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I see, I see what you don't see

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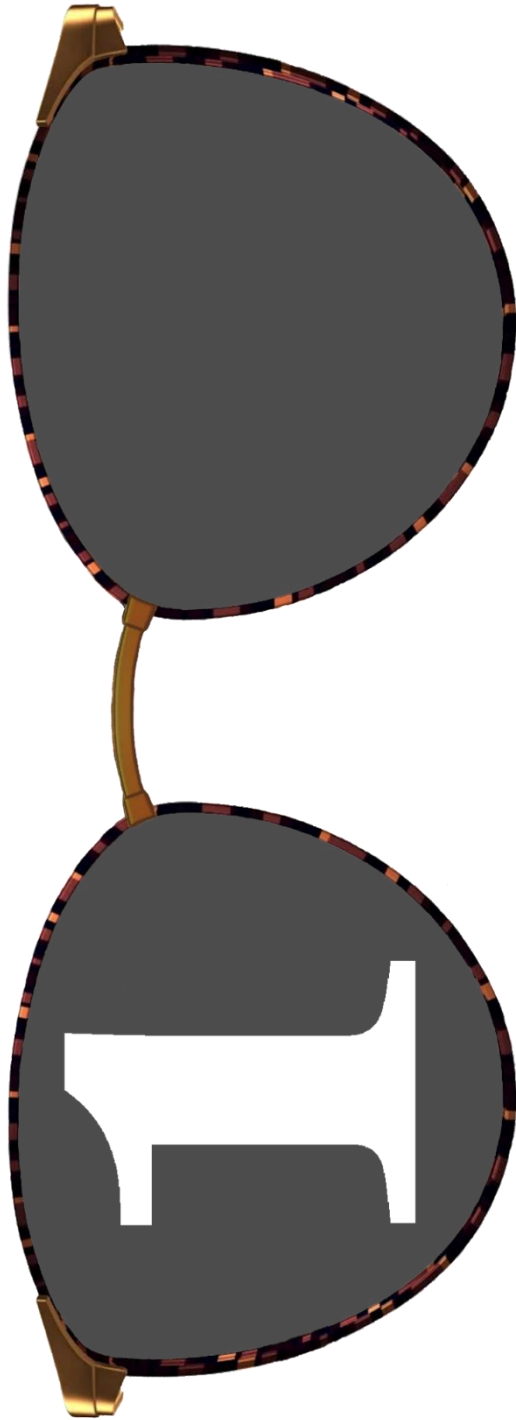
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Chapter 1

Introduction

Victimization experiences and interventions

The school must be a safe place for everyone. In 2015 Dutch legislation was approved that schools must strive to counteract bullying and increase their students' (social, psychological, and physical) safety (Ministry of Education Culture and Science, 2015). Schools must have social safety policies, representatives that parents and students can contact to report bullying and employees in charge of the safety policy. Last and most hard to carry out, schools must measure students' safety experience.

Bullying threatens safety in schools. With bullying, I refer to repeated, intentionally aggressive or hurtful behavior by a more powerful perpetrator (Olweus, 1993). Being a victim means being the receiver of these behaviors, of which there are different types. One distinction involves direct and indirect victimization. During direct victimization, the bullies hurt the victims themselves, whereas during indirect victimization the pain is conveyed indirectly, for example through another person. Another distinction involves physical and relational victimization: During physical victimization the victim or the victim's belongings are materially damaged, whereas during relational victimization the victim's social status or relationships are hurt. To help schools counteract all types of bullying, the Dutch government, together with the Netherlands Youth Institute (NJI) and the School and Safety Foundation ("Stichting School en Veiligheid"), have provided information on which anti-bullying programs are effective (Orobio de Castro et al., 2018), as schools must be able to show that their approach works.

Fortunately, anti-bullying programs typically have an effect. On average these programs decrease victimization of bullying by about fifteen percent (Gaffney et al., 2019), but the effect sizes differ largely between studies. From the large "what works" study in the Netherlands, it became clear that especially schoolwide universal anti-bullying programs (individual-focused) are effective in decreasing bullying. However, no single program had an effect on all examined bullying aspects (Orobio de Castro et al., 2018). This finding has been supported by findings from North America (Rawlings & Stoddard, 2019). In other words, current anti-bullying programs work and decrease victimization, but there still is a group of victims that falls by the wayside. Therefore, the aim of this dissertation is to better understand the underlying social processes of persistent victimization.

Consequences and prevalence of victimization

For over a decade, it is known that victims are at risk for lower levels of self-esteem (Tsaousis, 2016; van Geel et al., 2018) and higher levels of internalizing and externalizing symptoms (Christina et al., 2021; Reijntjes et al., 2010, 2011), such as anxiety and depressive symptoms (Goldbaum et al., 2003; Moore et al., 2017), as well as behavioral problems (Kokkinos & Panayiotou, 2004; Salmivalli & Nieminen, 2002). Furthermore, these effects are bi-directional: having higher levels of internalizing and externalizing symptoms and lower levels of self-esteem puts one at risk of being victimized (Christina et al., 2021; Reijntjes et al., 2010, 2011; van Geel et al., 2018).

Adverse mental health is not the only risk for victims, there are many more in other aspects of life. Victims are at greater risk for physical adversities, including substance abuse (Moore et al., 2017) and adverse physical health (Moore et al., 2017), professional adversity, such

as lower academic achievement (Pham & Adesman, 2015), and social adversities, such as lower quality peer relationships (Biswas et al., 2022; Kochenderfer-Ladd & Wardrop, 2001) and poorer social skills (da Silva et al., 2018; Fox & Boulton, 2005). In short, being a victim of bullying is associated with adverse developmental outcomes that can even last into adulthood (Arseneault, 2018; Brendgen & Poulin, 2018; Takizawa et al., 2014).

The strength of the risks of victimization seems to correlate with the severity and duration of victimization experiences. Most research on persistent victimization, which is long-term and more severe in intensity, has examined the relationship with adverse mental health outcomes and shows that persistent victims are at greater risk for adversity than less severe or short-term victims (Biggs et al., 2010; Hong et al., 2020; Kaufman et al., 2018; Kochenderfer-Ladd & Wardrop, 2001; Ladd & Troop-Gordon, 2003; Ouellet-Morin et al., 2011; Quinlan et al., 2020; Smokowski et al., 2014). Those who are persistently victimized have an increased risk for lower self-esteem (Ladd & Troop-Gordon, 2003; Smokowski et al., 2014), lower academic achievement (Bowes et al., 2013) and poorer social relationships (Hong et al., 2020).

Not only the duration and severity of victimization matter but also the context in which victimization takes place. The “healthy context paradox” (Huitsing et al., 2019; Salmivalli, 2018) indicates that adverse effects of victimization, like mental health problems, may be more severe when victimization takes place in a (more) positive environment. These hypotheses have been substantiated in the literature, for example the association between victimization and internalizing symptoms was stronger in classes with low social disorder (Bellmore et al., 2004), in classes with decreasing victimization rates (Garandau et al., 2018; Yun & Juvonen, 2020) and in schools that successfully implemented an anti-bullying intervention (Huitsing et al., 2019). That is, when schools implement an effective anti-bullying program, general levels of victimization are likely to decline, but effects for persistent victims are likely to aggravate. The prevalence of persistent victimization is estimated at around four percent in schools with an anti-bullying program (Kaufman et al., 2018), and can even go up to five to ten percent (Barker et al., 2008; Oncioiu et al., 2020; Sheppard et al., 2019; Zych et al., 2020). This means that approximately every tenth child may be at risk for mental health problems that can last for long periods of time, even into adulthood (Arseneault, 2018; Takizawa et al., 2014). To fend off these risks, a better understanding of the processes underlying victimization, and especially persistent victimization, is crucial.

Group and individual processes

Bullying is usually seen as a group process (Salmivalli, 2010). Bullying is not just an interaction between a victim and a bully, there are more roles to play. For example, children can have the role of the assistant, who joins a bully in bullying, the reinforcer, who encourages the bully with for example positive feedback, the defender, who supports or stands up for the victim, and the passive bystander (non-involved), who act in favor of neither the bully nor the victim. All children in a classroom take part in the bullying process in one of these roles. Whereas it is best for victims that there are a lot of defenders and few reinforcers and assistants, it is scary to stand up to bullies as it may risk the defender’s social position. Group processes such as the formation of (positive) group norms and values can reduce such risks for defenders and contribute to safe

Chapter 1

and enjoyable group interactions. Some schoolwide anti-bullying programs, such as the KiVa program, mainly focus on such group processes.

Even though the description of participant roles might seem rather clear, in practice it is less clear to disseminate who is a bully and who is a victim. First, children can switch roles between situations, of which the bully-victim is a clear example: in some situations, they are involved as a bully and in other situations as a victim (Veenstra et al., 2005). Second, everyone in a situation has their own perspective of that situation, which is supported by low to moderate concordance rates of reports by different informants, especially for the victim role (Ladd & Kochenderfer-Ladd, 2002; Lee et al., 2016). Children who perceive themselves to be the victim, may not necessarily be seen by their peers as a victim. This, however, does not mean that they are not hurt by those experiences. Therefore, it is important to focus on self-reported victims, rather than on peer-reported victims. School life is full of complex social situations where every individual might interpret the situation slightly differently. Furthermore, victims appear to already have weaker social skills (Fox & Boulton, 2005; Perren & Alsaker, 2006). Therefore, the examination of (self-reported) victimization and the links to internal processing of social situations, so-called social cognitions, is needed.

Social cognition

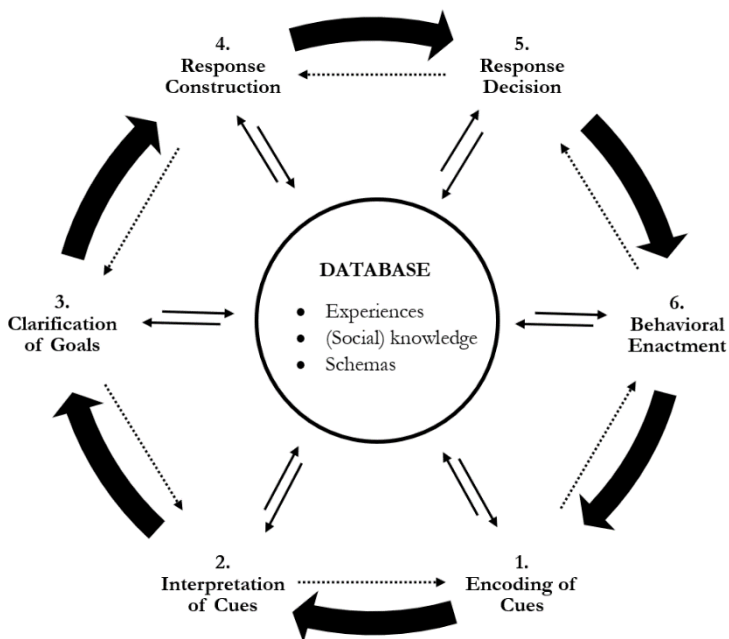
Social cognition refers to how individuals construct their (subjective) social reality. It involves psychological and cognitive processes of how an individual processes, stores and uses information about the social world (Ostrom, 1984). Crick and Dodge (1994) presented a model of social-cognitive processes, the social information processing (SIP) model, which is ordered in six steps or phases and a database: 1) *encoding of cues*, 2) *interpretation of cues*, 3) *clarification of goals*, 4) *response construction*, 5) *response decision*, and 6) *behavioral enactment* (see Figure 1 for the schematic model).

In the first phase of social information processing, *encoding*, individuals need to register the social cues in a social situation. Registration includes both that the cue is noticed (captures attention or is attended to) as well as that it is classified accurately (what it consists of). An example of encoding is attending to and classifying what type of facial expression another person has on their face. In the second phase, *interpretation*, all the registered social cues in the situation need to be made sense of, interpreted, together. In the case of the previous example, if the facial expression was registered as a frown, in this phase individuals will have to interpret why the person was frowning, while taking all cues into account. For example, if this frowning person were in a mathematics class it could be that the person was trying to understand an equation, whereas if this person looks at someone making a joke, the person could have been offended. The interpretation that is given to a situation by individuals has consequences for how the situation is responded to in the next phases. After interpretation, *clarification of goals* takes place in the third SIP phase. In this phase individuals assess which goal they are trying to achieve, as different goals can require different responses. Next, individuals have to produce possible response options, which happens in the fourth SIP phase, *response construction*. In the fifth SIP phase, *response evaluation*, individuals evaluate these possible response options and decide which response is most likely to result in achieving the chosen goal and is fitting to the situation. Last, in the sixth SIP phase, *behavioral enactment*, individuals have to actuate the chosen behavioral

response. The SIP phases are represented as a continuous cycle, but individuals do not necessarily go through these phases one by one and in sequential order (as represented by the dotted lines in Figure 1). It might be that during interpretation they realize that they lack information to understand what is going on, and they go back to the previous phase, encoding. In other words, individuals can go back and forth between SIP phases, and these phases can influence each other.

An important aspect that influences each of these SIP phases is the database, which consists of a particular individual's experiences, (social) knowledge and schemas. This database is of influence on each SIP phase, as well as concurrently updated with new experiences. Once individuals have had repeated exposure to specific situations, they receive more knowledge on which cues to attend to, likely interpretations and effective responses. Repeated experiences with specific types of social situations will lead to schemas on how to understand and respond to those types of social situations, which helps individuals in responding adequately. Thus, based on the SIP model it is likely that individuals with a plethora of victimization experiences adapt in how they encode, interpret, and respond to social situations.

Figure 1. Social Information Processing model.



Note. Schematic representation of the SIP model of Crick and Dodge (1994). Dotted lines represent going back to a previous phase of social information processing.

Neural processes relating to victimization

From origin, humans are a social species and survival depends on social relationships. The human brain likely evolved to adequately process social information (Nelson et al., 2016). Indeed, brain regions that are involved in processes of social cognition such as mentalizing are referred to as the social brain and involve the posterior superior temporal sulcus (pSTS), temporo-parietal junction (TPJ), temporal poles, medial prefrontal cortex (mPFC) and precuneus (Becht et al., 2021; Blakemore, 2012). Structural and functional brain development continues throughout adolescence (Kilford et al., 2016; Mills et al., 2014) and shows substantial individual variation that can be (partially) linked to social experiences (Becht et al., 2021). An example of such a social experience is being victimized by peers. Victimization might be especially influential when peers become increasingly important during late childhood and into adolescence (Asher & Coie, 1990; Laursen, 2018; Nelson et al., 2016). Therefore, being (persistently) victimized may have long-lasting effects on neural functioning underlying social cognition.

So far few studies have examined neural processes in relation to victimization experiences (for a review of more general peer experiences, see Güroğlu & Veenstra, 2021). Researchers have examined facial processing, social exclusion and reward processing and focused mainly on girls and adolescents. A brief overview of victimization literature follows (see also Table 1).

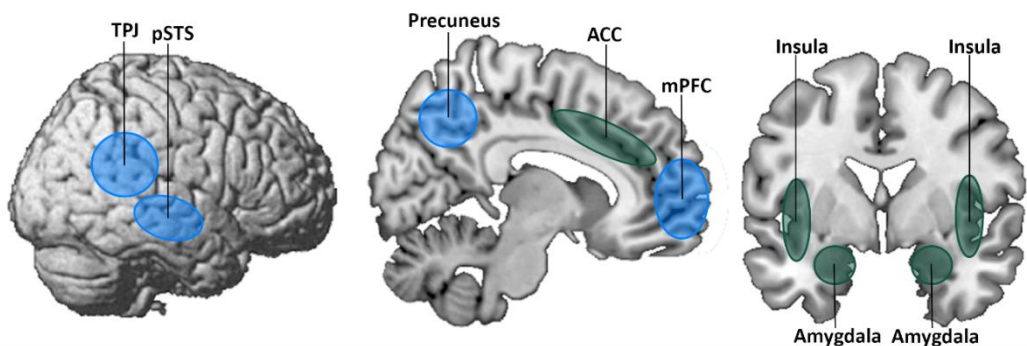
First, for emotion processing the amygdala has been differentially implicated in victims compared to non-victims. Victimization was positively related to amygdala activation during the processing of emotions of others (Rudolph, Skymba, et al., 2021; Swartz et al., 2019), although the direction may depend on the specific emotions involved (Swartz et al., 2019). Furthermore, the social context may be of influence on the processing of faces of others. In-group compared to out-group peer faces increasingly activate a region for emotions and relevance (amygdala), a reward processing region (ventral striatum), a region important for visual recognition (fusiform gyrus) and a social brain region (TPJ) in persistent as opposed to non-victims (Telzer et al., 2020). Hence, processing the faces of others seems to heighten amygdala responses of victims and the social context may be of additional influence.

Second is the most commonly examined construct in the neuroscientific victimization literature, social exclusion. The one study examining functional connectivity found that (persistent) victims had weak negative fronto-limbic connectivity during social exclusion, whereas non-victims had positive fronto-limbic connectivity (McIver et al., 2019). Studies examining neural activity are indicative of heightened neural sensitivity during social exclusion and victimization experiences. A first study compared a victim group to a defender and a control group (neither victim nor defender). The victims had higher levels of activation in frontal and parietal regions as well as the left amygdala (McIver et al., 2018). In line, Kiefer and colleagues found that victimization related to stronger left inferior frontal gyrus and subgenual anterior cingulate cortex (ACC) activation (2021). The last study on neural activity examined chronically victimized girls and found that only for highly victimized girls did activity in the dorsal and subgenual ACC and insula relate to their levels of internalizing symptoms (Rudolph et al., 2016). To conclude, some converging evidence exists that victimization experiences relate to differential engagement of frontal (e.g., the frontal gyrus and ACC) and limbic regions (e.g., amygdala).

Last is reward processing. Victimization seems related to blunted responses toward non-social rewards (Ethridge et al., 2018), also in a social brain region (mPFC) (Casement et al., 2014). With respect to positive social rewards, victimization seems related to increased activity in regions important for inhibition (prefrontal regions), risk-reward behavior (insula), and emotions and relevance (amygdala) (Jarcho et al., 2019; Telzer et al., 2018). For example when they receive unexpected positive social feedback (Jarcho et al., 2019), when they make successful risky decisions for the team (Telzer et al., 2018) and when they make safe decisions for the team (Telzer et al., 2018). Oppositely, expecting negative social feedback from peers, related in victims to reduced functional connectivity in a reward processing region (ventral striatum) and a region important for inhibition (inferior frontal gyrus) (Fowler et al., 2021). So far, but tentative due to little overlap, victims compared to non-victims seem to have more blunted neural responses to non-social reward processing and heightened responses to social reward processing.

Although there is some consistency across studies (see Figure 2 for brain regions of interest), there are also discrepant findings. The discrepancy may be due to utilization of different task paradigms within the examined domains. Furthermore, sample sizes are typically smaller (typically $N \approx 45$), boys are heavily underrepresented (only three studies include a substantial number of boys) and childhood is rarely examined (one study examines late childhood). The elementary school period is crucial for the development of social skills in the peer context. Victimization experiences in this period may be very influential. Hence, to better understand developmental processes of victimization, social cognition, and related neural processing, more research is needed that focuses on mid-to-late childhood.

Figure 2. Visualization of social cognitive brain regions of interest.



Note. In blue the social brain regions are depicted: Temporal Parietal Junction (TPJ), posterior Superior Temporal Sulcus (pSTS), precuneus and mPFC. In green other brain regions implicated in social cognition are depicted: Anterior Cingulate Cortex (ACC), Insula and Amygdala.

Research questions and overview of the dissertation

The aim of this dissertation was to further understand processes of persistent victimization of bullying by examining duration of victimization and the associations with social cognition. The research question guiding this dissertation reads: *“How do persistent victims of bullying process social information and what are the underlying neural processes?”* Four studies utilizing different datasets and analytical methods (see Table 2), were carried out to answer the main research question.

In **Chapter 2** a systematic review was set up to examine the state-of-the-art in research on victimization and social cognition, as the literature is broad and an overview overdue. Three main hypotheses were derived from SIP theory and tested against the available literature: 1) The *reaffiliation* hypothesis: Victims will develop a more positive social-cognitive style and focus on positive social cues and interpretation to facilitate affiliation, 2) The *prevention* hypothesis: Victims will develop a more negative social-cognitive style and focus on negative social cues and interpretation to prevent subsequent negative interactions and 3) The *desensitization* hypothesis: Victims will become increasingly insensitive to social information. The systematic review included studies that examined victimization experiences among youth (four to eighteen years old) in relation to encoding, interpretation and skills to understand others.

In **Chapter 3**, the encoding phase and possible underlying neural mechanisms were examined, as literature on encoding of prime aspects of social interactions is lacking. An emotional dot-probe (behavioral) task and emotion processing (fMRI) task were administered to the SCARS sample to examine whether persistent victimization related to differential attention toward and differential neural processing of specific facial expressions of unknown peers.

In **Chapter 4**, the interpretation phase was examined longitudinally. Verbal vignettes of possible rejection were administered to a Dutch and an Australian sample to examine whether there were negative cycles of rejection sensitivity and victimization at play. Although the victimization and rejection sensitivity association has been clearly established in the literature, the longitudinal effects have rarely been examined and the between- and within-person effects have never been distinguished from one another. The results in this chapter inform about the existence of bidirectional associations and fruition of rejection sensitivity as target for interventions.

In **Chapter 5**, the response phase as well as possible underlying neural mechanisms were examined. An online social exclusion paradigm was employed in the MRI scanner to examine whether persistent victimization related to differential neural processing of the social exclusion experience. Furthermore, it was examined whether persistent victimization related to different responses to this social exclusion experience, both in terms of affective responses and behavioral intentions to hurt excluders upon being excluded. Combining an exclusion experience with these behavioral assessments enabled the examination of possible underlying (neural) processes of rejection sensitivity with improved ecological validity.

Chapter 6 consists of the general conclusion and discussion. This chapter provides a discussion of social cognition in relation to persistent victimization, followed by scientific and societal implications, as well as directions for future research.

Overview of data in this dissertation

I used four datasets in my dissertation (see Table 2), one literature dataset and three empirical datasets. All datasets contain information on victimization and social cognition of children and adolescents.

The literature dataset utilized in Chapter 2 included participants with a large age range (4-17 years old) from 28 countries (median number of participants included in the studies = 399). The database with information per article is available with the online publication of the systematic review of Chapter 2.

The SCARS dataset (2021-2022; Social Cognitions and Attention Regarding Sufferers¹), utilized in Chapters 3 and 5, was collected for this dissertation to examine the association between victimization duration, social cognition and related underlying neural processes. For the data collection, I collaborated with KiVa BV, the organization behind the KiVa anti-bullying program in the Netherlands, and KiVa schools. This collaboration enabled the collection of this unique dataset with 83 Dutch children from 8 to 12 years old, of whom the self-reported victimization in the past two years is known without reliance on recall of past events (an in-depth description of this dataset can be found on <https://osf.io/hmq8z/>). As such, this dataset provided the opportunity to examine correlates of prolonged duration of victimization.

The Peer Power dataset (2016-2017), utilized in Chapter 4, was collected by Matteo Giletta and colleagues (<https://osf.io/zhfu2>) to examine associations of peer experiences with adolescents' health outcomes in early- to mid-adolescence. At baseline, the 233 Dutch participants (11-14 years old) started the second semester of secondary school. They filled out four waves of questionnaires over one and a half years (6-month intervals). Therefore, this dataset provided the opportunity to examine longitudinal associations with social cognition among young adolescents.

The Rejection Resilience Study dataset (2010-2011), utilized in Chapter 4, was collected by Melanie Zimmer-Gembeck and colleagues (Zimmer-Gembeck et al., 2013) to examine predictors and outcomes of rejection sensitivity in early adolescence. At the start of the study, the 711 Australian children (9-13) were in grades 5, 6, or 7 of primary school. They filled out three waves of questionnaires over one year (6-month intervals). Therefore, this dataset provided the opportunity to examine longitudinal associations of social cognition in late childhood.

With the use of these datasets, I provide an overview of the current state of the literature on social cognition and victimization experiences (Chapter 2), add to the (semi)longitudinal literature (Chapters 3, 4 and 5) and extend the neuroscientific literature on the neural processes underlying social cognition in relation to peer victimization (Chapters 3 and 5). Finally, I provide an overarching discussion of my findings (Chapter 6).

¹ Sociale Cognities en Aandacht voor Slachtoffers (original name in Dutch)

Table 1. Overview of previous neuroscientific studies on victimization experiences.

Study	N Scanned (girls)	Age	Construct	Brain region activity related to victimization
Casement et al., 2014	120(all girls)	Scan: 16 years Vic: 11 and 12 years	Non-social reward processing	mPFC
Ethridge et al., 2018	61 (54 girls)	18-25 years	Non-social reward processing	EEG: Reward positivity component (~250-350ms positivity at frontocentral)
Fowler et al., 2021	Study 1: 33(20 girls) Study 2: 26(all girls) 9 non- and 17 victimized	Study 1: Mean 13.7 years Study 2: Mean 15.4 years	Social reward processing	Calcarine gyrus activity Ventral striatum-inferior frontal gyrus, putamen, mPFC and inferior occipital connectivity
Jarcho et al., 2019	47(25 girls): 20 low and 27 high victimized	11 years	Social reward processing	Amygdala (R), striatum and insula (L)
Kiefer et al., 2021	24(14 girls)	12-15 years	Social exclusion	Inferior frontal gyrus (L) and subgenual ACC (L)
McIver et al., 2018*	45(36 girls): 15 victims, 15 defenders, 15 no victim/defender	17-19 years	Social exclusion	Precentral gyrus (R), inferior parietal lobe, angular gyrus (R), inferior frontal operculum (R) and superior frontal gyrus (R)
McIver et al., 2019*	45(36 girls): 15 victims, 15 defenders, 15 no victim/defender	17-19 years	Social exclusion	Fronto-limbic connectivity
Rudolph et al., 2016**	47(all girls): 24 persistent victims, 23 non-victims	Mean 15.4 years Vic: Annually past 7 years	Social exclusion	dorsal ACC, subgenual ACC and insula
Rudolph et al., 2021**	43(all girls)	Mean 15.4 years Vic: Annually past 4 years	Emotion processing	Amygdala-VLPFC (R) connectivity
Swartz et al., 2019	49(24 girls)	12-15 years	Emotion processing	Amygdala
Telzer et al., 2018**	46(all girls): 25 persistent victims, 21 non-victims	14-16 years Vic: Annually past 7 years	Social reward processing	Amygdala, ventral striatum, orbitofrontal cortex, mPFC, TPJ, medial posterior parietal cortex and pSTS
Telzer et al., 2020**	38(all girls): 21 persistent victims, 17 non-victims	14-16 years Vic: Annually past 7 years	Emotion processing	Fusiform gyrus, TPJ, ventral striatum, amygdala, insula and lingual gyrus

Note. */**Same datasets, Vic = Victimization, ACC = anterior cingulate cortex, (R) = right, (L) = left, EEG = electro encephalogram study.

Table 2. Overview of the aims, used data and methods of the empirical chapters.

	SIP phase	Specific constructs	Dataset	Sample	Analysis technique
Chapter 2	Encoding	All categories	142 articles	Children from 4 to 18 years y/o included in the articles from 28 countries	Systematic literature review
	Interpretation	All categories			
	Database	Skills to understand others			
Chapter 3	Encoding	Attention to emotions; Neural processing of emotions	SCARS	85 Dutch children from 8 to 12 years old, with previous two years of SR victimization experiences	fMRI analysis, rm ANCOVA
	Interpretation	Rejection sensitivity	Peer Power	711 Australian children from 9 to 13 years old, with three waves of SR victimization and rejection sensitivity measures over 1.5 years	RI-CLPM
Chapter 4	Interpretation	Rejection sensitivity	Rejection Resilience Study	233 Dutch adolescents from 11 to 14 years old, with four waves of SR victimization and rejection sensitivity measures over two years	
	Interpretation	Neural processing of social exclusion			
Chapter 5	Goal clarification	Intent to punish	SCARS	85 Dutch children from 8 to 12 y/o, with previous 2 years of SR victimization experiences	fMRI analysis, rm ANCOVA
	Psychological response	Need satisfaction; Positive mood			

Note. SR = self-reported.