

## Social Information Processing: A Useful Framework for Educational Psychology

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### Abstract

The Social Information Processing (SIP) model (Crick & Dodge, 1994; Dodge, 1986; Lemerise & Arsenio, 2000) offers a detailed framework for understanding the way that a child makes sense of and acts in social situations. When applied in the context of a wider biopsychosocial conceptualisation (Dodge & Pettit, 2003), it offers a comprehensive model that is in accordance with current ways of thinking about human behaviour. This article reviews the history of the SIP model and considers the evidence for each step of the SIP model. In the light of these findings, the article considers possible reasons for the relative oversight of this model by the educational psychology profession. After presenting some reasons why it is still of contemporary relevance, this article sets out the ways that an SIP-informed approach offers a range of questions for assessment and intervention.

### 1. Introduction

The Social Information Processing (SIP) model offers a comprehensive model for understanding the processes involved when a child makes sense of, and acts in, social situations. It acknowledges that children enter social situations with a set of predetermined influences, both biological and environmentally based. The model emphasises the role of “online processing” as a series of decisions which are made that guide future action. As such, it offers a range of possible points for intervention and is optimistic about the possibility of change.

This article sets out to achieve three main aims:

1. To understand the development of the SIP model from its origins in the mid-1980s (Dodge, 1986), through reformulation in the 1990s (Crick & Dodge, 1994) to revision at the turn of the century (Lemerise & Arsenio, 2000).
2. To explore the evidence for each stage of the SIP model.
3. To consider whether the model, over 30 years after its original formulation, still has practical value for educational psychology today. This is of particular interest to the author, given that, although a PsycINFO keyword search for “social information processing” reveals over three hundred and fifty articles have been written on the subject in peer-reviewed journals since 1980, none of these were in two leading UK EP journals: *Educational Psychology in Practice* and *British Journal of Educational Psychology*. This article considers some of the reasons for this absence and argues that the SIP model deserves renewed attention and application. The final section of the article considers and offers responses to some possible challenges to the claim that the SIP has relevance to contemporary themes in educational psychology.

This article focuses in particular on the application of the SIP model for children and young people who show aggressive behaviour, since this is the area of particular focus for the SIP model. However, the SIP model has more general application as a framework that can be used to problem-solve social difficulties experienced by any child, young person or adult.

## 2. The Social Information Processing Model

### 2.1. The history of the SIP model

The 1970s and 1980s saw increasing interest in the development of information processing theories and their applications to human behaviour (Newell & Simon, 1976; Simon & Newell, 1971) and two general models of SIP were developed in the 1980s. One was proposed by Dodge (1986), while the other was championed by Huesmann (1988). Although both models provided insights into the development and maintenance of aggressive behaviour<sup>1</sup>, there was a crucial difference between them in the emphasis that they placed on the factors that influenced action. Huesmann's (1988) model presented social cognitive processing as the result of an automatic, script based process:

Social behaviour is controlled to a great extent by programs for behaviour that have been learned during a person's early development. These programs can be described as cognitive scripts that are stored in a person's memory and are used as guides for behaviour and social problem-solving (p.15).

Huesmann's model (see Figure 1) suggested a simple linear process where there were three possible points at which individual differences might direct behaviour:

1. how the individual interpreted the social problem and its environmental cues;
2. the contents of memory about previous scripts used in similar situations and the manner of the individual's search for these scripts; and
3. the evaluation of each script.

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<sup>1</sup> This article uses the general definition of aggression referenced by Ferguson and Beaver (2000) as an intentional act that aims to increase one's own position in a dominance hierarchy at the expense of another. This definition includes both physical and psychological actions.

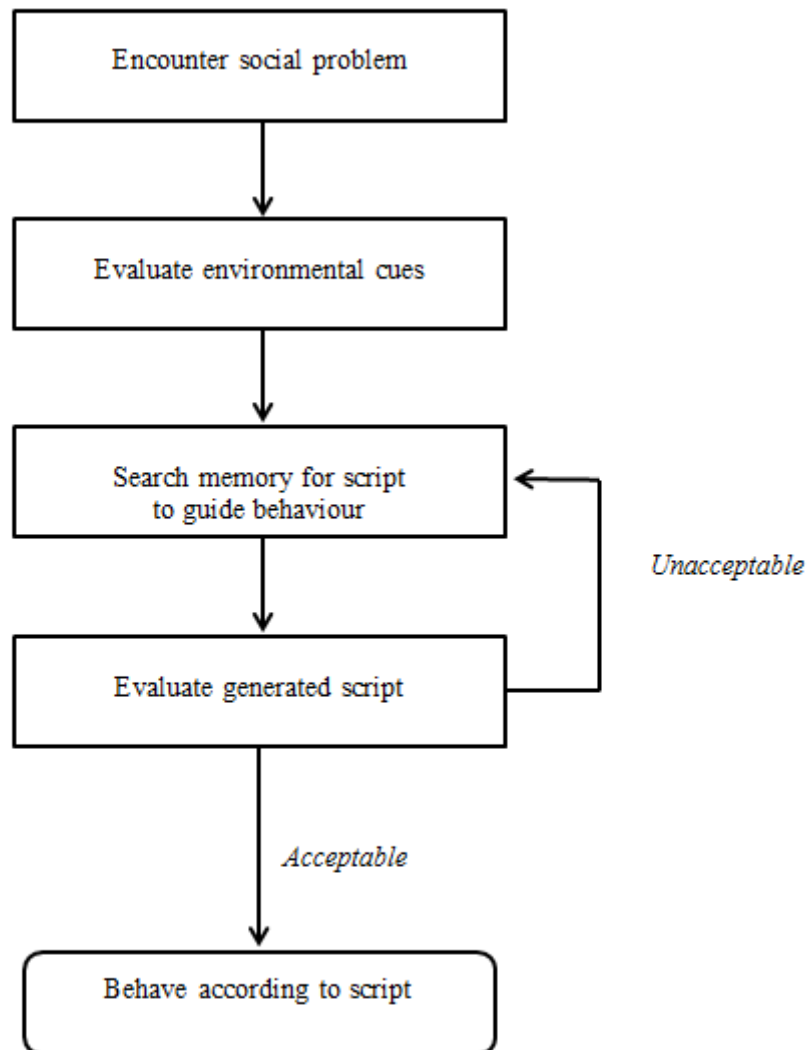


Figure 1: Huesmann's information processing model (1988)

In Huesmann's model (*ibid.*), the script was paramount, allowing him to propose that "the aggressive child is one who has acquired aggressive scripts to guide behavior early in life" (p. 23). Dodge's model (1986, see Figure 2) although similar, emphasised the role of "online cognition" in its focus on "the individual cognitive tasks that might be involved when a child is engaged in social interaction" (Crick & Dodge, 1994, p.74). This model, although linear like Huesmann's, differed in that it emphasised the active role played by the child in encoding information and evaluating responses.

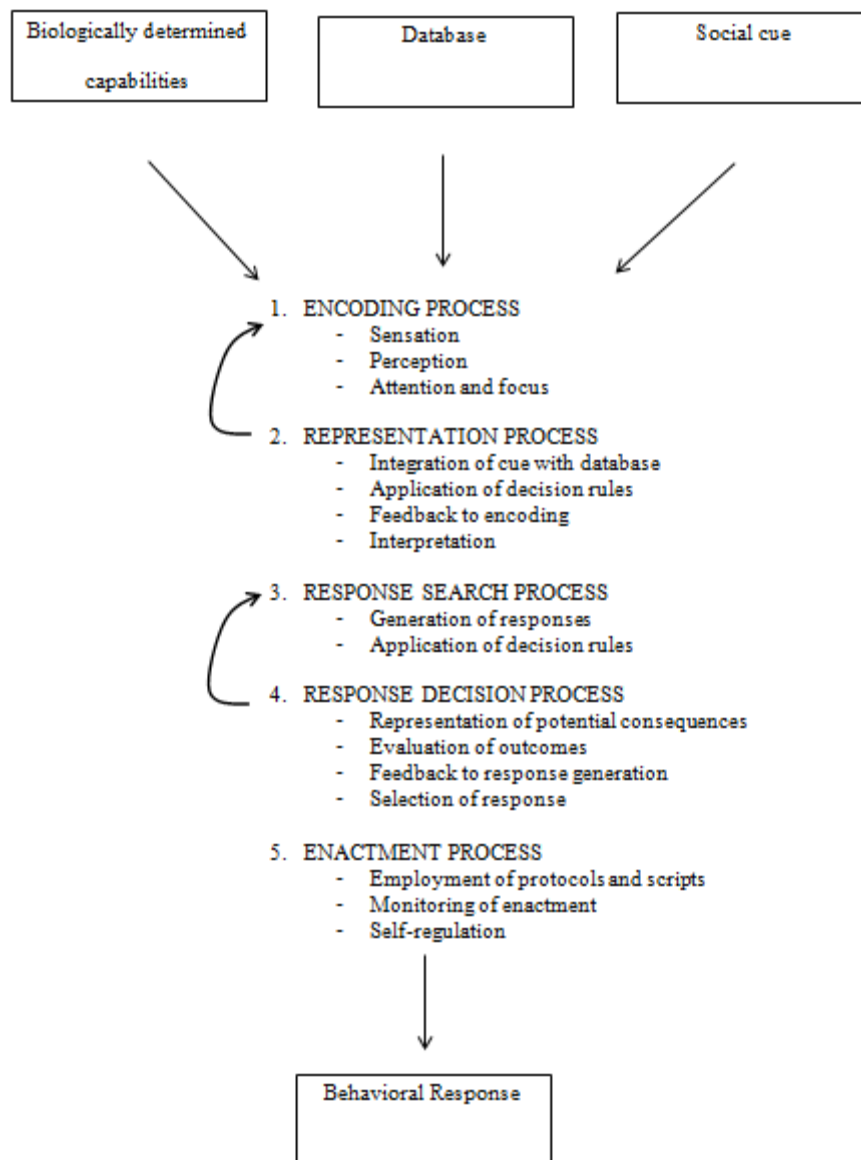


Figure 2: Dodge's information-processing model (1986)

Reviewing the relative reception of the two models, Li, Fraser, and Wike (2013) describe the reception of Huesmann's model as "tepid" (p.358), explaining this through its relation to the prevailing ideas of the time, with regard to mental structures such as values, scripts and beliefs. They suggest that Huesmann's model was more in line with the research tradition of the day, through its focus on latent structures (schemas, scripts and beliefs). This tradition had had trouble explaining how immediate behavioural responses were influenced by cognitions (Fontaine, 2008). However, Dodge's model offered new opportunities for understanding these immediate effects and was, therefore, more positively received. In this article, I suggest that Huesmann's model and Dodge's

model had more similarities than differences and that it was perhaps a simple matter of chance that one prevailed. It is ironic that, as Dodge's version of the SIP model has developed, it has perhaps become closer to Huesmann's original model, in the importance that it places on the database and prior experience. Even in the early steps of the model's formulation, Dodge's own research highlighted the importance of schemas in helping discriminate between the responses of habitually "aggressive" and "non-aggressive" children (see section 2.3.1 below).

In 1994, Crick and Dodge published a reformulated model of SIP (Crick & Dodge, 1994). The main aspect of this reformulation was a move from a rigid sequential structure to a more connectionist model. This was in response to connectionist theories such as those proposed by Rumelhart and colleagues (Rumelhart, McClelland, & PDP Research Group, 1986) which showed that information processing occurs across multiple simultaneous paths. The reformulated model showed feedback loops across processing steps but still emphasised that "the path from a particular stimulus...to a behavioral response...logically follows a sequence of steps" (Crick & Dodge, 1994, p.77).

Lemerise and Arsenio (2000, see Figure 3) further amended Crick and Dodge's reformulated version of the SIP model, developing and emphasising a theme acknowledged in Crick and Dodge's reformulation: the importance of emotions in influencing processing at each step of the model. It is this reformulation which will be considered throughout this article; the importance of emotion will be revisited later in section 3.3 below.

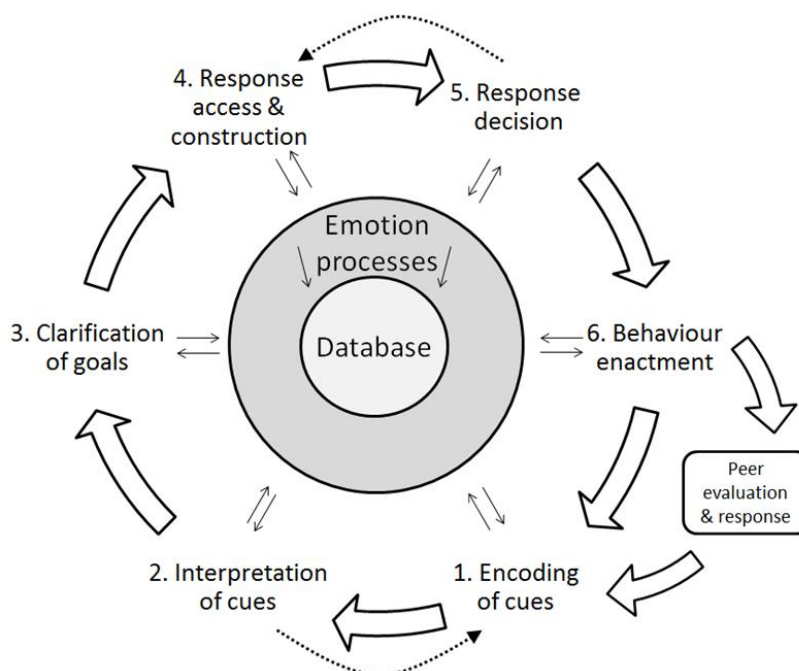


Figure 3: Lemerise and Arsenio's development (2000) of Crick and Dodge's reformulated model

## 2.2. The SIP model in summary

The SIP model suggests that children enter social situations with a database of predetermined influences from biologically determined capabilities along with the set of experiences (and the memory of those experiences) that the child has had (Crick & Dodge, 1994). Recent authors (e.g., Arsenio & Lemerise, 2010) have emphasised the role of moral values (see discussion in section 3.1 below) in guiding decisions at each step. The SIP model proposes that a particular stimulus is interpreted across a number of steps before a child acts. Action at each step of the model can lead to updating of information held in the database, which will influence future processing.

### 2.3. The SIP model step by step using aggression as an example

#### 2.3.1. Step one: Encoding of cues

In step one, the child attends to certain cues in the environment (this can be the internal, affective environment or the external social/behavioural environment). Dodge and Tomlin (1987) found that children described as aggressive were more likely to base their interpretation on schemas (i.e., information that was not part of the social situation but was instead based on their database of past experience) than were their “non-aggressive” peers. They were also more likely to base their interpretation on social cues that happened at the end of the event, rather than those at the beginning of the interaction. Both of the above features meant that they were less accurate in their interpretation of current situations since they did not process all of the available cues. As was noted in section 2.1 above, it is ironic that, despite the emphasis on online processing, one of Dodge’s early conclusions was that “aggressive” children tended to over-use schemas and scripts when compared with “non-aggressive” children.

Research in this area often uses Dodge and Coie’s (1987) distinction between two different types of aggression:

- Reactive aggression: a response to a perceived threat or provocation
- Proactive aggression: behaviour that is designed to achieve a particular reward

Crick and Dodge (1994) suggested that children described as aggressive paid relatively more attention to hostile than to non-hostile cues. However, recent research (Horsley, Orobio de Castro, & Van der Schoot, 2010) suggests that their distribution of attention is not simply a product of failure to notice certain non-hostile cues in the environment or of hypervigilance to the hostile cues. Horsley and colleagues (2010) used parent and teacher responses to the Dutch version of the Strengths and Difficulties Questionnaire (van Widenfelt, Goedhart, Treffers, & Goodman, 2003) and peer sociometric nominations to divide their sample of 10- to 13-year-olds into higher and lower aggression groups. They tracked eye movements of the children as they looked at cartoons of socially ambiguous situations. They did not find that children in the higher aggression group attended more to hostile cues, and less to non-hostile cues than their peers. Instead, the higher aggression group looked longer at non-hostile cues, and yet, in the next stage of the model (*interpretation of cues*), they still attributed more hostile intent. Horsley et al. applied insights from the psychology of perception and used the “schema inconsistency” hypothesis to explain this effect. They suggest that “aggressive” children’s schemas lead them to expect hostility. Previous research has suggested that we attend more to things that contradict our expectations than we do to the expected (Henderson, Weeks, & Hollingworth, 1999); in the same way, the “aggressive” children directed their attention to unexpected non-hostile cues. Because the cues were unexpected, they were more difficult to process, which led to greater impact of the easier-to-process cues (i.e., those that suggested hostility) and relative discounting of inconsistent, non-hostile information.

#### 2.3.2. Interpretation of cues

After attending to and encoding cues, the child starts to interpret. This involves an analysis of the causal events and inferences about other people’s intentions or perspectives. The child also tries to make sense of whether their previously desired goal has been achieved and considers how the other person might be evaluating the situation. This stage requires “theory of mind”: an ability to understand that “different people may have different emotions, feelings, thoughts and beliefs from one’s own” (Slater, Johnson, & Muir, 2011, p.35).

“Aggressive” children are more likely than their “non-aggressive” peers to attribute hostile intent to ambiguous situations (this pattern has been labelled HAS: Hostile Attributional Style; Dodge, 2006). For example, Graham, Hudley and Williams (1992) presented 12- to 14-year-old “aggressive” Latino and African-American boys with an ambiguous hypothetical social scenario<sup>2</sup> and found that the “aggressive” boys were more likely to attribute hostile intent than their peers (as well as to report greater feelings of anger and to endorse hostile behavioural choices). This pattern of results has been well supported in the literature; for example, Orobio de Castro and colleagues’ meta-analysis noted a “robust relation between hostile attribution of intent and aggressive behaviour” (Orobio de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002, p.931) across the 41 studies reviewed, although the effect on its own is relatively small (Graham et al., 1992).

And yet, this small effect of attributional style can be linked to a wider feature of the SIP model: cumulative effect. Graham and colleagues make the point that this cumulative effect across different steps of the SIP model is what leads to a significant difference in choices made by “aggressive” children. For example, Dodge and colleagues found that, while individual measures relating to encoding, interpretation, response access, response evaluation and enactment were correlated with displays of aggression at significant but low levels, the multiple correlation between component processes and overall levels of aggressive behaviour was higher, with correlation coefficients between 0.67 and 0.85 (Dodge, Pettit, McClaskey, Brown, & Gottman, 1986).

### *2.3.3. Clarification of goals*

Now the child decides what she/he wants to achieve. This is influenced by the cues to which the child has attended and how these have been interpreted. Once again, the database influences the goals that the child selects, and, once again, children with a history of aggressive behaviour typically choose different goals to those chosen by their peers.

Erdley and Asher (1996) gave 10- to 12-year-old children vignettes of a number of hypothetical situations. The situations involved a child of the same gender as the participant doing something harmful (e.g., spilling milk on the child) but in a situation where it was not clear whether this was deliberate or accidental. The participants then chose between six alternatives to say whether or not they would engage in that behaviour. Children were classified as “aggressive” if they chose aggressive physical or verbal responses (e.g., pouring milk back on the child or saying something mean) as their most likely choice for 50 per cent or more of the vignettes, as “withdrawn” if they chose passive or avoidant responses (e.g., ignoring or just leaving the situation) for 50 per cent or more and “problem-solvers” if they chose problem-solving or clarification-seeking responses (e.g., asking teacher for a towel or asking the other child how it happened) for 50 per cent or more. Follow-up interviews asked them to explain what they would have been trying to achieve in the hypothetical example. The “aggressive” children selected goals that were related to revenge and self-protection, while the “withdrawn” responders and the “problem solvers” selected goals that were prosocial (designed to maintain a relationship or solve the problem).

Despite this, it would not be fair to conclude that children with a history of aggression are not interested in social inclusion. Crick and Dodge (1996) found that social maladjustment was related to goals that involved wanting to be liked; they also found that a desire for peer relationships was most strongly experienced by rejected-reactive “aggressive” children. They speculated that angry

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<sup>2</sup> For example, the participants were asked to imagine walking to school, bending down to tie their shoelace and putting their homework on the ground. At that moment, another student walks by and steps on the paper, leaving a muddy footprint...



aggression may be an outworking of retaliation against peers who are seen as withholding the valued goal of social acceptance.

#### *2.3.4. Response access and construction*

Having decided what she/he wants to achieve, the child now moves to selecting a response to help them achieve it. It has been known for many years that “aggressive” children have a more limited repertoire of responses than their peers (Dodge et al., 1986; Guerra & Slaby, 1990; Kempes, Matthys, de Vries, & van Engeland, 2005; Spivack, Platt, & Shure, 1976)

Of itself, this is not necessarily a problem, since the child needs just to put one choice into effect (and then have the skills to monitor its effectiveness in pursuing the chosen goal). However, related research has also shown that the balance of responses considered is different for “aggressive” children: “aggressive” children generate more aggressive responses than their “non-aggressive” peers, but a smaller number of assertive responses (as reviewed by Quiggle, Garber, Panak, & Dodge, 1992). The child’s development of a wider range of aggressive responses may be for a variety of reasons, as reviewed by Dodge and Pettit in their presentation of a biopsychosocial model of adolescent conduct difficulties (Dodge & Pettit, 2003). For example, inconsistent parenting has been shown to be strongly linked to the development of subsequent behavioural difficulties, through its contingent reinforcement of child antisocial behaviour (Patterson, 1995). So, “aggressive” children may simply have had reinforcement histories that strengthened rather than extinguished aggressive responses. They may also have been exposed to different social learning opportunities. For example, the amount of exposure that a child has in preschool or day care to peers who themselves show challenging behaviour is predictive of the development of that child’s own future challenging behaviour (Sinclair, Pettit, Harrist, Dodge, & Bates, 1994). So, even without any bias in the evaluation process, “aggressive” children are more likely, on a purely probabilistic basis, to put into action an aggressive response.

#### *2.3.5. Response decision*

At this point, the child evaluates and eventually chooses a response. This decision process involves a consideration of the response itself (for example, whether it fits in with the child’s general rules about life and how to treat people), as well as how likely the response is to achieve its desired goal and an assessment of the child’s self-perceived competence to put that response into practice.

As might be expected by now, there are differences to be found in the processing patterns of “aggressive” and “non-aggressive” children. Quiggle and colleagues (1992) gave 9- to 12-year-olds a range of vignettes and asked them related questions about intent attribution, mood, response choice and response evaluation. Of particular interest in this context is their response evaluation. After each vignette, the children were read three types of response, allegedly made by other children: an “aggressive”, “withdrawn” or “assertive” response. They were then asked to rate each response by how bad–good it was, what would happen if the hypothetical child used that response (i.e., whether or not it would produce a good outcome), how likely it was they would themselves use a similar response and how easy it would be for them to use that response. Children who had been classified through a combination of teacher rating and peer nomination as “aggressive” evaluated aggressive responses more favourably (i.e., as more acceptable) than their peers who were rated as more socially competent; similarly, they rated prosocial or assertive responses more negatively than did their “socially competent” peers.

“Aggressive” children also have different expectations to their peers when they predict the outcomes of behaviour choices (Crick & Dodge, 1989). For example, in the study above, Quiggle and colleagues found that “aggressive” children expected less positive outcomes than their “non-aggressive” peers if they used prosocial behaviours (Quiggle et al., 1992). However, there are mixed



findings with regard to expectations about physical aggression. For example, Crick and Ladd (1990) found that most children expected negative outcomes involving adults following the use of physical aggression. In contrast, Dodge and colleagues (1986) found a positive association between children's observed aggression and their expectations about outcomes of both physical and verbal aggression. More recently, Arsenio and colleagues (Arsenio, Adams, & Gold, 2009) found that the use of proactive aggression (in pursuit of desirable material or psychological rewards) by Latino and African American 13- to 18-year-olds was linked to their expectations of positive outcomes. So, the probability of endorsing proactive aggression was not predicted by any difficulty in understanding the intention of others but, instead, by a belief that instrumental aggression was more likely to produce positive emotional outcomes. The nature of these mixed findings suggests that there is more to a child's decision making than just their outcome expectations; for example, as discussed in section 3.1 below, the child may also be making a judgement about the moral nature of any decision that they make.

Finally, there are differences in how "aggressive" children, compared to "non-aggressive" children, evaluate the relative ease of implementing a decision. In the Quiggle study mentioned above (1992), the "aggressive" children thought that aggressive responses would be easy for them to put into practice. Erdley and Asher (1996) found a similar result, where "aggressive" children reported that they would be good at actions in pursuit of antisocial goals like revenge, but less good at prosocial goals such as problem solving. Similarly, Arsenio and colleagues (2009) found the use of reactive aggression was linked to expected ease in enacting aggression.

Some researchers have suggested that while the early steps of the SIP model are evident in early childhood, this step (RED — Response Evaluation and Decision) is particularly important in adolescence. This is consistent with brain imaging studies that show the rapid development of the frontal cortex, an area associated with executive function, during puberty (Blakemore & Choudhury, 2006). For example, Fontaine and colleagues (Fontaine, Yang, Dodge, Pettit, & Bates, 2009) showed that although 8- and 9-year-olds were able to differentiate and consistently evaluate alternative responses, there was no consistent relationship between their RED processing and their behaviour difficulties. However, by adolescence, there was a strong link between RED and antisocial behaviour. In their follow-up work, Fontaine et al. (2010) found that RED mediated the relationship between hostile attributional style and antisocial behaviour in 15- to 18-year-olds. As noted in section 2.3.2. above, this illustrates an important issue with the SIP model: although each step makes an individual prediction about the child's behaviour, the power of the model comes in the "multiple correlations between component processes and aggression" (Dodge & Crick, 1990, p.17).

#### *2.3.6. Behaviour enactment*

In the final step of the SIP model, the child implements the choices that have been made on the basis of the information that has been processed. Interestingly, Crick and Dodge's reformulated model (1994) jumps straight through this step, as though it is a necessary and straightforward outcome of the processing at previous steps. However, as Lemerise and Arsenio (2000) point out, action at this step is also influenced by emotions. More than a hundred years ago, the Yerkes–Dodson rule (Yerkes & Dodson, 1908) showed how the performance of a skill was related to arousal, with the performance of difficult skills decreasing when arousal progressed beyond an optimal arousal point. A skill which may be easy to demonstrate in a calm situation will be more difficult to use in arousing conditions, where the actor feels threatened. For example, Dodge and Pettit (2003) note that children who have experienced peer group rejection are particularly likely to be vulnerable to heart rate acceleration in the face of peer conflict. They note that this acceleration can interfere with attention to external cues and can, in turn, interfere with effective social interaction. More recent work (albeit with adults) (Choi et al., 2010) has found that high levels of negative arousal are associated with a reduction in working memory capacity. Working memory is, of course, a key

component in the ability to purposefully plan and monitor behaviour, a key element of behaviour enactment.

Children with a history of aggression are typically less skilful in their behavioural displays than their peers (Lemerise & Arsenio, 2000). For example, one study (Casey & Schlosser, 1994) arranged for 7- to 14-year-olds with externalising disorders (in which category the researchers included oppositional defiance disorder, conduct disorder, attention deficit hyperactivity disorder, major depressive disorder and anxiety disorder) to experience positive peer praise. Although they reported a positive emotional response, their facial displays showed more hostile and surprised expressions than their non-diagnosed peers. In addition, they were less accurate in reporting their own facial expressions than were their peers.

In turn, as acknowledged by the “breakout” step in the reformulated SIP model, a child’s skill in behavioural enactment influences the development of the social situation. Their chosen behaviour, or perhaps more accurately their skill in implementing the chosen behaviour, will be subject to peer evaluation and response, which itself then generates further cues for the child to encode and interpret. Perhaps equally importantly, the child’s ability to monitor their own behaviour and its success or otherwise in achieving its goals will impact their ability to develop and adapt their initial response to a more successful one. Related work by Chevalier and colleagues (Chevalier, Chatham, & Munakata, 2014) suggests that while it is hard to develop response inhibition in impulsive children simply by the act of practising inhibition, it is more productive to help children improve their ability to monitor their context for perceptually salient signals. In the same way, a key focus from the “breakout” step of the reformulated SIP model is its implication that “aggressive” children should be supported to develop skills in assessing the effectiveness and impact of their behavioural choices as they implement them in “real time”.

### 3. Considering the relevance of the SIP model to current practice

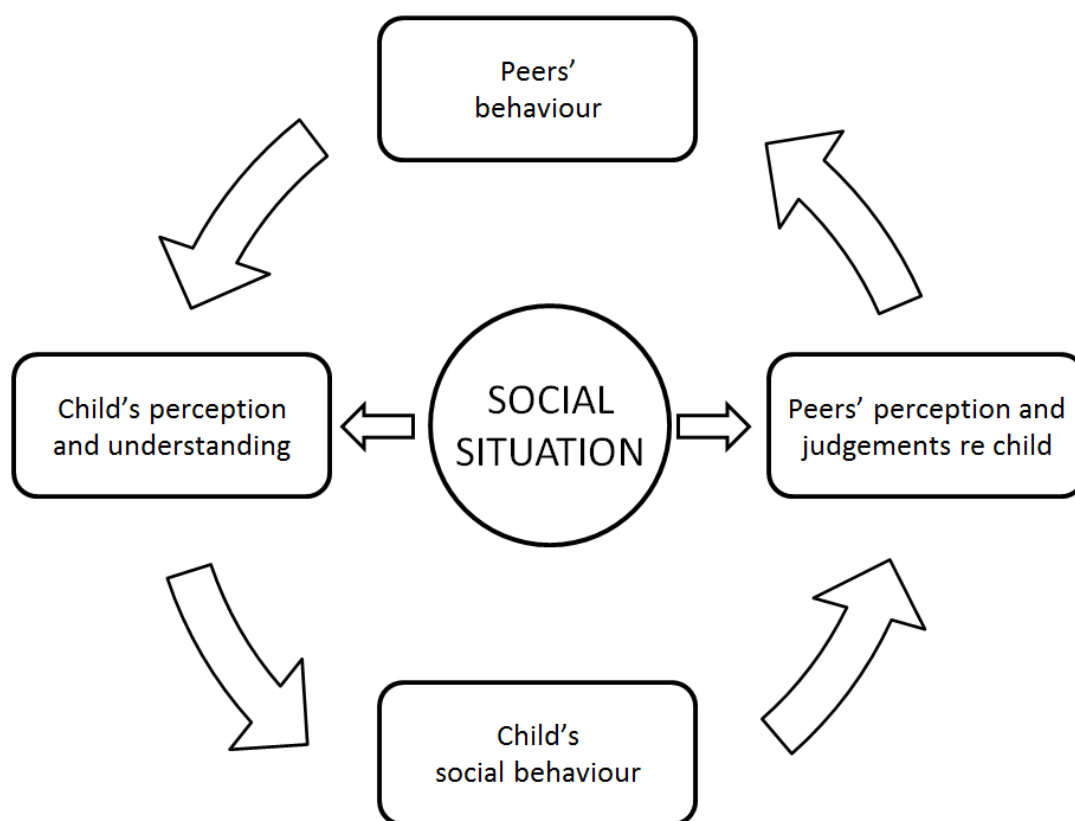
This article has described the SIP model, its development over time in response to new findings and the evidence that supports each step of the model. Given the fine grain of detail that the SIP model offers in terms of assessment and intervention, this should make it prime material for the use of educational psychologists in their professional practice. So, why, as noted in the introduction above, does there appear to be so little attention given by the educational psychology profession to this model? The next section considers some possible answers to this question and proposes that the SIP model offers valuable insights to assist interventions. It concludes by drawing out some key implications for educational psychologists.

#### 3.1. Does the SIP integrate with interactionist models?

Forty years ago, Urie Bronfenbrenner lamented that “much of American developmental psychology is the science of the behavior of children in strange situations with strange adults” (Bronfenbrenner, 1974, p.3). He proposed an alternative theoretical framework, which took account of the multiple systemic factors that influenced human behaviour and that broadened the field of study into that of “human development *in context* [original italics]” (p. 5). This approach to conceptualising the work of educational psychologists carries much influence in the profession (see, for example, Frederickson, Miller, & Cline, 2008; Frederickson & Cline, 2015).

At first glance, the SIP model seems at odds with this contemporaneous understanding. It could be argued (inaccurately, in the view of this author) that the model suggests that “aggressive” children experience difficulties for reasons that are entirely related to their own processing style at that particular moment. Perhaps some of the reason for the failure of the educational psychology profession to attend to the SIP model is that the profession has somehow, and inaccurately, linked the SIP model to a within-child formulation.

However, to interpret the SIP model in this way would be to see it out of context. In the same year that he published his first version of the SIP model, Dodge co-published a model of social competence (Dodge et al., 1986, see Figure 4) that specifically identified that a child's perception, understanding and social behaviour took place in the context of the perception, understanding and social behaviour of their peers and the specific demands of the social situation. While the SIP model has precise contributions to make about two of these elements (the child's perception and understanding, and the child's social behaviour), it needs to be applied in the context of this greater understanding. Dodge and his long-time collaborator Graham Pettit went on to publish a paper in 2003 that proposed a biopsychosocial model of the development of challenging behaviour in adolescents, where there are nonlinear, reciprocal interactions between factors and where life experiences mediate the effect of biological predispositions and sociocultural circumstances. So, Dodge and Pettit (2003) acknowledge the impact of biological predispositions and cultural contexts, alongside the "cognitive and emotional processes within the child, including the acquisition of knowledge and social-information-processing patterns" (p. 349).



*Figure 4: Dodge et al.'s (1986) model of social competence*

This location of the SIP model within a sociocultural context helps expand our understanding of some of the experimental findings. There is more to an understanding of the development of social competence than just a theory of noticing and processing cues. Arsenio and Lemerise (2010) argue for the importance of understanding moral development when considering social competence. Arsenio et al. (2009) showed that adolescents' use of proactive aggression was connected to their expectation that it would make victimisers happy, even where they acknowledged that the victims would have negative emotions. In this way, adolescents' aggression was not related to attribution bias, nor to inability to predict accurately the reactions of victims, nor even a misjudgment about the moral permissibility of an act. Instead, it was the result of moral disengagement (Hyde, Shaw, & Moilanen, 2010). Hyde and colleagues suggest a number of potential precursors to such moral disengagement, including rejecting parenting (Shaw, Gilliom, Ingoldsby, & Nagin, 2003), exposure to

inter-parental violence (Fantuzzo et al., 1991) and living in impoverished environments (Leventhal & Brooks-Gunn, 2000).

To conclude this section of the discussion, the SIP model was developed in the context of a much wider understanding of human behaviour. It does not propose a within-child understanding; instead, its value is in its contribution to a broader, biopsychosocial understanding of human behaviour, which fits neatly with contemporary educational psychology practice.

### 3.2. Does the SIP model assume conscious processing?

Perhaps the SIP model has fallen out of fashion because it appears to be too mechanical, too conscious? Maybe it suggests a conscious weighing up of information, in too linear a fashion, rather than the current understanding that much of human processing is beyond our conscious control (Gigerenzer, 2007; Kahneman, 2003; 2012; Marewski, Gaissmaier, & Gigerenzer, 2010).

But the SIP model has never suggested that the process is under the deliberate and conscious control of the child. Crick and Dodge (1994) state “we doubt that most processing is conscious or reflective. More likely, it is highly automated.” (p.79). They also suggest that the child “reaches” for approaches that they have used before, influenced by habit as much as by feedback on whether or not they have worked or are appropriate. Crick and Dodge (1994) use the analogy of a marble rolling down a muddy, rocky and slowly drying hill (p. 81). When it makes the first few journeys down the hill, the marble will probably take different routes. As the mud dries out, and as the marble makes tracks through the mud, certain routes become deeper and smoother. And the marble becomes increasingly likely to take these, even though they may not represent the quickest way down the hill. In the same way, a child may use maladaptive strategies, even though these are not the ones that lead to the best social outcomes.

Neither does the SIP model imply that the child follows a simple cycle. The reformulated model explicitly references multiple parallel processing of different stimuli, but it suggests that

the path from a particular stimulus (such as a single provocation by a peer) to a behavioural response (such as retaliation) logically follows a sequence of steps. So the processing of that stimulus follows a time-related linear sequence, even though processing in general occurs simultaneously. (Crick & Dodge, 1994, p. 77).

Of course, the SIP model suggests that the processing of a particular stimulus follows a sequential model, where action at one step influences the next. As Arsenio (2010) observes “it is harder to have ‘relational goals’ towards a peer who, you decide, just threw a ball at you on purpose” (p. 628). However, reformulations of the model (e.g., Lemerise & Arsenio, 2000) suggest an element of feedback as well, so that, for example, the interpretation of cues will influence the selective attention to and encoding of other cues in the environment.

### 3.3. Does the SIP model ignore the value of emotions?

Although scientists have been interested in the role of emotions for hundreds of years, for example, Darwin’s work linking human emotions to vestigial patterns of action from earlier evolutionary forms (Darwin, 1872/1965), the role of emotions in human behaviour has received new interest since Salovey and Mayer’s work (1990) on emotional intelligence. There has also been recent renewed interest in the value of positive emotions, prompted by Fredrickson’s work on the broaden-and-build hypothesis (Cohn, Fredrickson, Brown, Mikels, & Conway, 2009; Fredrickson, 2003, 2004). In order for the SIP model to have traction in the field of contemporary educational psychology, it would need to show that it does not ignore the role of emotion.

Crick and Dodge (1994) themselves acknowledge in their 1994 reformulation that emotion had previously been a “relatively neglected aspect of social information processing” (p. 81) but highlight that “in the reformulated model presented here, emotions are an integral part of each social information-processing step” (p.81). Current understanding of the SIP model (e.g., Lemerise & Arsenio, 2000) continues to emphasise the central role of emotion, and empirical evidence supports this. For example, Harper, Lemerise & Caverly (2010) used mood induction to provoke happy, angry or neutral moods in 6- to 9-year-olds. They showed that an angry mood led to children being more likely to adopt instrumental goals (measured by whether or not they helped the child achieve their desired outcome) rather than relational goals (which focused on building the relationship with the people around them). Their work also demonstrated the impact of previous social experience: children who were “aggressive” and who had low levels of social acceptance (“low accepted-aggressive”) were more vulnerable to the effects of angry mood than were the “high accepted-” and “average-nonaggressive” children.

However, a possible criticism could be that research into the role of emotions in SIP has focused either on their role simply as information about a potential problem to be solved or on their negative impact on effective processing. This overlooks the positive benefits of emotion, as proposed by Fredrickson (2004), through the way that positive emotion can broaden a person’s mindset and build positive resources. As Arsenio has acknowledged (2010), this area is ripe for further research.

### 3.4. Implications for educational psychologists

We have seen so far that the SIP model is coherent and well supported in the academic literature. We have also seen that although it is not widely referenced in the professional educational psychology literature there is no strong reason why this should be the case, since it fits well with current conceptualisations of interactionist models, unconscious processing and the role of emotions in influencing behaviour. This leads now to a consideration of how an understanding of SIP can help the professional practice of educational psychologists.

Clearly, as noted above, any consideration of SIP must be in the context of a biopsychosocial model — we need to understand the factors in a young person’s environment which might be acting to prompt or maintain challenging behaviour. In this context, there are implications at each step of the model (sample questions for the EP practitioner are set out in the Appendix). At the *encoding of cues* step, SIP-informed assessment could focus on the young person’s attention to cues, in particular on the influence of potential memory difficulties and the degree to which expectations (or a “script”) detract attention from the cues themselves in favour of attention to a generalised pattern of expectations. At the *interpretation of cues* step, SIP-informed assessment pays special attention to the role of ambiguity in social situations and the “stories” that a young person tells about cause and intention. In particular, the SIP-informed practitioner will look carefully at the measures that the child uses to help interpret cues: the outcomes, the perceived intent and the emotions shown by others. At *clarification of goals*, SIP suggests that assessment and intervention can focus not only on identifying those goals, but also on considering the child’s perception of the security of their relationships with others — if they already feel securely accepted, then they are less likely to need to use aggressive behaviours to retaliate against peers who are seen as withholding the valued goal of social acceptance. The *response access* step is perhaps the least novel of the steps informed by SIP, since it focuses on identifying and constructing possible behaviours, which is traditionally the focus of social skills programmes. But at *response decision*, the SIP-informed practitioner will explore and challenge the values framework within which the child considers choices and also aim to explore the degree of confidence that the child has in each possibility. Finally, at *behaviour enactment*, SIP practice considers the skill with which a behaviour choice is implemented and its “resistance” to the disruptive impact of high emotionality, as well as to the possible positive influence of positive

emotions. The SIP-informed practitioner will consider the child's alertness to cues that signal the success, or otherwise, of the chosen strategy, their ability to manage any feelings arising as a result of mismatch and their ability to select an alternative strategy.

#### 4. Conclusion

This article has explored the SIP model, from its first iteration in 1986 through to a reformulated version in 2000. By considering the evidence at each step of the model, it presented the case for the value of the SIP model as a framework for a detailed and rigorous consideration of a child's social behaviour. It showed how the SIP model was always intended to be, and needs to be, understood in the context of a wider system, as a biopsychosocial model. It also showed that SIP's acknowledgement of unconscious processing, informed by emotions, allows it to fit neatly with current models of educational psychology practice. This enlarges the range of assessment questions, and intervention possibilities, for educational psychologists working with children with difficulties with social behaviour.



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## Appendix

### SIP informed questions for the EP practitioner

#### *Step one: encoding of cues*

- What cues does the child pay attention to in a social situation?
- How can we help the child attend more carefully to the cues that are present?
- How can we help them develop their memory to be able to attend properly to all the cues available?
- To what degree is their expectation influencing the manner in which they attend to cues?

#### *Step two: interpretation of cues*

- What “stories” does the child tell about cause and intention in social situations?
- How attuned is the child to ambiguity in social situations?
- How does the child explain negative and positive events that they experience?
- What measures is the child using to help interpret cues? (e.g., the outcome of the actions; the attributed intent of the actors; the emotions shown by the actors?)

#### *Step three: clarification of goals*

- What is the child trying to achieve in social situations?
- How secure are they in their relationships with others? Do they have relationships that they can rely on? Are they likely to see them as vulnerable and unable to withstand any challenge, or robust enough to deal with the odd setback?

#### *Step four: response access and construction*

- How wide is the range of responses that the child might choose?
- What experiences have they had that will lead to the relative ease in accessing (and enacting) different options?
- In what order does she/he generate the responses? Do the socially constructive responses precede or come after the socially damaging ones?
- Are the responses biased towards a particular type of goal?

#### *Step five: response decision*

- What is the values framework that will inform the child’s response decision?
- How confident is she/he about her or his own ability to put into practice the prosocial behaviours? Where does this confidence come from?

- How good is the child at recognising the range of consequences, not just for themselves but for other people? To what extent does she or he discount outcomes for other people in favour of focusing on outcomes that just affect her or him?

*Step six: behaviour enactment*

- How aware is the child of her or his own emotions, and the impact that these have on their performance?
- Is the child able to control and channel their emotions? How can she or he be helped to regain control?
- How proficient is the child in using the desired skill? Will this help them overcome the interfering effect of high emotion? What other steps can be taken to reduce the presence or impact of high emotion?
- How do the peers typically react to the child? Can they be helped to understand and react to the child's behaviour in a different way?