Developmental Psychology, 9*(3), 371-388. doi:10.1080/17405629.2012.680300

Orobio de Castro, B., Veerman, J. W., Koops, W., Bosch, J. D., & Monshouwer, H. J. (2002). Hostile attribution of intent and aggressive behavior: A meta-analysis. *Child Development, 73*(3), 916-934. doi:10.1111/1467-8624.00447

Ostrov, J. M., & Crick, N. R. (2007). Forms and functions of aggression during early childhood: A short-term longitudinal study. *School Psychology Review, 36*(1), 22-43.

Peters, E., Vastfjall, D., Garling, T., & Slovic, P. (2006). Affect and decision making: A "hot" topic. *Journal of Behavioral Decision Making, 19*(2), 79-85. doi:10.1002/bdm.528

Petersen, I. T., Bates, J. E., Dodge, K. A., Lansford, J. E., & Pettit, G. S. (2015). Describing and predicting developmental profiles of externalizing problems from childhood to adulthood. *Development and Psychopathology, 27*(3), 791-818. doi:10.1017/S0954579414000789

Peterson, C. C. (2016). Empathy and theory of mind in deaf and hearing children. *Journal of Deaf Studies and Deaf Education, 21*(2), 141-147. doi:10.1093/deafed/env058

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879-903. doi:10.1037/0021-9010.88.5.879

Reimer, M. S. (1996). ''Sinking into the ground'': The development and consequences of shame in adolescence. *Developmental Review, 16*(4), 321-363. doi:10.1006/drev.1996.0015

Rieffe, C., Broekhof, E., Kouwenberg, M., Faber, J., Tsutsui, M. M., & Guroglu, B. (2016). Disentangling proactive and reactive aggression in children using self-report. *European Journal of Developmental Psychology, 13*(4), 439-451. doi:10.1080/17405629.2015.1109506

Rieffe, C., & Terwogt, M. M. (2006). Anger communication in deaf children. *Cognition and Emotion, 20*(8), 1261-1273. doi:10.1080/02699930500513502

Roos, S., Hodges, E. V. E., & Salmivalli, C. (2014). Do guilt- and shame-proneness differentially predict prosocial, aggressive, and withdrawn behaviors during early adolescence? *Developmental Psychology, 50*(3), 941-946. doi:10.1037/a0033904

Roos, S., Salmivalli, C., & Hodges, E. V. E. (2011). Person x context effects on anticipated moral emotions following aggression. *Social Development, 20*(4), 685-702. doi:10.1111/j.1467-9507.2011.00603.x

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurence*. New York, NY: Oxford University Press.

Sohn, J. H., Kim, H. E., Sohn, S., Seok, J. W., Choi, D., & Watanuki, S. (2015). Effect of emotional arousal on inter-temporal decision-making: An fMRI study. *Journal of Physiological Anthropology, 34*, 8. doi:10.1186/s40101-015-0047-5

Sokol, B. W., & Chandler, M. J. (2003). Taking agency seriously in the theories-of-mind enterprise: Exploring children's understanding of interpretation and intention. *British Journal of Educational Psychology Monograph Series, 2*, 125-136.

Steinberg, L. (2008). A social neuroscience perspective on adolescent risk-taking. *Developmental Review, 28*(1), 78-106. doi:10.1016/j.dr.2007.08.002

Stuewig, J., Tangney, J. P., Heigel, C., Harty, L., & McCloskey, L. (2010). Shaming, blaming, and maiming: Functional links among the moral emotions, externalization of blame, and aggression. *Journal of Research in Personality, 44*(1), 91-102. doi:10.1016/j.jrp.2009.12.005

Tangney, J. P., & Dearing, R. L. (2002). *Shame and guilt*. New York, NY: Guilford Press.

Theunissen, S. C., Rieffe, C., Kouwenberg, M., Soede, W., Briaire, J. J., & Frijns, J. H. (2011). Depression in hearing-impaired children. *International Journal of Pediatric Otorhinolaryngology, 75*(10), 1313-1317. doi:10.1016/j.ijporl.2011.07.023

Thomaes, S., Stegge, H., Olthof, T., Bushman, B. J., & Nezlek, J. B. (2011). Turning shame inside-out: "Humiliated fury" in young adolescents. *Emotion, 11*(4), 786-793. doi:10.1037/a0023403

Tomblin, J. B., Harrison, M., Ambrose, S. E., Walker, E. A., Oleson, J. J., & Moeller, M. P. (2015). Language outcomes in young children with mild to severe hearing loss. *Ear and Hearing, 36*(1), 76S-91S. doi:10.1097/AUD.0000000000000219

Torres, J., Saldana, D., & Rodriguez-Ortiz, I. R. (2016). Social information processing in deaf adolescents. *Journal of Deaf Studies and Deaf Education, 21*(3), 326-338. doi:10.1093/deafed/enw030

Tremblay, R. E. (2000). The development of aggressive behaviour during childhood: What have we learned in the past century? *International Journal of Behavioral Development, 24*(2), 129-141. doi:10.1080/016502500383232

Van Eldik, T. (2005). Mental health problems of Dutch youth with hearing loss as shown on the youth self report. *American Annals of the Deaf, 150*(1), 11-16. doi:10.1353/aad.2005.0024

van Hoorn, J., van Dijk, E., Meuwese, R., Rieffe, C., & Crone, E. A. (2016). Peer influence on prosocial behavior in adolescence. *Journal of Research on Adolescence, 26*(1), 90-100. doi:10.1111/jora.12173

Vierikko, E., Pulkkinen, L., Kaprio, J., & Rose, R. J. (2006). Genetic and environmental sources of continuity and change in teacher-rated aggression during early adolescence. *Aggressive Behavior, 32*(4), 308-320. doi:10.1002/ab.20117

Zeman, J., Cassano, M., Perry-Parrish, C., & Stegall, S. (2006). Emotion regulation in children and adolescents. *Journal of Developmental and Behavioral Pediatrics, 27*(2), 155-168. doi:10.1097/00004703-200604000-00014