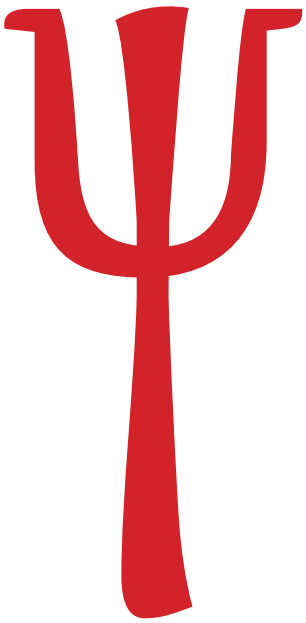

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Jealousy: Unconscious processes

Children with somatic complaints

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Children's science and technology talents

Volume 66/number 3/September 2011
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Contents

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Jealousy: Unconscious processes

An evolutionary perspective on human (social) behaviour assumes that the human mind has evolved to be responsive to contextual stimuli that are relevant to fundamental motives such as survival or reproduction. In the current paper, we argue that the presence of a rival is one such contextual stimulus. We hypothesise that given the fact that the pair bond is essential to human reproductive success, rival evaluation over the course of human evolution has evolved into an automatic process, and that subliminal exposure to a rival should suffice to evoke jealousy. We describe three studies using subliminal priming that confirm this hypothesis, and which show that sex-specific jealousy was evoked by rival characteristics to which participants were exposed outside their conscious awareness – whether these were in the form of words, photographs, or line drawings.
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Entering 'jealousy' as a search term in Google generates 29,200,000 hits within 0.08 seconds, and the same search term generates over 2060 results from all areas of psychology in PsychINFO. Clearly, jealousy fascinates scores of people, both the layperson and the professional, and in all cultures. Most work focuses on the negative side of jealousy, which is justified, since jealousy is often implicated in spousal assault, stalking behaviour, and homicide (Daly, Wilson, & Weghorst, 1982). Despite this negativity, in the current paper we take the view that jealousy is a functional emotion, in the sense that it helps to solve an adaptive problem, in this case to warn that a rival is threatening the relationship. Acting on this emotion would help to prevent a partner's infidelity. Indeed, we posit that since protecting one's relationship is crucial for one's reproductive success, the ability to evaluate the threat of a rival has evolved into an automatic process, taking place outside one's awareness.

An evolutionary (social) psychological view of human behaviour assumes that human cognitive and motivational functioning is directed by specific functional mental mechanisms which have evolved to solve adaptive problems that in human evolutionary history were crucial for survival and reproduction. Considering the existence of sex differences in, for example, parental investment, these adaptive problems likely differed to an extent for the sexes (Miller, 2000; Buss, 1994; Trivers, 1972). Moreover, an evolutionary perspective assumes there is an interaction between variables within the person (such as motives, strategies, and capacities) and variables within the situation (i.e., contextual stimuli connoting threats or opportunities). More specifically, the human mind is hypothesised to have evolved to be responsive to contextual stimuli that are relevant to fundamental motives such as survival or reproduction, in a flexible way (e.g., Neuberg, Kenrick, & Schaller, 2010; Maner, Gailliot, Rouby, & Miller, 2007).

Whenever such contextual stimuli are detected, motivational systems are temporarily activated and content-specific adaptive mechanisms are triggered – emotions, attitudes, or behaviour. For example, Schaller, Park, and Mueller (2003) showed that people in a dark room – a situation that heuristically would suggest a vulnerability to harm and thus activates a self-protective motive – are more likely to perceive ethnic outgroup members in a stereotypic manner, e.g. as hostile and threatening. Similarly, since mating is a fundamental human goal, contextual cues are able to trigger cognitive mechanisms that are associated with reproductive success. Several studies have shown that especially physically attractive women capture the eye of men

as well as women (Maner et al., 2003; Buss, 1989). For example, Maner et al. (2003) showed that both male and female participants overestimated the frequency of attractive faces in an array of pictures of women when they were given insufficient time to process all the faces thoroughly. Moreover, in a recognition memory task, participants showed biased recognition memory for attractive women as opposed to unattractive women. In this case, then, physical attractiveness triggered mating-related motives. Similarly, in an experiment by Roney (2003), young men who were visually exposed to young women reported more favourable attitudes to material wealth, reported greater feelings of ambition and aggressiveness, and described themselves as more extraverted than men exposed to other men or men exposed to older women. That is, exposure to potential mates seemed to activate a courtship motive, making the participants 'conform' to women's preferences for socially dominant and high-status males.

With respect to jealousy, an evolutionary psychological view holds that experiencing this emotion helps to prevent a mate's infidelity, and thereby maintains the pair bond, which is essential to reproductive success because it increases both one's own and one's offspring's survival chances. Jealousy can be conceptualised as part of a coordinated system of cognitive, affective, physiological, and behavioural responses aimed at guarding one's mate from potential intrasexual competitors which, ultimately, is of importance to reproductive success (Maner & Shackelford, 2007; Buunk, Massar, & Dijkstra, 2007; Buss, 1994; Daly et al.,1982). In general, no sex differences in the intensity of jealousy have been found – when confronted with a jealousy evoking situation, men and women report equal amounts of jealousy (Bringle & Buunk, 1985; Pines & Friedman, 1998). However, when contextual factors are taken into account, sex differences in jealousy do emerge. One such factor is the presence of a rival: Research (e.g. Dijkstra & Buunk, 1998, 2002; Buunk & Dijkstra, 2001; Buss, Shackelford, Choe, Buunk, & Dijkstra, 2000) has shown that the amount of jealousy evoked by the rival is dependent on his or her characteristics. More specifically, women report most jealousy when they are confronted with a physically attractive rival, whereas a socially dominant rival evoked most jealousy in male participants (for an overview, see Buunk et al., 2007).

As was mentioned above, contextual stimuli are able to trigger content-specific adaptive motives that are relevant to human reproduction (Maner et al., 2003, 2007a, 2007b; Kenrick, Neuberg, Griskevicius, Becker, & Schaller, 2010) – most likely, on an unconscious level. This implies that people are often not aware of the influence of these stimuli on their behaviour, and it also means that even though they are aware of the stimuli themselves, they might not be aware of their ultimate significance. Indeed, in most men the fact that physically attractive female faces capture their attention does not necessarily activate a conscious desire to spread their genes. Given the importance of preventing rivals from interfering with one's relationship it seems plausible that during the course of human evolution, humans have evolved to be especially sensitive to the presence of rivals, especially those with desirable mating characteristics. Indeed, since this capacity is so fundamental, it is reasonable to assume that rivals may be detected outside conscious awareness – and subsequently influence jealousy responses. This assumption was the basis of our research into the unconscious processes in rival evaluation (Massar, Buunk, & Dechesne, 2009; Massar & Buunk, 2009, 2010). The main focus of these studies was to determine whether men and women are able to detect a rival's characteristics without being consciously aware of having been exposed to him or her, and whether this unconscious exposure would evoke to the same extent the sex-specific jealousy reported in earlier studies (e.g. Dijkstra & Buunk, 1998, 2002). To test these hypotheses, we used a technique that is often used in social cognitive research but is new to jealousy research, i.e., subliminal priming (e.g., Bargh, 1989).

There is a large body of research that shows that it is possible to prime people with stimuli they report not having seen, but which nonetheless may influence their performance on subsequent tasks, their judgments, or their emotions (for an overview see Merikle, 2007). Bargh and Pietromonaco (1982) were the first to use this paradigm in a study on person perception. In their study, participants were exposed for 100 ms to words relating to hostility. Immediately after the word was flashed it was masked by a string of Xs. Next, participants were asked to read the description of a man named Donald behaving in a rather hostile way, but his behaviour could either be interpreted as stemming from the situation, or as stemming from his personality. When asked to evaluate Donald's behaviour, the results showed that participants who had previously been primed with hostility words evaluated Donald's personality more negatively than participants who had not been exposed to hostility words. These last participants were more inclined to ascribe Donald's ambiguous behaviour to situational factors (Bargh & Pietromonaco, 1982). Thus, without their awareness or control, these participants' evaluation of Donald was influenced by the subliminal priming. After this first study, over the years a number of studies

on automatic evaluations and category accessibility have repeatedly established that unobtrusively presenting participants with input cues may nonconsciously prime attitudes and emotions, and may influence participants' person judgments or object evaluations (e.g., Ferguson, Bargh, & Nayak, 2005; Dijksterhuis, 2004; Wegner & Bargh, 1998; Devine, 1989; Fazio, Sanbonmatsu, Powell, & Kardes, 1986).

Social stimuli relevant to mating and mate-guarding may also be processed selectively and at a very early stage. In several experiments Maner, Gaillot, and DeWall (2007a) showed that when a mating motive had been induced, both male and female participants' attention 'stuck' to physically attractive women, but not to attractive men. This bias for attractiveness was more pronounced in sexually unrestricted men and in women who were insecure about their current relationship. Supposedly, this last group is inherently more attuned to rivals. More evidence for an early order, attention-grabbing component in jealousy comes from a study by Schützwohl (2008), in which participants who were currently involved in a romantic relationship and who were therefore hypothesised to be more vigilant to intrasexual competitors, had more difficulties disengaging their attention from cues signalling infidelity. These men and women recalled significantly less task-irrelevant target cues when they had been primed with cues relating to sexual and emotional infidelity, respectively, than men and women not currently in a romantic relationship (Schützwohl, 2008).

In all of the studies described here, participants were unaware of the purpose of the study, or of the influence of the primes on their performance on subsequent tasks, suggesting that the jealousy mechanism is a highly vigilant monitoring device that operates at very early stages of information processing. Applying these findings from research in both social cognition and evolutionary psychology to rival evaluation in a jealousy context, in our series of experiments (Massar et al., 2009; Massar & Buunk, 2009, 2010) we assumed that subliminal exposure to rival characteristics should suffice to activate feelings of jealousy. We will now briefly describe these studies and their results.

Method & results

Study 1[1]

In this study, 35 men and 40 women (mean age = 22.8, SD = 1.94) were randomly assigned to either the social dominance or the attractiveness condition. Before starting with the subliminal priming task, they completed two questionnaires. First they completed a questionnaire that measured their mate value (Landolt, Lalumière, & Quinsey, 1995). Participants indicated on a five-point scale (1 = not at all, 5 = very much) how applicable certain statements were to them. Examples are: 'I receive many compliments from members of the opposite sex' and 'I receive invitations for sex from members of the opposite sex.' ($M = 3.31$, $SD = 0.52$). Next, participants who were in a relationship at the time of the experiment completed the relationship interaction satisfaction scale (Buunk, 1990). This scale measures the frequency with which the interaction with the partner in an intimate relationship is experienced as rewarding and not as aversive. There are eight items in this scale, and examples are: 'I feel happy when I'm with my partner,' and 'We have quarrels'. On a five-point scale (1 = never, 5 = very often) participants indicated how often these statements applied to them ($M = 4.16$ ($SD = 0.49$).

Next, in a subliminal priming procedure adapted from Dijksterhuis (2004), which was presented as an association task to participants, they had to indicate as quickly as possible whether two neutral words presented on the screen were related to each other. The visible words in this task had no relation to rival characteristics, but were neutral words like 'house' and 'garden'. However, unbeknownst to the participants, in between these two neutral words they were subliminally exposed to rival characteristics. To ensure that participants would relate the rival characteristics to another individual, and not to themselves, each word was preceded by a personal pronoun – 'he' for the men and 'she' for the women. The rival characteristics were those words that in a preliminary study were most often mentioned when men and women were asked to generate words relating to attractiveness and social dominance (Dijkstra & Buunk, 2002). For the attractiveness condition, these were 'pretty,' 'beautiful,' 'slender,' and 'sexy' (these are imperfect translations of Dutch words that apply equally to men and women), and for the social dominance condition, 'tough,' 'money,' 'power,' and 'success.'

Each rival characteristic was presented five times, making a total of 20 trials. A trial would thus consist of a neutral word (presented for 1.5 s), a personal pronoun (17 ms), a rival characteristic (17 ms), and then another neutral word (1.5 s). After completing the association task, participants read a jealousy scenario. In this short vignette they were asked to imagine themselves and their partner at a party, where an unfamiliar man or woman started flirting with their partner. Next, they were asked how jealous they would be in such a situation, measured on a scale ranging from 0 (not jealous at all) to 100 (extremely jealous). To make sure the only information the participants received about the rival was the subliminal primes, the rival's appearance and personality characteristics were purposefully

1 For details on the statistical analyses and the results, see Massar, Buunk, and Dechesne (2009).

withheld in this vignette. Using a funnelled debriefing procedure, participants' awareness of the primes was assessed. Next, they were informed about the true nature of the study and thanked for their participation.

The results showed that subliminal priming in this context clearly had the hypothesised effects, but that there were sex-specific moderating variables that influenced the relationship between rival characteristics and jealousy. For women, their self-reported mate value, but not their relationship satisfaction, influenced their jealousy. Women with a high mate value reported more jealousy (M = 82.03) after being primed with attractiveness words than social dominance words (M = 48.51; $p < .01$), whereas women with a low mate value reported equal amounts of jealousy after exposure to the attractive and the socially dominant rival (M = 78.51 and M = 75.15 respectively, ns). For men, their relationship satisfaction, but not their mate value, moderated jealousy scores. Men high in relationship satisfaction reported more jealousy after exposure to a socially dominant rival (M = 90.42) than men low in relationship satisfaction (M = 34.75; $p < .001$). However, men high and low in relationship satisfaction did not differ in their jealousy response after priming with attractiveness words: M = 75.51 and M = 57.38 (ns), respectively.

This study established for the first time that it is possible to induce jealousy in participants through subliminal exposure to rival characteristics, and that individual differences in mating-related variables such as mate value and relationship satisfaction moderate the influence a rival has on one's jealousy. Our next study focused on facial attractiveness. Within and across cultures, common standards of (female) facial attractiveness are shared by both men and women from different social classes (for a review see Langlois et al., 2000). This high consensus in attractiveness ratings would suggest that there are biologically based standards of beauty. Indeed, early on in human development, before cultural standards of beauty are likely to have developed, a preference for attractive faces over unattractive faces emerges (Slater, Quinn, Hayes, & Brown, 2000; Rubenstein, Kalakanis, & Langlois, 1999). Most relevant to the present paper, women with attractive faces have more long-term mating success and become sexually active earlier in life than women with unattractive faces (Rhodes, Simmons, & Peters, 2005). Since facial attractiveness contributes less to male mate value than to female mate value, in this study (Massar & Buunk, 2010) we decided to use only women as participants, and predicted that they would report more jealousy after subliminal exposure to a photograph of an attractive woman than after exposure to an unattractive woman.

Study 2[2]

In this experiment, 40 women (mean age =20.78, SD = 4.26) participated. After providing some demographic information, they started with the priming task which consisted of a parafoveal priming procedure. In this procedure the primes are presented in the visual periphery of the attended region (for details, see Chartrand & Bargh, 1996). A fixation point consisting of an asterisk (*) remained in the centre of the screen and participants were told to focus on this fixation point throughout the task because of the unpredictable location and timing of the stimuli on the screen. Two keys on the keyboard were labelled L and R, and participants were instructed to press the L key whenever they saw a flash on the left side of the screen, and the R key whenever they saw a flash on the right side of the computer screen. As priming stimuli, pre-rated photographs of an attractive and an unattractive female were used. These priming stimuli were flashed in 15 of the 60 experimental trials. In the practice trials and in the remainder of the 45 experimental trials participants were exposed to geometrical shapes (circles, triangles and squares), which were also presented for 60 ms. The geometrical shapes were of the same size as the priming stimuli and consisted of black line drawings on a white background. Both the geometrical shapes and the priming stimuli measured 4 x 5 cm (width x height), and were presented for 60 ms. Each picture was immediately followed by a 60 ms masking picture, of the same size as the stimulus picture. This mask consisted of a scrambled (unrecognisable) version of the stimulus pictures. The stimulus pictures and the mask appeared randomly at one of four parafoveal locations on the screen (for details, see Chartrand & Bargh, 1996; Stapel, Koomen, & Ruys, 2002). Intervals between the offset of the mask and the onset of the next picture varied randomly from 2 to 7 s. Both the random presentation in one of the four parafoveal regions and the random time intervals between stimulus presentations ensured that it was impossible for participants to learn or predict the next presentation of the stimuli.

To get familiar with the procedure, participants were given 15 practice trials, in which only geometrical shapes were flashed. After the practice trials, the participants completed 60 experimental trials. The priming stimuli were flashed in 15 of the 60 experimental trials. In the remainder of the 45 experimental trials participants were exposed to the geometrical shapes which were also presented for 60 ms. After the priming procedure, the jealousy evoking scenario described above was presented

2 For full details on the statistical analysis and the results, see Massar and Buunk (2010).

to the participants, and their jealousy (0-100) was measured. In addition to jealousy, we also asked about a number of other emotions: suspicious, betrayed, worried, distrustful, jealous, rejected, hurt, anxious, angry, threatened, and sad, rated on a scale from 1 [not at all] to 5 [very much] (see DeSteno & Salovey, 1996). After completing these questions, participants' awareness of the primes was assessed using a funnelled debriefing procedure. Finally, they were informed about the true nature of the study and thanked for their participation.

The results confirmed our expectations: women who were subliminally exposed to the attractive woman reported significantly more jealousy ($M = 77.24$) than women exposed to the unattractive rival ($M = 64.50$; $p < .05$). Significant effects were also found on both the mean of the other emotions ($M = 3.09$ and $M = 2.53$ respectively, $p < .05$), and on several separate emotions. Women who were subliminally exposed to the rival with the attractive face reported they would feel more worried, angry, hurt, and sad if the situation described in the scenario would happen to them than women exposed to the unattractive rival (p's < .05).

This study thus established that exposure to attractive faces evokes women's jealousy, even outside their conscious awareness. However, not only facial attractiveness, but also body shape is an important cue that contributes to one's physical attractiveness, particularly when individuals are observed from a distance (e.g., Alicke, Smith, & Klotz, 1986). A low waist-to-hip ratio (WHR) is one factor contributing to women's physical attractiveness. This ratio is considered an indicator of a woman's reproductive capability and health as it is the result of high levels of oestrogen that cause more fat to be deposited on the buttocks and hips than on the waist. A low ratio, between 0.67-0.80, results in a curvaceous, hour-glass shaped figure and is considered most attractive, and a WHR around 0.7 is considered an 'ideal' female body shape. Ratings of female attractiveness are significantly correlated with WHR (Singh, 1993; Streeter & McBurney, 2003), and WHR has been shown to be a reliable morphological indicator of the levels of sex hormones (Singh, 1993). Paper-and-pencil studies have shown that rivals with a relatively low WHR evoke more jealousy in women than in men, and that women pay more attention to the waist, hips, and legs in evaluating their rivals (Buunk & Dijkstra, 2001; Dijkstra & Buunk, 2005).

Male physical attractiveness is largely determined by body parts such as the chest and shoulders. Moreover, men whose torsos have an inverted triangle shape, that is, men who have broad shoulders and narrow hips, are considered most attractive (Fan, Dai, Liu, &Wu, 2005; Franzoi & Herzog, 1987). This body shape is indicative of larger physical strength and muscular development in the upper body. Men with a high SHR are also perceived as being higher in both social and physical dominance than men with a low SHR (Dijkstra & Buunk, 2001). A male's waist also plays a role in determining physical attractiveness: research has shown that a male WHR of 0.9 is considered the optimal ratio and that increasing WHRs decrease a male's attractiveness (Dijkstra & Buunk, 2005). Concerning jealousy, there is evidence from paper and pencil studies that rivals with a relatively high SHR evoke more jealousy in men than in women, and that men say that they pay more attention to their rivals' shoulders, chest, and belly (Buunk & Dijkstra, 2001; Dijkstra & Buunk, 2001). In our next study, we focused on WHR and SHR, and used Singh's (1993) line drawings as subliminal primes.

Study 3[3]

Thirty-four men (mean age = 22, $SD = 3.0$) and 54 women (mean age = 21.6, $SD = 3.0$) took part in this experiment, and after providing some demographic information, they started with the parafoveal priming procedure. The primes (taken from Singh, 1993, and Dijkstra & Buunk, 2001) were for male participants: a figure with either a high shoulder-to-hip ratio (e.g., an attractive body shape), or a low shoulder-to-hip ratio (an unattractive body shape), and for female participants: a figure with either a low WHR (an attractive body shape), or a high WHR (unattractive body shape). The priming procedure was identical to the one described above. After this priming task, participants read the jealousy-evoking scenario again, and indicated their jealousy. After completing the dependent variables, participants' awareness of the primes was assessed using a funnelled debriefing procedure. Finally, they were informed about the true nature of the study and thanked for their participation.

The results were in line with our expectations: Males reported significantly more jealousy after subliminal exposure to the figure with the attractive body shape (high SHR; $M = 77.43$) than after exposure to the figure with the unattractive body shape (low SHR; $M = 61.03$, $p < .05$). The results for women also confirmed the hypotheses, i.e. the attractive body shape evoked most jealousy ($M = 74.18$ versus $M = 65.86$, $p = .05$), but only after the stimulus pictures were modified by removing possibly distracting features like the face and the arms.

Discussion

Using methods commonly used in social cognition, we have tested hypotheses derived from an evolutionary psychological approach to human

3 For full details on the procedure, the statistical analyses and the results, see Massar and Buunk (2009).

behaviour. Our experiments show that participants are able to evaluate a rival's threat outside their conscious awareness, and that sex-specific jealousy is aroused by adaptively relevant rival characteristics, i.e. facial and physical attractiveness for women, and social and physical dominance for men. The research reported here is largely in line with Kenrick et al. (2010)'s model of top-down, fundamental motives being activated by bottom-up processes such as visual processing. This model presumes that functionally relevant stimuli in the environment are quickly and automatically attended to, especially when a fundamental motive is activated, whereas less relevant features are more likely to be ignored. For example, activation of a mate retention goal will increase attention to goal-relevant stimuli – such as physical attractiveness and social status in same-sex others – and in this way bias how these stimuli are interpreted and remembered. The results from our experiments suggest that having been exposed to stimuli before a functionally relevant goal is activated produces the same effects as exposing participants to stimuli after a goal is activated (see Maner et al., 2003). That is, the interpretation of stimuli which would on their own not necessarily have been very informative to participants was retrospectively affected by activating a mate retention goal.

One can assume that highly adaptive responses have evolved to become automatic, since automaticity frees up cognitive resources. This in turn helps the individual respond easily and adaptively to a wide range of physical and social challenges, thereby enhancing reproductive success. Bargh (1989) identified four core components of automaticity: Intention, awareness, efficiency, and control. More specifically, a process – or behaviour, emotion, attitude, etc. – is deemed to be automatic when there is little intention involved (i.e. it is spontaneous), when it takes place without one being aware of it, when it is highly efficient (i.e. it requires little cognitive capacity), and finally, when it is outside one's control (i.e. it is unconscious). However, not all four features need to co-occur before one can say mental processes are automated (Bargh, 1989). The studies above can be said to have at least three of the hallmarks of automaticity. First of all, the evaluation of the rival was spontaneous: without the presence of explicit prompts to evaluate the subliminal prime, it had an effect on subsequent emotions, most notably jealousy. Second, participants were not aware of the priming, and thus of the presence of the rival. Finally, the information was presented to participants outside their conscious awareness. Moreover, due to the nature of the subliminal priming task, we can assume the rival evaluation was highly efficient – i.e. requiring few cognitive resources – as well. Thus, in the present studies it seems that rival evaluation shaped subsequent responses even though participants were not explicitly directed to do so.

In our research, evaluating a rival automatically produced overall the same results as evaluating a rival consciously (e.g., Dijkstra & Buunk, 1998). Is implicit evaluation of rivals indeed similar to explicit evaluation? Evidence for a correspondence between explicit and implicit evaluations comes from Gardner, Bargh, Shellman, and Bessenoff (2002). In this study, brain activation patterns of participants making conscious evaluations of stimuli and participants who were merely told to listen to stimuli names – the implicit evaluation condition – were compared. The participants in the latter group did not know they were evaluating, and did not intend to evaluate the stimuli. However, the results showed that in both groups of participants the same area of the brain unique to the evaluative response reacted to the stimuli, suggesting that unintended, unconscious evaluations evoke the same brain activation as explicit evaluations. Thus, we feel it is reasonable to assume that in the experiments presented in this paper, the process of unconscious rival evaluation was comparable to the explicit rival evaluation reported by Dijkstra and Buunk (1998, 2002).

To conclude, using paradigms from social cognitive psychology to test evolutionary psychological hypotheses, our research program has helped to unravel how the male and female minds are made up to pay attention in different ways to specific rival characteristics. We argue that using implicit manipulations or measures to test hypotheses derived from an evolutionary perspective on human behaviour provides opportunities to test whether processes that are assumed to have evolved into automatic tendencies indeed influence and guide our behaviour, attitudes and emotions outside our awareness.

Author's note

This paper is based on Karlijn Massar's dissertation, 'Unconscious Rivals: The automatic evaluation of rivals in jealousy-evoking situations', which was written at the University of Groningen under supervision of Abraham P. Buunk.

References

Alicke, M. D., Smith, R. H., & Klotz, M. L. (1986). Judgements of physical attractiveness: The role of faces and bodies. *Personality and Social Psychology Bulletin, 12*, 381-389.

Bargh, J. A., & Pietromonaco, P. (1982). Automatic information processing and social perception: The influence of trait information presented outside conscious awareness on impression formation. *Journal of Personality and Social Psychology, 43*, 437-449.

Bargh, J. A. (1989). Conditional automaticity: Varieties of automatic influence in social perception and cognition. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 3-51). New York: Guilford.

Bringle, R. G., & Buunk, A. P. (1985). Jealousy and social behavior: A review of person, relationship, and situational determinants. In P. Shaver (Ed.), *Review of Personality and Social Psychology* (Vol. 6). Beverly Hills, CA: Sage.

Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences, 12*, 1-49.

Buss, D. M. (1994). *The evolution of desire*. New York: Basic Books.

Buss, D. M., Shackelford, T. K., Choe, J., Buunk, B. P., & Dijkstra, P. (2000). Distress about mating rivals. *Personal Relationships, 7*, 235-243.

Buunk, A.P. (1990). Relational interaction satisfaction scale. In: J. Touliatos, B.F. Perlmutter, & M.A. Strauss (Eds.), *Handbook of Family Measurement Techniques* (pp. 106-107). Newbury Park, CA: Sage Publications.

Buunk, A. P, & Dijkstra, P. (2001). Evidence for a sex-based rival oriented mechanism jealousy as a function of a rival's physical attractiveness and dominance in a homosexual sample. *Personal Relationships, 8*, 391-406.

Buunk, A. P., Massar, K., & Dijkstra, P. (2007). Automatically evaluating one's romantic rivals: towards a social cognitive evolutionary approach of jealousy. In Forgas, J., Haselton, M., & Von Hippel, W. (Eds.) The Evolution of the Social Mind: *Evolutionary Psychology and social cognition* (pp 213-228). New York: Psychology Press.

Chartrand, T. L., & Bargh, J. A. (1996). Automatic activation of impression formation and memorization goals: nonconscious goal priming reproduces effects of explicit task instructions. *Journal of Personality and Social Psychology, 71*, 464-478.

Daly, M., Wilson, M., & Weghorst, S. J. (1982). Male sexual jealousy. E*thology and Sociobiology, 3*, 11-27.

DeSteno, D. A., & Salovey, P. (1996). Jealousy and the characteristics of one's rival: A self-evaluation maintenance perspective. *Personality and Social Psychology Bulletin, 22*, 920-932.

Devine, P. G. (1989). Stereotypes and prejudice: their automatic and controlled components. *Journal of Personality and Social Psychology, 56*, 5-18.

Dijksterhuis, A. (2004). I like myself but I don't know why: enhancing implicit self-esteem by subliminal evaluative conditioning. *Journal of Personality and Social Psychology, 86*, 345-355

Dijkstra, P. & Buunk, A. P. (1998). Jealousy as a function of rival characteristics: an evolutionary perspective. *Personality and Social Psychology Bulletin, 24*, 1158-1166.

Dijkstra, P. & Buunk, A. P. (2001). Gender differences in the jealousy-evoking nature of a rival's body build. *Evolution and Human Behavior, 22*, 335-341.

Dijkstra, P. & Buunk, A. P. (2002). Sex differences in the jealousy-evoking effect of rival characteristics. *European Journal of Social Psychology, 32*, 829-852.

Dijkstra, P., & Buunk, A. P. (2005). A narrow waist versus broad shoulders: Sex and age differences in the jealousy-evoking characteristics of a rival's body build. *Personality and Individual Differences, 39*, 379-389.

Fan, J. T., Dai, W., Liu, F., & Wu, J. (2005). Visual perception of male body attractiveness. *Proceedings of the Royal Society of London B, 272*, 347-352.

Fazio, R. H., Sanbonmatsu, D. M., Powell, M. C., & Kardes, F. R. (1986). On the automatic activation of evaluations. *Journal of Social and Personality Psychology, 44*, 723-735.

Ferguson, M. J., Bargh, J. A., & Nayak, D. A. (2005). After-affects: How automatic evaluations influence the interpretation of subsequent, unrelated stimuli. *Journal of Experimental Social Psychology, 41*, 182-191.

Franzoi, S. L., & Herzog, M. E. (1987). Judging physical attractiveness: what body aspects do we use? *Personality and Social Psychology Bulletin, 13*, 19-33.

Gardner, W. L., Bargh, J. A., Shellman, A., & Bessenoff, G. (2002). *This is your brain on primes: Explicit and implicit evaluation goals induce similar lateralized event-related brain potentials*. Manuscript submitted for publication.

Kenrick, D. T., Neuberg, S. L., Griskevicius, V., Becker, D. V., & Schaller, M. (2010). Goal-driven cognition and functional behavior. The fundamental-motives framework. Current *Directions in Psychological Science, 19*, 63-67.

Landolt, M. A., Lalumière, M. L., & Quinsey, V. L. (1995). Sex differences and intra-sex variations in human mating tactics: An evolutionary approach. *Ethology and Sociobiology, 16*, 3-23.

Langlois, J. H., Kalakanis, L., Rubenstein, A. J., Larson, A., Hallamm, M., & Smoot, M. (2000). Maxims or myths of beauty? A meta-analytic and theoretical review. *Psychological Bulletin, 126*, 390-423.

Maner, J., Kenrick, D., Becker, D., Delton, A., Hofer, B., Wilbur, C., & Neuberg, S. (2003). Sexually selective cognition: Beauty captures the mind of the beholder. *Journal of Personality and Social Psychology, 85*, 1107-1120.

Maner, J. K., Gaillot, D., & DeWall, N. C. (2007a). Adaptive attentional attunement: Evidence for a mating-related perceptual bias. *Evolution and Human Behavior, 28*, 28-36

Maner, J. K., Gailliot, M. T., Rouby, D. A., & Miller, S. L. (2007b). Can't take my eyes off you: Attentional adhesion to mates and rivals. *Journal of Personality and Social Psychology, 93*, 389-401

Maner, J. K., & Shackelford, T. K. (2007). The basic cognition of jealousy: an evolutionary perspective. *European Journal of Personality, 22*, 31-36.

Massar, K., Buunk, A. P., & Dechesne, M. (2009). Jealousy in the blink of an eye: Jealous reactions following subliminal exposure to rival characteristics. *European Journal of Social Psychology, 39*, 768-779.

Massar, K., & Buunk, A. P. (2009). Rivals in the mind's eye: jealous responses after subliminal exposure to body shapes. *Personality and Individual Differences, 46*, 129-134.

Massar, K., & Buunk, A. P. (2010). Judging a book by its cover: Jealousy after subliminal priming with attractive and unattractive faces. *Personality and Individual Differences, 49*, 634-639.

Merikle, P. (2007). Preconscious processing. In M. Velmans & S. Schneider (Eds.), *The Blackwell companion to consciousness* (pp. 512-524). Malden, MA: Blackwell Publishing.

Miller, G. F. (2000). *The mating mind: How sexual choice shaped the evolution of human nature*. New York, NY: Doubleday.

Neuberg, S. L., Kenrick, D. T., & Schaller, M. (2010). Evolutionary social psychology. In S. T. Fiske, D. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (5th ed., pp. 761-796). New York: John Wiley & Sons.

Pines, A. M., & Friedman, A. (1998). Gender differences in romantic jealousy. *The Journal of Social Psychology, 138*, 54-71.

Rhodes, G., Simmons, L. W., & Peters, M. (2005). Attractiveness and sexual behavior: Does attractiveness enhance mating success? *Evolution and Human Behavior, 26*, 186-201.

Roney, J. R. (2003). Effects of visual exposure to the opposite sex: cognitive aspects of mate attraction in human males. *Personality and Social Psychology Bulletin, 29*, 393-404.

Rubenstein, A. J., Kalakanis, L., & Langlois, J. H. (1999). Infant preferences for attractive faces: a cognitive explanation. *Developmental Psychology, 35*, 848-855.

Schaller, M., Park, J. H., & Mueller, A. (2003). Fear of the dark: Interactive effects of beliefs about danger and ambient darkness on ethnic stereotypes. *Personality and Social Psychology Bulletin, 29*, 637-649.

Schützwohl, A. (2008). The disengagement of attentive resources from task-irrelevant cues to sexual and emotional infidelity. *Personality and Individual Differences, 44*, 633-644.

Singh, D. (1993). Is thin really beautiful and good? Relationship between waist-to-hip ratio (WHR) and female attractiveness. *Personality and Individual Differences, 16*, 123-132.

Slater, A., Quinn, P. C., Hayes, R., & Brown, E. (2000). The role of facial orientation in newborn infants' preference for attractive faces. *Developmental Science, 3*, 181-185.

Stapel, D. A., Koomen, W., & Ruys, K. I. (2002). The effects of diffuse and distinct affect. *Journal of Personality and Social Psychology, 83*, 60-74.

Streeter, S. A., & McBurney, D. (2003). Waist-to-hip ratio and attractiveness: new evidence and a critique for a 'critical test'. *Evolution and Human Behavior, 24*, 88-98.

Trivers, R. L. (1972). Parental investment and sexual selection. In: B. Campbell (Ed.), *Sexual selection and the descent of man* (pp. 136-179). Chicago, IL: Aldine.

Wegner, D., & Bargh, J. A. (1998). Control and automaticity in social life. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (Vol.1, pp. 446-496). Boston: McGraw-Hill.

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Children with somatic complaints: Do they show a somatic attention bias?

The aim of this study was to investigate whether children with frequent somatic complaints have an attention bias. For this purpose, 9- to 13-year-old children participated in a dot-probe task. We compared 39 children with few/no somatic complaints with 51 children experiencing frequent complaints in their reaction times on the dot-probe task and self-reported negative moods. Children with many somatic complaints reported more negative moods and showed longer reaction times on all trials compared with children with few complaints, not only on trials that included somatic information. The longer reaction times of children with frequent somatic complaints were explained by their levels of sadness. The current study could not support the assumed somatic attention bias in children with frequent somatic complaints, but did provide some interesting new support for the emotion perspective.
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The experience of somatic complaints such as headaches, dizziness, fatigue, and abdominal pain, is widespread in children (Perquin, Hazebroek-Kampschreur, Hunfeld, Bohnen, van Suijlekom-Smit, Passchier, et al., 2000; Petersen, Bergstrom, & Brulin, 2003; Roth-Isigkeit, Thyen, Raspe, Stoven, & Schmucker, 2004). Similar to common complaints in adults, these somatic complaints in children are often not fully explained by medical conditions (Croffie, Fitzgerald, & Chong, 2000; Goodman & McGrath, 1991). Psychological explanations have therefore been suggested. These explanations focus on cognitive-perceptual factors (symptom perception approach; Hermann, Zohsel, Hohmeister, & Flor, 2008) or on emotional factors and psychophysiological activation (emotion approach; Campo et al., 2004; Gadin & Hammerstrom, 2003; Mikkelsson, Sourander, Piha, & Salminen, 1997; Murberg & Bru, 2004; Muris & Meesters, 2004; Meerum Terwogt, Rieffe, Miers, Jellesma, & Tolland, 2006). In the current study, we focused on children's attention towards somatic information. Attention is a major theme in the symptom perception approach. We also took into account the possibility that our results could be explained by an alternative, emotion approach.

The experience of somatic complaints is usually associated with physiological changes caused by, for example, a disease, emotions, or external conditions. There is, however, not a one-to-one correspondence between what happens at a physiological level and the experience of somatic complaints (Pennebaker, 1982). The extent to which physiological changes are experienced as somatic complaints depends on external information input (e.g., people will be less likely to experience somatic complaints when there is a lot of distraction from the environment). Furthermore, according to the symptom perception approach, people are not passive information recipients. They also direct their attention (Kolk et al., 2003; Rietveld & Brosschot, 1999). Some people would (voluntarily or involuntarily) give more attention to somatic experiences, further referred to as a 'somatic attention bias'. It is assumed that because of the attention given to somatic sensations, people with a somatic attention bias are more frequently aware of physiological changes. This, in turn, increases the likelihood that they will experience somatic complaints. There is some support for the relationship between a somatic attention bias and more frequent experiences of somatic complaints in adults-although these

studies mainly rely on self-reports and the causal relationship is not clear (Barsky, 1992; Kolk et al., 2003; Pennebaker, 2000).

This cognitive-perceptual explanation has received little attention in the literature on childhood somatic complaints. There are two relevant studies that we wish to discuss in this respect. In a recent study by Hermann and colleagues (2008), children with recurrent abdominal pain (RAP) and a pain-free control group participated in a reaction-time experiment while they received painful (at pain threshold) or non-painful stimuli. Children's task performance (how well they performed; e.g., reaction times) and 'event-related potentials' were measured (i.e., electrical potentials recorded from the central nervous system following stimulation). The physical stimuli consisted of pressure to the hand delivered by a mechanical device. Contrary to expectations, the task performance of the children with RAP did not differ from that of the children in the control group; neither did two of the measured neurophysiological correlates of the response (the N1 and P2 event-related potentials). Compared with the controls, children with RAP only showed what is called an 'enhanced P3 component' in reaction to the painful and non-painful stimuli. This P3 component is assumed to reflect an automatic shift to somatic stimuli (Polich, 2003). Hermann et al. interpreted the difference in P3 accordingly as a general somatic attention bias, that is: children with somatic complaints would be more focused on all somatic stimuli, not just painful stimuli.

An earlier study provides an alternative explanation for the results of Hermann et al. In 2006, Boyer and colleagues also carried out an experiment in which children with RAP participated. In this study, children completed an attention bias task. Boyer et al. showed that children with RAP shifted their attention towards subliminally presented pain-related words. This would support the somatic attention bias. The same result, however, was found for social threat-related words. Possibly, the children with RAP pay more attention to all information that is negative for them, or even to all information that is personally relevant.
This last explanation would fit with findings in individuals who experience high levels of negative affect. Research from the emotion approach shows that negative affect is positively associated with somatic complaints (e.g., Campo et al., 2004; Ginsburg, Riddle, & Davies, 2006; Jellesma, 2008). Negative affect causes alterations in physiological activation (Greaves-Lord, Ferdinand, Sondeijker, Dietrich, Oldehinkel, Rosmalen, et al., 2007); i.e., fight or flight), and the prolongation of this activation can lead to a pathogenic state and somatic problems (Brosschot, Pieper, & Thayer, 2006; McEwen & Sapolsky, 1995). Several studies indicate that negative affect is associated with differences in amygdala activity. The amygdala is thought to play a key role in the processing of emotions. One recent study showed that the normal difference in amygdala activity in response to faces with fearful or neutral expressions was absent in adults with high levels of social inhibition and negative affect (De Gelder, Van de Riet, Grèzes, & Denollet, 2008). In addition, two other studies showed less differential activity in the amygdala in depressed adults compared with control subjects in response to fearful and neutral faces (Drevets, Gautier, Lowry, Bogers, Greer, & Kupfer, 2001) and similar findings were found in depressed children (Thomas et al., 2001). Perhaps, this indicates that people high on negative affect focus more on any stimulus that might be important or personally relevant. It is possible that, in comparison to their peers, children with frequent somatic complaints show different reactions on attention tasks that are explained by higher levels of negative affect. This would provide an alternative explanation to the assumed somatic attention bias and should be considered in studies attempting to measure such a bias.

In the current study, we tried to further investigate whether children with frequent somatic complaints have a somatic attention bias. More specifically, we aimed to find out whether the previously found results on experiments could be explained by (1) a somatic attention bias; (2) a bias for significant stimuli; or (3) by general distress as a result of negative affect in these children. For this purpose, we designed a dot-probe task and compared the performance of children with many or few somatic complaints. The dot-probe task is an often-used paradigm to measure selective attention (Koster, Crombez, Verschuere, & De Houwer, 2004). In this computer task participants are asked to indicate as fast as possible whether a dot appears on the left or right side of the screen. The dot is preceded by two stimuli of interest. The idea is that when children direct their attention on a certain stimulus or find it difficult to disengage from this particular stimulus, they will respond slower if the dot is placed in the position opposite to this stimulus (incongruent trial), and faster if it replaces the stimulus (congruent trial; Koster et al.). In the current study, we used pictorial stimuli preceding the dot. The stimulus of interest with respect to the somatic attention bias was a picture of what children believed to show their heart rate; the other stimulus of interest was (believed) level of classroom noise as an external stimulus. A (believed) random computer signal was used as a completely neutral stimulus. The use of heart rate and classroom noise enabled us to analyse whether differences in reaction times between the two groups could be attributed to a somatic attention

bias in children with many somatic complaints or to an overall heightened attention to meaningful stimuli in children with many somatic complaints. Typically what would be expected under the symptom perception approach is that children with many somatic complaints would respond faster on the trials that were congruent on heart rate. However, if the children were more attentive to all significant stimuli, shorter reaction times on both heart rate congruent and classroom noise congruent trials could be expected for the children with many somatic complaints. We anticipated that children with frequent somatic complaints could respond slower to all trials, which would make it difficult to verify whether it was the confrontation with meaningful stimuli that slowed them down or general distress from the experiment. We therefore also used trials that included both significant stimuli. If it was the meaningfulness of the stimuli that slowed them down, a more pronounced effect would be expected on these trials; otherwise, the reaction times of the children would be on the same level as compared with the congruent/incongruent trials that contained a neutral stimulus. We analysed whether any group differences could be explained by higher levels of negative affect in children with many somatic complaints compared with children with few somatic complaints.

Method

Participants

We selected children aged nine and older from three regular primary schools based on the frequency with which they experienced somatic complaints. With a participation rate of 57%, our initial sample consisted of 120 children. We selected children with many and few somatic complaints (40th and 60th percentiles), based on the Somatic Complaint List (see Materials), taking into account gender differences in the mean scores (M = 25 for girls and M = 19 for boys, $t(118) = -4.55$, $p < .01$). Children in the group with many somatic complaints were 18 boys (somatic complaint values between 19 and 29) and 33 girls (somatic complaints values between 26 and 43). Children in the few somatic complaints group were 19 boys (somatic complaint values between 11 and 18) and 20 girls (somatic complaints values between 13 and 22). The children were in the age range of 9 to 13 (mean age = 11, SD = 0.95). Written parental consent was obtained for all participating children.

Procedure

At the start of the study, parents received information letters and informed consent forms that the children took home from school. Parents were asked to return the informed consent form to their child's teacher. The questionnaires were filled out in small groups. The children were able to ask the experimenter questions at any time. The dot-probe task was presented to the children in an individual session with the experimenter. These individual sessions took place in a quiet room of the school. Debriefing took place after all participating children had finished the dot-probe task. All children confirmed that they had believed all information that was given by the experimenter during the experiment. The experimental design was submitted to the University's Ethics Commission before the start of the study.

Materials and Design

Somatic complaints

For the measurement of somatic complaints, the Somatic Complaint List was used (Jellesma, Rieffe, & Meerum Terwogt, 2007). This questionnaire contains 11 complaints. Children indicated how often they experienced the somatic complaints in the four weeks before assessment on a five-point scale from *(almost) never* (0) to *(almost) always* (4) (e.g. 'I have a headache'). The internal consistency of this questionnaire was good (α = .87).

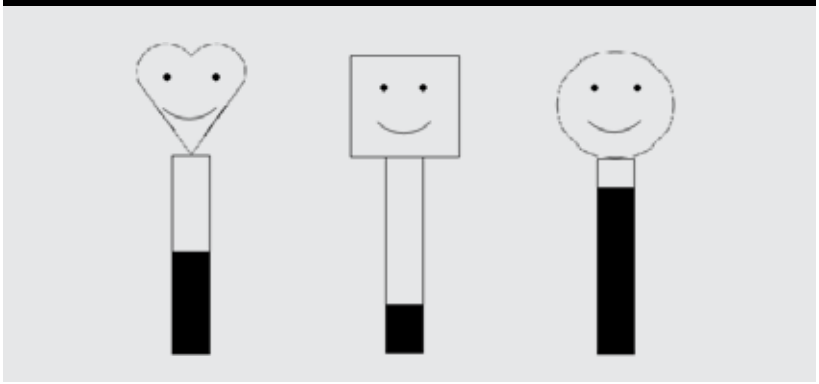
Negative moods

The Sadness and Fear/Anxiety subscales of the Mood Questionnaire were used to assess children's self-reported negative affect (MQ; Rieffe, Oosterveld, & Meerum Terwogt, 2006). The Mood scales each consist of four items. The items are on a Likert-type scale (0 = *never*, 1 = *sometimes*, 3 = *often*, e.g. 'I never/sometimes/often feel sad'). The internal consistency of the scales were sufficient (α = .84 for Sadness; α = .76 for Fear/Anxiety).

Dot-probe task

The dot-probe task was presented on a Tecra S3 Toshiba with a 15-inch monitor and was programmed in E-Prime, version 1.1. Each child was seated in a comfortable chair, approximately 70 cm from the monitor. Reaction times were recorded using a dual key button press device attached to the computer. The stimuli were pictures depicting what the children believed to be their heart rate, a neutral computer signal, or classroom noise. Figure 1 depicts examples of the pictures we used in the dot-probe task. We told the children that noise in the classroom was measured with a microphone we had put in the classroom earlier that day and that we registered their heart rate with a chip attached to the children's wrist. In order to make this story more credible, we let the children feel their own heart rate first and than attached a square band-aid from a hospital to their wrist. For the children's comfort, we told them that all ranges of heart rate were possible, and potential heart problems could not be revealed during the experiment. The neutral stimulus was said to be a random signal from the computer.

Figure 1 Examples of pictures used in the dot-probe task (from left to right): believed heart rate, computer activity (neutral), and believed classroom noise. The filling of the bars varied randomly



A trial started with a fixation cross in the middle of the screen, which was shown for 1000 milliseconds, in correspondence with previous studies using a dot-probe task in children (Joormann, Talbot, & Gotlib, 2007; Boyer et al., 2006). This was followed by two pictures on the left and right side of the screen for 1200 milliseconds (slightly shorter in comparison with a previous dot-probe study in which reading was required; Boyer et al.). The following conditions were included: *heart rate-classroom noise, classroom noise-heart rate, heart rate-neutral, neutral-heart rate, heart rate-heart rate, classroom noise-neutral, and neutral-classroom noise*. These seven conditions were randomly presented in 63 trials. After the two pictures had been shown on the screen, a black dot appeared in the centre of the place where one of the pictures had been (the left or right side of the screen). This dot remained on the screen until the child responded.

Before the start of the actual experiment, children participated in a 14 trial practice session. After the practice session, the experimenter asked the child to draw how the computer shows heart rate, randomised computer signals, and classroom noise. All children had remembered this correctly. The internal consistency of all conditions was good ($\alpha >$ .80).

Table 1 Means and standard deviations on sadness and fear/anxiety for children with few or many somatic complaints

Mood	Few somatic complaints M (SD)	Many somatic complaints M (SD)
Sadness	0.59 (0.41)	0.89 (0.48)
Fear/Anxiety	0.59 (0.38)	0.82 (0.47)

Data screening

Reaction times were measured in milliseconds. Individual outliers defined as values 3 standard deviations from the individual mean, reaction times shorter than 200 milliseconds or longer than 2000 milliseconds and errors (wrong button) were deleted (less than 3% of the data). This procedure was previously suggested by Koster et al. (2004).

Statistical analyses

Group differences in the dot-probe reaction times and in negative affect were analysed with repeated measures analyses of variance. For the dot-probe reaction times, we calculated standardised mean differences in addition to analysing potential interaction effects, by subtracting the group means and dividing by the pooled standard deviation. This was done to fully investigate the possibility that children with frequent somatic complaints would

Table 2 Reaction times in milliseconds for children with few (or no) and for children with many somatic complaints

Condition		Group	
In position of the dot	In position opposite to the dot	Few somatic complaints M (SD)	Many somatic complaints M (SD)
Heart rate	Neutral	414.93 (75.86)	452.43 (91.34)
(Heart rate congruent trial)			
Neutral	Heart rate	417.10 (70.68)	449.58 (82.75)
(Heart rate incongruent trial)			
Classroom noise	Neutral	414.88 (70.47)	447.56 (87.38)
(Classroom noise congruent trial)			
Neutral	Classroom noise	417.50 (86.36)	450.46 (81.95)
(classroom noise incongruent trial)			
Heart rate	Classroom noise	417.19 (81.08)	454.21 (92.02)
Classroom noise	Heart rate	413.64 (69.44)	448.23 (90.05)
Heart rate	Heart rate	417.33 (65.17)	454.21 (93.64)

show particularly longer reaction times on trials with two meaningful stimuli. We then calculated the correlations between negative affect and reaction times. Spearman correlations were used for this purpose, because we had a sample that consisted of children who were selected on a related variable and this implies violation of normality. In order to investigate whether negative affect could explain group differences in reaction times, a repeated measure analysis of covariance was carried out, with negative affect as a covariate. Controlling for gender effects did not reveal any differences between boys and girls, therefore these results will not be presented.

Results

Performance on the dot-probe task

The mean reaction times for children with many somatic complaints and children with few somatic complaints are presented in Table 1. We carried out a 2(Group) x 7(Condition) analysis of variance with repeated measures on condition. We only found one effect and this was on group, $F(1,88) = 4.19$, $p = .04$. As can be seen in Table 2, children with many somatic complaints consistently responded slower than children with few somatic complaints. There was no interaction effect, $F(6,528) = 0.20$, $p = .88$. We also found that the standardised mean difference for the trials that included a neutral stimulus and for the trials that included only relevant stimuli was comparable, $SMD = 0.43$ and $SMD = 0.45$ respectively. These results indicate that the meaningfulness of the stimuli in the trials did not cause a more pronounced difference in the reaction times of the children with frequent somatic complaints.

Negative affect

A 2(Group) x 2(Mood) analysis of variance with repeated measures on mood was carried out in order to analyse differences in negative affect between children with few and many somatic complaints. As expected, we found a main effect for Group, $F(1, 88) = 10.87$, $p < .01$. No other effects were found. Children with many somatic complaints reported more feelings of sadness and fear/anxiety than children with few somatic complaints. The means and standard deviations are shown in Table 1.
We then calculated the correlations between negative moods and children's mean reaction times. This analysis revealed that only sadness was associated with children's reaction times ($r = .27$, $p = .01$) and not fear ($r = .08$, $p = .43$).

Sadness as an explanation for the group differences

We then carried out the same 2(Group) x 7(Condition) repeated measures analysis of variance analysis we started with, but this time included sadness as a covariate in the model. The previously found group effect on the dot-probe reaction times was no longer significant, $F(1, 87) = 2.01$, $p = .16$. This result indicates that the longer reaction times of children with many somatic complaints could be explained by their higher levels of sadness compared with the children with few somatic complaints.

Discussion

The results of this study showed that children with frequent somatic complaints showed longer reaction times than children with few complaints on the dot-probe experiment in which they were confronted with believed heart rate and classroom noise. This result could be explained by the higher levels of negative affect in children with frequent somatic complaints: the group effect was no longer found when we controlled for sadness. The results showed that particularly sadness and not moods on the fear/anxiety dimension were associated with children's reaction times.

Our findings fail to support the somatic attention bias assumed under the symptom perception hypothesis. Furthermore, we could not find any indication of the idea that children with many somatic complaints were more focused on potentially significant information. However, the level of experienced sadness was related to children's reaction times and this gives room for explanations.
One explanation might be that children with high levels of sadness were more distracted overall by receiving information they found relevant. People who are sad (particularly people who are depressed) tend to associate negative information with negative memories and ruminate, even until after the stimulus presentation (Matt, Vazquez, & Campbell, 1992). The information the children received was ambiguous as the children had no information about what would be considered high or low and even then, both types of information can give rise to negative interpretation (e.g., low levels of classroom noise can evoke feelings of discomfort because the child thinks that he/she misses an important task whereas high levels of classroom noise could mean that the child misses a fun task). This ambiguity of information is a limitation of our study. Previous research has shown that children with high levels of sadness tend to make pessimistic attributions in ambiguous situations. As a result of distraction and rumination, sadness interferes with task performance, such as reaction times (Siegle, Steinhauer, Thase, Stenger, & Carter, 2002; Wang, Labar, & McCarthy, 2006).
Two other explanations are that children with high levels of sadness have lower reaction times either because they have less energy than their peers or

because they have lower expectancies about their performance. There is a clear link in the literature between depression and fatigue and between depression and low self-worth (Lagges, & Dunn, 2003).

The children in this study were not a clinical sample, but nevertheless we could find reaction time differences. If this can be explained by one of the three above-mentioned adverse cognitive consequences of sadness, this could imply, for example, that children with frequent somatic complaints may perform at non-optimal levels in school. Somatic complaints have indeed been linked to poorer school performance (Campo, Jansen-Mcwilliams, Comer, & Kelleher, 1999). Future studies could investigate the role of sadness and rumination in this association.

A limitation of this study was that there was no information available about children's medical records. Somatic complaints in childhood are often not fully explained by medical conditions (Croffie et al., 2000; Goodman & McGrath, 1991), whereas they are strongly associated with children's emotional functioning (Jellesma et al., 2006). There nevertheless might have been children in the group with many somatic complaints whose complaints were primarily caused by medical problems. For these children, psychological processes may be less relevant. This might have resulted in an underestimation of the effects that were found.

A suggestion for future research we wish to make is the inclusion of information about children's brain activation. Future studies that include for example event-related potentials or amygdala activity might provide further insight into the underlying mechanism that explains the longer reaction times of children with many somatic complaints and the role of negative affect.

In short, in this study we could not support the hypothesis that a somatic attention bias is an explanation for somatic complaints in childhood. The study has, however, provided several new questions to be tested in future research: potential task interference caused by sadness in children with somatic complaints, interpretation biases in confrontation with ambiguous information, and differences in brain activation that may help understand why children with frequent somatic complaints seem to respond slower on reaction time experiments. If we could learn more about this, we might be able to incorporate this knowledge in treatments for these children, to prevent further life-interference related to their complaints.

References

Barsky, A. J. (1992). Amplification, somatization, and the somatoform disorders. *Psychosomatics*, *33*, 28-34.

Boyer, M. C., Compas, B. E., Stanger, C., Colletti, R. B., Konik, B. S., Morrow, S. B., & Thomsen A. H. (2006). Attentional biases to pain and social threat in children with recurrent abdominal pain. *Journal of Pediatric Psychology*, *31*, 209-220.

Brosschot, J. F., Pieper, S., & Thayer, J. F. (2005). Expanding stress theory: Prolonged activation and perseverative cognition. *Psychoneuroendocrinology*, *30*, 1043-1049.

Campo, J. V., Bridge, J., Ehmann, M., Altman, S., Lucas, A., Birmaher, B., Di Lorenzo, C., Iyengar, S., & Brent, D. A. (2004). Recurrent abdominal pain, anxiety, and depression in primary care. *Pediatrics*, *113*, 817-824.

Campo, J. V., Jansen-Mcwilliams, L., Comer, D. M., & Kelleher, K. J. (1999). Somatization in pediatric primary care: Association with psychopathology, functional impairment, and use of services. *Journal of the American Academy of Child and Adolescent Psychiatry*, *38*, 1093-1101.

Croffie, J. M., Fitzgerald, J. F., & Chong, S. K. F. (2000). Recurrent abdominal pain in children – A retrospective study of outcome in a group referred to a pediatric gastroenterology practice. *Clinical Pediatrics*, *39*, 267-274.

De Gelder, B., Van de Riet, W. A., Grèzes, J., & Denollet, J. (2008). Decreased differential activity in the amygdala in response to fearful expressions in Type D personality. (2008). *Clinical Neurophysiology*, *38*, 163-169.

Drevets, W. C., Gautier, C., Lowry, T., Bogers, W., Greer, P., & Kupfer, D. J. (2001). Abnormal hemodynamic responses to facially expressed emotion in major depression (Abstract). Society for Neuroscience, *27*, 785.

Gadin, K. G., & Hammarstrom, A. (2003). Do changes in the psychosocial school environment influence pupils' health development? Results from a three-year follow-up study. *Scandinavian Journal of Public Health*, *31*, 169-177.

Ginsburg, G. S., Riddle, M., & Davies, M. (2006). Somatic symptoms in children and adolescents with anxiety disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*, *45*, 1179-1187.

Goodman, J. E., & McGrath, P. J. (1991). The epidemiology of pain in children and adolescents – A review. *Pain*, *46*, 247-264.

Greaves-Lord, K., Ferdinand, R. F., Sondeijker, F. E. P. L., Dietrich, A., Oldehinkel, A. J., Rosmalen, J. G. M., Ormel, J., & Verhulst, F. C. (2007). Testing the tripartite model in young adolescents: Is hyperarousal specific for anxiety and not depression? *Journal of Affective Disorders*, *102*, 55-63.

Hermann, C., Zohsel, K., Hohmeister, J., & Flor, H. (2008). Dimensions of pain-related parent behavior: Development and psychometric evaluation of a new measure for children and their parents. *Pain*, *137*, 689-699.

Jellesma, F. C. (2008). Health in young people: Social inhibition and negative affect and their relationship with self-reported somatic complaints. *Journal of Developmental and Behavioral Pediatrics*, *29*, 94-100.

Jellesma, F. C., Rieffe, C., & Meerum Terwogt, M. (2007). The Somatic Complaint List: Validation of a self-report questionnaire assessing somatic complaints in children. *Journal of Psychosomatic Research*, *63*, 399-401.

Jellesma, F. C., Rieffe, C., Meerum Terwogt, M., & Kneepkens, C. M. F. (2006). Somatic complaints and health care use in children: Mood, emotion awareness and sense of coherence. Social Science and Medicine, 63, 2640-2648.

Joormann, J., Talbot, L., & Gotlib, I. H. (2007). Biased processing of emotional information in girls at risk for depression. *Journal of Abnormal Psychology*, *116*, 135-143.

Kolk, A. M., Hanewald, G. J. F. P., Schagen, S., & Gijsbers van Wijk, C. M. T. (2003). A symptom perception approach to common physical symptoms. *Social Science & Medicine*, *57*, 2343-2354.

Koster, E. H. W., Crombez, G., Verschuere, B., & De Houwer, J. (2004). Selective attention to threat in the dot probe paradigm: Differentiating vigilance and difficulty to disengage. *Behavior Research and Therapy*, *42*, 1183-1192.

Lagges, A. M., & Dunn, D.W. (2003). Depression in children and adolescents. *Neurologic Clinics*, *21*, 953-960.

Matt, G., Vazquez, C., & Campbell, W. (1992): Mood-congruent recall of affectively toned stimuli: A meta-analytic review. *Clinical Psychology Review*, *12*, 227-255.

McEwen, B. S. & Sapolsky, R. M. (1995). Stress and cognitive function, *Current Opinion in Neurobiology*, *5*, 205-216.

Meerum Terwogt, M., Rieffe, C., Miers, A. C., Jellesma, F. C., & Tolland, A. (2006). Emotions and self esteem as indicators of somatic complaints in children. *Infant and Child Development*, *15*, 581-592.

Mikkelsson, M., Sourander, A., Piha, J., & Salminen, J. J. (1997). Psychiatric symptoms in preadolescents with musculoskeletal pain and fibromyalgia. *Pediatrics*, *100*, 220.

Murberg, T. A., & Bru, E. (2004). School-related stress and psychosomatic symptoms among Norwegian adolescents. *School Psychology International*, *25*, 317-332.

Muris, P. & Meesters, C. (2004). Children's somatization symptoms: Correlations with trait anxiety, anxiety sensitivity, and learning experiences. *Psychological Reports*, *94*, 1269-1275.

Pennebaker, J. W. (2000). Psychological factors influencing the reporting of physical symptoms. In A. A. Stone, J. S. Turkkan, C. A. Bachrach, J. B. Jobe, H. S. Kurtzman, & V. S. Cain (Eds.), *The science of self-report: Implications for research and practice* (pp. 299-315). New Jersey: Lawrence Erlbaum Associates.

Pennebaker, J.W. (1982). *The psychology of physical symptoms*. New York: Springer.

Perquin, C. W., Hazebroek-Kampschreur, A. A. J. M., Hunfeld, J. A. M., Bohnen, A. M., van Suijlekom-Smit, L. W. A., Passchier, J., & van der Wouden, J. C. (2000). Pain in children and adolescents: A common experience. *Pain*, *87*, 51-58.

Petersen, S., Bergstrom, E., & Brulin, C. (2003). High prevalence of tiredness and pain in young schoolchildren. *Scandinavian Journal of Public Health*, *31*, 367-374.

Polich, J. (2003). Theoretical overview of P3a and P3b. In J. Polich (Ed.), *Detection of change: Event-related potential and fMRI findings* (pp. 83-98). Boston: Kluwer Academic Press.

Rieffe, C., Oosterveld, P., & Meerum Terwogt, M. (2006). An alexithymia questionnaire for children: Factorial and concurrent validation results. *Personality and Individual Differences*, *40*, 123-133.

Rietveld, S. & Brosschot, J. F. (1999). Current perspectives on symptom perception in asthma: A biomedical and psychological review. *International Journal of Behavioral Medicine*, *6*, 120-134.

Roth-Isigkeit, A., Thyen, U., Raspe, H. H., Stoven, H., & Schmucker, P. (2004). Reports of pain among German children and adolescents: An epidemiological study. *Acta Paediatrica*, *93*, 258-263.

Siegle, G. J. Steinhauer, S. R. Thase, M. E. Stenger V. A., & Carter C. S. (2002). Can't shake that feeling: Event-related fMRI assessment of sustained amygdala activity in response to emotional information in depressed individuals. *Biological Psychiatry*, *51*, 693-707.

Thomas, K. M., Drevets, W. C., Dahl, R. E., Ryan, N. D., Birmaher, B., Eccard, C. H., Axelson, D., Whalen, P. J., & Casey, B. J. (2001). Amygdala response to fearful faces in anxious and depressed children. *Archives of General Psychiatry*, *58*, 1057-1063.

Wang, L. H., Labar, K. S., & McCarthy, G. (2006). Mood alters amygdala activation to sad distractors during an attentional task. *Biological Psychiatry*, *60*, 1139-1146.

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Understanding and promoting desistance from crime: A decision-theoretical approach

In this article desistance from crime is approached from a decision-theoretical view. The movement away from crime is conceptualised as a pathway with subsequent stages. To be successful in moving along these stages offenders need explicit strategies for action, i.e. strategies for behaviour the individual is aware of. These involve decisional choices aimed at redefining situations and at attempts to overcome or over-ride automatic implicit mental processes with harmful or antisocial consequences. Desistance is situated in the interplay between these implicit and explicit strategies for action. It is suggested that desistance involves the use of a proactive capability of setting higher level approach goals including moral beliefs of the offender about the social acceptability of his offending behaviour. Goal-seeking behaviour and moral beliefs of the offender about his criminal activity are included as intervening variables in an integrated and theory-based research model predicting desistance. After empirical validation of this framework, goal-seeking (or goal-setting) behaviour and moral beliefs of the offender appear as significant predictors for desistance as measured by subjective accounts of offenders, self-report and official data. Implications for intervention practice are discussed.
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Desistance, or the voluntary termination or reduction of offending over the life course, has become a key facet of the emerging subfield of life-course criminology. In addition, several researchers have explored the potential application of natural desistance to rehabilitation programs (Maruna, 2001; Farrall, 2002; McNeill & Whyte, 2007). Still, attempts at integrating intervention programs with natural processes of withdrawal from criminal careers remain scarce (Rumgay, 2004). Understanding the factors and the conditions that are associated with the process of desistance may be very useful for focusing the activities of interventions more effectively towards activating, accelerating and consolidating the process of desistance (Piquero, 2004).

To support the desistance process of individual offenders, especially of those involved with the criminal justice system, two things need to be sorted out. First, a meaningful definition of desistance with useful measures is needed. Second, a theory-based integrated framework is needed that specifies factors supportive for desistance and explains *why, how and for whom* these factors are supportive.

As to the *first* task of defining desistance an important assumption is that offenders involved in the criminal justice system have incident events that may be part of a long-term development of reduced involvement in crime. Reduced involvement is manifested either in longer periods of abstinence from criminal activity (changes in intermittency) and/or by a (gradual) reduction in the frequency and seriousness of criminal activity. These patterns of decreased involvement in crime could be interpreted as indicators of the emergence of a natural desistance process especially when they involve a movement towards the role or identity of a changed person (Shover, 1985; Maruna, 2001; Giordano, Cernkovich, & Rudolph, 2002).

Of special interest is desistance defined as a movement away from crime including a cognitive

transformation and the gradual assumption of the role of a changed person. In this study the movement away from crime is operationalised as reductions in the offence rate measured by subjective accounts, self-report or official measures of desistance (Massoglia & Uggen, 2007). The usefulness of these measures will be explored in the light of their relationship with (causal) factors that prior research has linked to desistance involving a development of personal reform.

As to the *second* task of specifying factors supportive for desistance and explaining *why, how and for whom* these factors are supportive, this article introduces a decision-theoretical approach of desistance with a special focus on the role of goal-seeking behaviour and moral beliefs of the offender about the social acceptability of his offending. behaviour. Alongside other concepts related to desistance, goal-seeking behaviour and moral beliefs about offending will be integrated in a research model. In this article the question for whom certain factors are supportive is also answered.

From a theoretical point of view desistance may be conceptualised as a decisional process with various (cognitive) stages. The first stage involves a change in the affective component of criminal activity. The second stage implies the move from motivational ambivalence to intentions to desist. The next stage is to transform intentions into action towards and maintenance of newly acquired behaviours.
To be successful in moving along these stages it is suggested that offenders need explicit behavioural strategies of the conscious system. These strategies for action are aimed at redefining situations and at attempts to overcome or over-ride automatic implicit mental processes with harmful or antisocial consequences. Human behaviour is initiated and regulated by these implicit and explicit strategies for action. A strategy is a determination of and *choice* between alternative actions that an individual usually takes in certain situations. An implicit (or automatic, visceral, first-order) strategy is a strategy one is not aware of; an explicit strategy is a strategy that one is aware of (Greenwald & Banaji, 1995).
In this paper desistance is approached as an *explicit* strategy for behaviour with: (a) enhanced consciousness of the individual of a conflict between criminogenic implicit, automatic behavioural processes and more important personally endorsed higher level goals, (b) a decision to act in accordance with these higher level goals and (c) proactive capabilities including decisions to exert *willpower* in order to subordinate viscerally motivated behavioural responses to higher level goals, especially during stages of action and maintenance of altered behaviours. In the next section this decision – theoretical approach of desistance – will be described.

Literature review

Desistance and changes in the affective component of criminal involvement

Previous research literature indicates that desistance processes start with the experience of criminal activity as less attractive or aversive (Rumgay, 2004). This change in the affective component of criminal involvement may be caused by various experiences of the individual.

Crime may become less attractive by the experience of finding new interests or pro-social attainments (a partner, a child, a good job, a new vocation) that are important to the individual, i.e. become a *valued* reality. In this situation there is something to lose and to be guarded. Valued, new attainments may over-ride any interest in or need for crime.

Events and/or experiences within the legal system (repeated imprisonment) or the criminal world (the stress of the criminal lifestyle) may also play an important role. The accumulation of the legal, social, personal and moral costs of continued offending and incarceration can *deter* offenders and trigger a *change in criminal calculus*, i.e. a changed appraisal of the relative costs and benefits of criminal activity including repeated incarceration (Piquero, 2004).

Crime may also become less attractive by the maturing into adulthood and an increased cognitive capacity to assess the long-term negative consequences of continued offending or incarceration. In addition, psychosocially more mature offenders may experience a growing need to make sense of their lives as they may notice time and opportunities running out for them. These developmental changes can trigger a more negative stance toward criminal involvement and an increased attractiveness of a conventional lifestyle (Shover, 1985).

The role of motivational ambivalence

Increased attractiveness of a conventional lifestyle may result in contemplating desistance and the possibility of personal reform. Nevertheless, offenders may remain uncertain about the possibility of reoffending (Burnett, 2004). The path to desistance is therefore one of motivational *ambivalence* and conflict. Motivational ambivalence or the contemplation stage of motivational development (Prochaska & Di Clemente, 1984) is an abiding or recurring experience during the criminal career of most offenders. It involves a state of motivational conflict and it resembles the push and pull mechanisms of addictive habits. It arises from simultaneous desires to act in two opposing ways. Ambivalence is reflected in movements from crime to non-crime and back again. The zigzag path

towards desistance (Piquero, 2004) with its reversals of decision and indecision, compromise and lapses (Burnett, 2004) is one result of this ambivalence.

Ambivalence is generally triggered by the experience of criminal activity as less attractive or aversive. Ambivalence and uncertainty about the possibility of reoffending may develop into rationalisations or cognitive scripts (with standing decisions and rules of thumb) supportive of either persistence or desistance. These cognitive scripts may enhance or minimise the need for careful forethought and evaluative self-reflection (Burnett, 2004).

Burnett's study shows that there may be a large discrepancy between the wish to exit from crime and the transformation of this intention into tangible changes over a sustained period of time. In order to reach lasting change the individual must be able to *capitalise* on the experience of criminal activity as less attractive or aversive. Desistance may be seen as a process of capitalising *on an attitudinal shift* which involves *decisional choices* and the activation of the ability to carry through with these choices.

Moving beyond ambivalence

For desistance to occur it is important that offenders move beyond the contemplative stage of ambivalence. This means that the contemplation of desistance evolves from a mere wish or desire to stop offending into a *will* to stop offending. This step implies an *increased cognitive orientation* towards desistance, expressed as an explicit decisional choice or *intention* to stop offending. This intention to stop offending may be grounded in fear for the risks and negative consequences of reoffending. Although this fear may be a powerful catalyst for intentions to develop, avoidant motives and *avoidance goals* involving a *passive responsibility* are probably not powerful enough to hold on and to resist criminal temptations. Facing powerful temptations is difficult when intentions are merely grounded in deterrence and especially when the individual is confronted with situations of low risk of penal consequences (Ward & Maruna, 2007; Sullivan & Rothman, 2008). It is therefore suggested that for lasting change and maintenance of altered behaviours. intentions need to be supported by *approach* motives or higher level goals.

Research literature suggests that intentions to personal reform involve: (a) rational and conscious considerations grounded in (*self*)-*reflective* capacities of the individual. Self-reflection includes attributions and judgments, for instance of moral responsibility. Intentions may also involve judgments of a conflict between higher level goals and viscerally motivated behaviours or implicit behavioural strategies that are supportive of continued offending, (b) sufficient self-belief (personal control or self-efficacy) that one is able to resist future temptations to breaking the law as well as some confidence about supportive circumstances (institutional, familial and peer structures) offering opportunities to personal reform (Bandura, 1986; Burnett, 2004, Baer, Manning, & Izard, 2003).

Desistance and the role of higher level goals

According to Ward and Maruna (2007) 'goals are desired states or situations that individuals strive to achieve or to avoid, and as such are important components of personality'(p.146). Support for the relevance of goal- or goods-seeking behaviour comes from the self-regulation literature (Austin & Vancouver, 1996). They have their origin in basic human needs for autonomy, competence and relatedness (Deci & Ryan, 2000).
Previous research shows a relationship between the process of (successful) natural desistance and the discovery by the individual of important higher level goals (Maruna, 2001; Giordano et al., 2002). These goals are grounded in (moral) values. Of particular importance here are approach goals (strengths or personally endorsed adaptive goals). To transform his life the individual particularly needs these approach goals or good reasons for change. Approach goals offer a sense of purpose to life and they are grounded in opportunities for promoting primary human goods, e.g. relatedness, agency, mastery, inner peace (emotional regulation), creativity, excellence, life-health (Ward & Maruna, 2007).

The relationship of desistance intentions with good reasons or higher level life goals for change may be seen as the blue-print for laying claim to an adaptive, conventional personal identity or 'another non-criminal and normal Self'. This other, normal Self is probably the most powerful cognitive incentive for offenders to embark on a process of personal reform and to resist the many temptations activated by processes of implicit behaviour regulation. As Meisenhelder (1982, p.140) concludes: 'The plan to exit from crime is in large part founded on the sense of self as noncriminal.'

Good reasons or approach motives to desist merge with components or beliefs of the offender about the *moral* and social acceptability of criminal activity. Offenders who decide to desist and to act prosocially also tend to be motivated to achieve social acceptance (relatedness), respect from others and a sense of integrity. They are also driven by moral values and they decide to act (or not to act) in accordance with one's sociomoral reasoning. Without a certain sociomoral maturation and a

belief in the legitimacy of sanctioning and the wrongfulness of their criminal acts, it is unlikely that offenders will be able to achieve desistance and personal reform for a sustained period of time. Positive attitudes toward crime and an oppositional stance toward the sanctioning system will probably provide them with reasons that can deflect any active personal responsibility and undermine attempts at self-regulation when coping with adversity, social pressures and temptations. I suggest that desistance, defined as the (gradual) movement out of crime is also an exercise in moral, responsible behaviour and, somewhere in the interplay between implicit and explicit strategies of behaviour, it involves the triggering of *conscience* with morally reflected appraisals and self-judgments of the individual.

Bringing intentions into practice: the role of proactive capabilities and willpower

It is one thing to develop desistance intentions and to decide that one is going to exit from a criminal lifestyle, it is quite another thing to bring this intention into practice and to hold on. This means that the individual's resolution must be actually carried through by the decision to act in accordance with intentions supported by important higher level approach goals.

Orientation on and acting in accordance with approach goals implies the use of *proactive, goal-setting capabilities* and taking active responsibility. Proactivity is grounded in the need for *self-determination* and to make things happen. It is an executive capability driven by reflected autonomous and value-based choices oriented at securing primary goods. Proactive goal-setting capacities include *decisions to exert or allocate willpower* and to stick to important goals during the process of desistance. Allocation (or possession) of requisite levels of willpower is needed to carry through with intentions and plans. In general it is seen as rather senseless to 'decide' to quit harmful activities without a certain willingness to exert a required amount of willpower.

According to Loewenstein (2000, p. 61) willpower is 'a resource that can be used to decrease or eliminate discrepancies between viscerally motivated and deliberatively desired behaviours.' Willpower represents attempts to suppress viscerally motivated behaviours or implicit behavioural strategies that conflict with higher goals. Willpower is at the same time a constrained resource demanding an efficient use. It must be allocated selectively between alternative uses (Loewenstein, 2000). Therefore, exerting willpower is preceded by a decision of allocation.

The exercise of willpower is always immediately aversive, it means performing a course of action that has direct adverse hedonic consequences and a sacrifice of immediate utility (happiness, pleasure, comfort). The individual chooses for this action because he consciously decides that the viscerally motivated behaviour conflicts with more important goals (Loewenstein, 2000).

From this point of view, willpower is seen as an explicit behavioural strategy to suppress implicit, hedonic, behavioural responses or strategies (Greenwald & Banaji,1995). The allocation of willpower and the sacrifice of the immediate utility of criminal options become particularly important when faced with adversity during the stage of maintenance of altered prosocial behaviours.

Facing adversity and the role of willpower

The concept of willpower may be particularly relevant for the stage of maintenance of changed behaviours during the desistance process. Maintenance involves the ability of offenders to stick to newly adopted prosocial cognitive scripts and behavioural routines.

For many desisting offenders who embark on a trajectory of prosocial action, coping with conditions or *environments* of *adversity* may be a potential threat to the development and maintenance of altered behaviours. Adversity in the life of desisting offenders refers to problems as not (immediately) getting the promised accommodation or job (sometimes because of the status of ex-offender), interpersonal conflicts, divorce, social exclusion, mental problems, financial problems and stigmatisation (Nelissen, 2003; Byrne & Trew, 2008). When these life problems block positively valued goals, offenders may experience negative and antagonistic emotions that (re)activate the push and pull mechanisms associated with ambivalence and opposing cognitive scripts either pro or contra continued offending.

The level of *resistance* offered by offenders to this push and pull mechanism depends on the strength of their belief of crime as an inappropriate or morally unacceptable way of coping with situations of adversity in their life (Maruna, 2001). The less one believes that crime is a (morally) acceptable way of coping with life problems and the more one believes that continued offending *conflicts* with important and personally endorsed prosocial goals, the more offenders will be resistant and be able to allocate required levels of willpower when faced with (un) anticipated adversities.

Experiencing stress related to adversity during the stage of maintenance may be followed by two types of reactions, either by the *disarming of willpower* or by *reorientation*. The disarming of willpower

involves abandoning one's approach goals, giving up internalised control and indulging to temptations ('a what the heck effect', Loewenstein, 2000). Reorientation (Breese, Ra'el, & Grant, 2000) involves an explicit and conscious decision to reallocate and intensify willpower in order to resist implicit automatic responses and the temptation of continued offending. In addition, successful desisters may use more resilient and effective coping or problem-solving strategies (seeking social support or help) that not only reduce or eliminate the intensity of the viscerally motivated behaviours but that also reduce the need for willpower (see for the role of resiliency: Rumgay, 2004).

Empirical support for the role of willpower in maintaining altered behaviours and resisting temptations may for instance be found in the subjective accounts of desisting offenders (Nelissen, 2003). When asked retrospectively to characterise the road to their success many successful desisters experienced the process of desistance as a *struggle* or: *'a bitter pill to swallow', 'pumping or drowning', 'to work or doing time', 'a struggle to get my life rearranged'*. Some desisting offenders not only struggled with mastering the behavioural routines of conventionality, they particularly struggled with the visceral thrills and hedonic aspects associated with a criminal lifestyle. For them the *unlearning* of a criminal habit and the *sacrifice* of its immediate utility (happiness, pleasure, comfort) was the main barrier to overcome (Nelissen, 2010).

Higher level approach goals and the proactive goal-setting capacity of the individual seem to be situated at the heart of desistance from crime and its explicit and conscious strategies for action. These decision-theoretical concepts may be integrated in a research model alongside with other concepts derived from Informal Social Control Theory, General Theory of Crime, General Strain Theory and deterrence. In the next section this framework will be described and empirically validated.

Methods

Research strategy

Independent, intervening and control variables correlated with the dependent variables are used for logistic and linear regression analysis. To answer the question for *whom* certain factors are supportive for desistance, ANOVA analysis is used to compare the mean scores of different age groups of the sample.

Data

The data for this study were taken from an evaluation study of six safety houses in the Dutch province of Limburg (Nelissen, 2010). Safety houses in the Netherlands are local organisations working together to reduce crime. Within the safety houses criminal justice organisations, municipalities, social service departments and organisations for mental health care participate in a network system aimed at achieving better coordinated (better integrated and more complete) penal and rehabilitative interventions.

A sample of 90 mainly repeat offenders was followed during a period of four years, i.e. from 2007 until 2011. Data were gathered among offenders and process and case managers participating in the safety houses using a semi-structured instrument (the Addiction Severity Index, Hendriks, Van der Meer, & Blanken, 1991), in-depth interviews, questionnaires and document analysis.

Participants

Respondents were between 16 and 53 years of age ($M = 29$) and 93% are male. A large majority (80%) of them are unmarried and 67% have no partner. About one third of respondents are parents of one or more children.

About six out of ten respondents had parents who were divorced. At the time of the first interview 37% of the respondents were detained. Those who were not detained included offenders awaiting trial or were convicted (ex) offenders adopted by the safety houses for reasons of high risk and prevention. Officially reported data show a mean number of seven convictions up to 2007 and a mean career duration of more than nine years. Prior to the first interview 47% of respondents lived with their parents, partner and/or children, or other family members. More than half of the interviewed persons lived alone or at varying, unstable addresses. During the month preceding the interview or the current detention only 29% were employed on a steady or regular basis. In the field of accommodation, income, social relations, drug dependency, psychoemotional wellbeing and cognitive-behavioural skills, a majority suffer from moderate to serious problems. For 47% of the respondents chronic financial problems are mentioned as the most import reason for their criminal activity. Overall, 60% mention this as of importance to a varying degree.

Measures

Independent variables refer to the accumulated human and social capital and experiences with the criminal justice system. They include the following measures.

Self-control, a concept derived from the General Theory of Crime (Gottfredson & Hirschi, 1990), is measured by *impulsivity* (four items, Cronbach's α .68) and *risk-seeking* (four items, Cronbach's α .83) (Arneklev, Grasmick, & Bursik, 2000).

(Self)-reflective capacity (Cronbach's α .66) is constructed by three items reflecting the level of understanding of the individual of his/her own role in conflicts, reactions of other people towards the individual and a poor sense of control of their own life.

Passive coping behaviour (Schreurs & Van de Willige, 1988) is measured by seven items (Cronbach's α .83) representing reactive patterns of depression, drug use, flight, isolation, puzzling and powerlessness when faced with problems.

Motivation for change is based on a clinical assessment using five response alternatives ranging from none/poor to good or very good.

Variables referring to informal social control theory (Sampson & Laub, 1993) involve the *bonds with family or other persons important to the offender* and *bonds related to work or school*. Bonds with family or other persons are measured by two separate variables, i.e. the offenders level of satisfaction with his/her present *social* life circumstances and the number of persons in the social network giving support to the offender when faced with problems or setbacks. Bonds related to work or school are assessed by the number of days working or going to school during the month preceding the interview or incarceration.

The *psychoemotional wellbeing* of the offender reflects the strain theoretical perspective of negative emotions that mediate the relationship between strain and deviant behaviour (Agnew, 1992). The variable psychoemotional wellbeing uses five response alternatives to measure the *need for professional help* offenders express regarding their reported complaints that include feelings of fear, anger, depression and suicidal thoughts.

Experiences with the criminal justice system is used as a variable to measure the deterrent effect of the accumulated experiences with the criminal justice system. The greater the volume of previous convictions or incarcerations the more likely a development of desistance. This variable is assessed by the officially reported number of previous convictions and the self-reported number of preceding detentions.

The dependent variable of desistance is measured by subjective account, self-report and official data. The *subjective account of desistance* reflects the offender's assessment of the development of his criminal activity during the past years and uses scores ranging from decreasing (score 0) to no change or increasing (score 1).

The *self-report measure of desistance* regards the offender's information about his offence frequency during the preceding six months which covers the committing of zero offences, one or some offences or a pattern of weekly or daily offending and uses scores ranging from zero to three. A lower score on this continuous variable is interpreted as an indication of a pattern of desistance.

The *official measure of desistance* covers a trend of decrease, no change or increase during a three-year adoption period of the safety houses relative to a three-year period prior to adoption and uses scores ranging from zero (decreased) to one (no change or increased).
Lower scores on these variables are used as indications of a development of desistance. For all three dependent variables it is hypothesised that they are related to theoretically relevant desistance markers in the accumulated human and social capital. Moreover it is hypothesised that the perception of a long-term development of a declining (or unchanged/increasing) pattern of offending is reflected in and correlates with the other two self-report and official measures.

Goal-setting behaviour (Cronbach's α .69) as an ***intervening decision variable*** is measured by five items involving the ability to set goals, reflecting about future personal development, the setting of unattainable goals, not knowing what one really wants with one's life and giving up easily when confronted with difficulties or adversity. Goal-setting behaviour is rather neutrally formulated as a largely stable, but not fixed capacity across the life course that reflects *proactive capabilities*.

Beliefs of the offender about the moral acceptability of his offense behaviour, also an *intervening variable*, is measured by one item (how do you consider your own criminal activity?) and uses four response alternatives ranging from (strongly) disapproves, neutral to approves. This variable reflects the offender's orientation towards crime. It is a variable with a moral connotation and an indirect link with moral reasoning and higher level, ethical goals. In addition it is hypothesised that better goal-setting abilities are positively correlated with stronger self-efficacy beliefs related to desistance (measured by one item using five response alternatives ranging from not confident at all to very confident) and disapproval of offenders of their own offending behaviour.

Control variables are *age*; *accommodation problems* measured by the offender's perception of the frequency and level of suffering from problems with accommodation (two items, Cronbach's α.91); *income*

problems (three items, Cronbach's α .77) measured by the offender's perceptions of the instability of the financial household and the frequency and level of suffering from these problems; *addictive behaviours (drugs and alcohol)* measured by items regarding the perceived frequency and level of suffering and the perceived need for professional help.

Results

When the relationships between the independent variables and the subjective account of desistance were examined without the intervening variable of goal-setting behaviour, *risk-seeking behaviour* and *prior convictions* remained as significant predictors for the subjective account of desistance. When goal setting is added to the equation, risk seeking is no longer a significant predictor indicating that risk-seeking behaviour is fully mediated by goal-setting behaviour. In Table 1 the final results of regression analysis are presented. The subjective account of desistance is significantly predicted by goal-setting behaviour and the deterrent role of prior convictions. With one point increase of problems with goal-setting or proactive abilities, the odds of a perceived development of unchanged or growing criminal involvement increases by 53%. The findings also indicate that the odds that a person perceives a development of unchanged or growing criminal involvement decreases by 25% when the number of prior convictions increases by one conviction. The model is significant.

Linear regression analysis of the self-report measure of desistance results in four significant predictors, *satisfaction with the social situation*, *moral beliefs about offending*, *risk-seeking behaviour* and *problems with drugs*. The more offenders are dissatisfied with their social situation, are seeking risks, are approving of their own criminal activity and experience more severe problems with drugs, the less they show indications of desistance, i.e. the more frequently they were engaged in criminal activity during a six-month period prior to the first interview or incarceration. The regression model is significant and it explains 47% of the variation in the dependent variable.

Logistic regression analysis for desistance measured by official data results in three significant predictors. Two of them are the control variables problems with drugs and income. The third significant predictor is goal-setting behaviour. With one point increase of problems with goal-setting abilities the odds of a development of no change or growing criminal involvement during the adoption period of the safety houses increases by 65%.

As hypothesised, the self-report and official measures of desistance are significantly correlated

Table 1 Results of regression analysis on three desistance measures

Dependent variable	Subjective account				Self-report			Official report			
	B	SE	Wald	EXP (B)	B	SE	Beta	B	SE	Wald	Exp (B)
Age	-.0.4	.05	.76	.95	NS	NS	NS	-.02	.06	.22	.97
Officially reported convictions	-.28	.12	5.52	.75*	NS	NS	NS	-.13	.10	1.70	.87
Incarcerations (self- report)	.08	.11	.51	1.08	NS	NS	NS	.11	.13	.65	1.11
Number of days working	.49	.25	3.77	1.63	NS	NS	NS	-	-	-	-
Accommodation problems	.10	.20	.26	1.11	NS	NS	NS	-.07	.16	.22	.92
Problems with income	.04	.15	.06	1.04	NS	NS	NS	.56	.19	8.25	1.75**
Drug problems	.12	.11	1.23	1.13	0.05	.01	.32**	-.30	.12	5.78	.73*
Self-reflection	-.36	.24	2.18	.69	NS	NS	NS	-	-	-	-
Risk-seeking behaviour	.22	.14	2.52	1.25	0.7	.03	.24*	-	-	-	-
Need for help with psychoemotional problems	.31	.41	.58	1.37	NS	NS	NS	-	-	-	-
Satisfaction with social situation	.35	.25	1.93	1.42	.18	.04	.43***	-	-	-	-
Goal setting	.42	.18	5.65	1.53*	NS	NS	NS	.50	.17	8.05	1.65**
Moral beliefs about offending	-	-	-	-	.29	.12	.24*	.64	.63	.22	1.91
	χ^2 (-df) = 32.88 (12)* Nagelkerke R2 = 0.61 -2 log likelihood = 40.11 Method = Enter				R2 = .47 Df = 4 F = 10.33*** Method = Forward			χ^2 (df) = 31.74 (8)*** Nagelkerke R2 = 0.60 -2 log likelihood = 41.55 Method = Enter			

* p=<.05 ** p=<.01 ***p=<.001

with the subjective account of long-term development of criminal activity. The more often offenders believe their offence behaviour decreased in the long term, the lower their self-report criminal activity during the recent past ($R = 0.62$**) and the more often the official reported criminal activity during the adoption period of the safety houses shows a decrease in convictions relative to the period prior to adoption ($R = 0.26$*). As hypothesised, better goal-setting abilities are positively correlated with stronger self-efficacy beliefs related to desistance ($R = 0.50$**) and with disapproval of offenders of their own offending behaviour ($R = .030$*). For reasons of limited space these correlations are not presented in a table.

In Table 2 the results of the comparison of mean scores of four age groups on relevant variables are presented.

Compared with the age groups of 22 years or younger and 23-28 years, the oldest group of 38 years or older has significantly less persons giving support to the offender. Offenders aged from 23-28 years and 29-37 years express a greater need for help compared with the youngest group. Offenders between the age of 29-37 are significantly more inclined to passive coping strategies compared with the youngest offenders. Also their goal-setting abilities are significantly less adequate compared with offenders younger than 29 years. Motivation for change shows a steady increase when offenders grow older. The oldest group is significantly more motivated for change than the youngest group. Offenders older than 29 years experience significantly more problems with drugs than the youngest group of offenders.

Discussion

The previous findings show that when desistance is conceptualised as a long-term development and measured either by the subjective accounts of offenders or by official data, goal-setting behaviour is a significant predictor. Apparently, the gradual development of a declining pattern of offending is related to proactivity and the growing ability to subordinate impulses to value-based choices related to higher level approach goals. The effect of risk seeking as an impulse variable is fully mediated by goal-setting behaviour. This is an important finding. It shows that the exercise of internalised control during the process of desistance is the result of consciousness and a decisional choice to proactive behaviour in order to subordinate implicit and viscerally motivated behaviours to higher level goals (see also Wikström & Trieber, 2007).

When desistance is conceptualised from a short-term, situational perspective and measured by recent self-report offence frequencies a different pattern emerges. Lower levels of criminal involvement are best predicted by variables inhibiting criminal activity, such as a more satisfying social situation with more positive social bonds, less thrill- or risk-seeking behaviour, less severe problems with drugs and morality expressed as a more disapproving attitude of offenders towards their own offending behaviour. The latter predictor illustrates the relevance of moral reasoning and its role for the engagement in acts of crime. One of the interviewed offenders clarified his score on this moral predictor as follows: '*Although I know stealing is wrong, I don't regret or disapprove of my own criminal acts of stealing, I made a deliberate choice to commit them, I reflected on it and next it was just a matter of switching the button, to stop thinking and doing it*.' In addition, this repeat offender says that his main motive to commit crime was his need for a life of comfort and luxury. And, as he remarks, to hold on with desistance would be difficult for him as long as he believes that opportunities *to get access* to legitimate ways of earning a good living are severely restricted.

Behind the predictors of these short-term fluctuations in offence frequency and movements in or out of crime there may lay a more latent and gradual long-term change that in its turn is predicted by particular developmental or maturational factors such as for

Table 2 Comparison of mean scores for different age groups in the sample

	≤22 years n=30	23-28 years n=18	29-37 years n=18	≤38 years n=22	Total
Number of persons giving support**	3.3 (2.2)	3.5 (1.9)	1.9 (1.8)	1.5 (1.2)	2.6 (2.0)
Need for help with psycho-emotional problems**	2.4 (1.5)	3.3 (.85)	3.4 (.82)	3.1 (1.0)	3.0 (1.2)
Passive coping**	11.4 (4.5)	12.0 (3.9)	16.4 (4.9)	12.6 (3.0)	12.9 (4.5)
Goal-setting behaviour*	8.8 (2.2)	8.5 (3.3)	12.0 (4.3)	10.0 (2.9)	9.8 (3.5)
Motivation for change*	1.4 (1.0)	1.5 (.85)	1.9 (.96)	2.1 (1.0)	1.7 (1.0)
Problems with drugs **	4.0 (4.0)	6.3 (5.1)	10.5 (5.6)	8.8 (5.9)	7.0 (5.6)

Values are presented as means with the standard deviation in brackets. * p=<.05 ** p=<.01 ***p=<.001

instance a growing proactive capacity and moral readiness to steer one's life in a desired, conventional direction.

The desistance measures introduced in this study demonstrate their utility not only by their relationship with the intervening decision-theoretical variables but also by their relationship with other predictors that prior research identifies as relevant for desistance, such as factors related to self-control (risk taking), cognitive and reflective capacity, social relationship quality, work-related bonds, strain reflected in psychoemotional wellbeing and deterrence. The significant role of control variables referring to 'life problems' with drugs, income and housing may also be in line with strain theory, with positively valued goals having been blocked, positively valued stimuli removed, or negative stimuli presented. These life problems may cause negative feelings which in turn lead to continued offending.

The findings resulting from comparing mean scores of the various age groups on relevant variables show that continued offending after the age of 30 is marked by reduced levels of goal-setting abilities compared with younger age groups. Also a pattern of more passive coping behaviour, reduced levels of social support, more severe levels of psychoemotional suffering and drug dependency may be discerned among older offenders. These findings probably reflect a problematic adjustment to life-course challenges. Poor adjustment may in part be related to a lack of resiliency and to reduced levels of proactivity when confronted with the demands of the various stages of human development.
The fact that by the age of 28 most offenders (85%) seem to stop offending (Blumstein & Cohen, 1987) may be accounted for by increased motivation of offenders to meet the life-course challenges of the developmental stage of (young) adulthood. As they have noticed that time and opportunities are running out for them more and more, their orientation to important life goals or primary goods increases. This may trigger active and moral responsibility to adjust to the demands of this stage of human development and encourage desistance.

Continued or increased offending at older ages may perhaps be accounted for by a combination of poor or dismantled levels of (previously) accumulated human and social capital that block the achievement of important primary goods and life goals. This eventually leads to the building up of negative emotions including anger, frustration, disappointment, depression and fatalism. Continued criminal offending at older ages and a relative lack of 'agentic' and proactive moves toward desistance may be seen as a way of negative coping with and giving up control of problems that are essentially rooted into a poor adjustment to (previous) life-course challenges. As a consequence, continued offending at ages older than 30 may be accompanied by periods of a 'what the heck' attitude and of giving up control and the disarming of willpower. The data of this study suggest that this 'what the heck effect' of disappointment and giving up control probably occurs among the older offenders of ages between 29 and 37 years. They show significantly more problems with proactive goal setting and they suffer more from passive coping with adversity. These findings are in line with other results of research on willpower which indicate that phases of development of harmful and risky activities (crime and drug addiction) vary in the loss of volitional control over these activities and that desisting requires an ever greater exercise of willpower and proactive capacities in later stages (Loewenstein, 2000).

By the time repeat offenders reach the age of 40 or older, problems with proactivity lessen as they probably grow tired with the burdens and the accumulated costs of a criminal and addictive lifestyle. Also for this hypothesis the data offer some support. The oldest group of offenders show better goal-setting capacities and less passive coping behaviours compared with offenders in the beginning of their thirties. And perhaps this change in proactive behaviour is triggered by the growing experience of crime and its negative consequences as aversive. At the same time older offenders seem motivated for change. Motivation for change increases with age. In addition, for older persisting offenders in the beginning of their thirties the fundamental problem is probably also one of, what Laub and Sampson (2006) define as, a *distorted sense of autonomy* referring to limited capabilities, sociocultural opportunities and decisional choices to value and secure the primary human good of *relatedness* and bonding. This relative lack of sensitivity to the human good of relatedness may hamper changes in the *affective* component of criminal involvement and block the unfolding of desistance defined as a process of capitalising on an attitudinal shift.

Conclusion

In this study two tasks were previously formulated, i.e. finding meaningful measures of desistance and formulating a framework that specifies relevant factors and explains why, how and for whom these factors are supportive of desistance.

As to the first task, the research findings suggest that using a combination of measurement approaches, each with different strength, is a fruitful and informative strategy. A great deal of desistance

research examines officially reported data, but these data are subject to biases associated with for instance law enforcement policies. Especially with repeat offenders there may be a large discrepancy between officially reported convictions and the fluctuations in and volume of the actual involvement in crime. In order to get an impression of movements in or out of crime on the level of individual offenders it is therefore also interesting to measure change in patterns of offending by subjective and self-report instruments (Farrington, 2003). The research findings suggest that using a combination of measurement approaches, each with different strengths, is a fruitful and informative strategy.

As to the second task of specifying factors that are important to understand and to support desistance this study offers a number of important clues. An important clue to the understanding of the process of desistance is the role of value-based and (morally) reflected decisions by offenders in the initiating and maintenance of movements out of crime. Interventions may assist offenders in making these decisions by helping them to discover valued approach goals that inspire to goal-directed actions. This finding is in line with results from health studies emphasising that chances of success decrease dramatically when people do not *reflect*, *set goals* and *make plans* on the change of their behaviour and of the maintenance of the changed behaviour (Loewenstein, 2000; Gollwitzer, 1999; Armitage & Arden, 2008; Sullivan & Rothman, 2008). Valued approach goals (or the absence of them) are also important in the experience of offenders themselves. One of the interviewed offenders summarised his basic problem as '*not being able to discover good reasons to choose for a normal life without crime'* (Nelissen, 2010). Therefore, supporting the process of desistance should start with teaching offenders to reflect on issues of personal identity, desired primary goods and legitimate ways of securing them.

Although goal-seeking behaviour as an explicit technique of self-regulative planning seems to be situated at the heart of desistance as a decisional process, it is not the only clue to support desistance. Equally important are for instance efforts at enhancing supportive circumstances (institutional, familial and peer structures) offering resources for bonding (or social inclusion) and for the acquiring of the requisite technical and coping skills associated with a conventional behavioural repertoire. Also these forms of support that refer to the theoretical concepts accounting for the role of sociocultural context and structurally mediated processes may strengthen explicit strategies for action and *internalised control*.

It is further suggested that a focus on the theoretical and empirical body of criminological research on desistance may offer an opportunity to bring back criminology in a field that has currently become dominated by a risk factor prevention paradigm. This latter paradigm fails to account properly for key facets such as personal agency, intentionality, sociocultural context or barriers, moral development, psychological motivation and human rights dimensions (O'Mahoney, 2009). As a consequence the risk factor paradigm leads to interventions that, instead of *adding* to the individual's repertoire of personal and *social* functioning, merely seek to manage risks by controlling the outward behaviour of offenders. Interventions, however, must be grounded in the understanding of why offenders behave as they do. Criminological theories on desistance may offer a fruitful basis for this understanding. Building interventions on this knowledge about the causes of desistance is probably a more promising way to support offenders in their movement away from crime and to prevent long-term criminal careers with highly fluctuating levels of volitional control, ambivalence and repetitive movements from crime to non crime and back again.

References

Agnew, R. (1992). Foundation for a general strain theory of crime and delinquency. *Criminology*, *30*, 245-266.

Armitage, C. J., & Arden, M. A. (2008). How useful are the stages of change for targeting interventions? Randomized test of a brief intervention to reduce smoking. *Health Psychology*, *27*, 789-798.

Arneklev, B. J., Grasmick, H. G., & Bursik, R. J. (2000). Evaluating the dimensionality and invariance of 'Low Self-Control'. *Journal of Quantitative Criminology*, *15*, 307-332.

Austin, J. T., & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process and content. *Psychological Bulletin*, *120*, 338-375.

Bandura, A., (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs: Prentice-Hall.

Baer, G. G., Manning M. A. & Izard, C. E. (2003). Responsible behavior: The importance of social cognition and emotion. *School Psychology Quarterly*, *18*, 140-157.

Blumstein, A., & Cohen, J. (1987). Characterizing criminal careers, *Science*, *237*, 985-999.

Breese, J. R., Ra'el, K., & Grant, G. K. (2000). No place like home; A quantitative investigation of social support and its effects on recidivism. *Sociological Practice: A Journal of Clinical and Applied Research*, *2*, 1-22.

Burnett, R. (2004). To reoffend or not to reoffend? The ambivalence of convicted property offenders. In S. Maruna & R. Immarigeon (Eds.), *After crime and punishment* (pp. 152-181). Cullompton: Willan Publishing, UK.

Byrne, C. F., & Trew, K. J. (2008). Pathways through crime: The development of crime and desistance in the accounts of men and women offenders. *The Howard Journal*, *47*, 238-258.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behaviour. *Psychological Inquiry*, *11*, 227-268.

Farrington, D. P. (2003). *What has been learned from self-reports about criminal careers and the causes of offending?* Report for the Home Office, Cambridge.

Farrall, S. (2002). *Rethinking what works with offenders. Probation, social context and desistance from crime*. Cullompton: Willan Publishing, UK.

Giordano, P., Cernkovich S. & Rudolph J. L. (2002). Gender, crime and desistance. *American Journal of Sociology*, *107*, 990-1064.

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, *102*, 4-27.

Gottfredson, M. R., & Hirschi T. (1990). *A general theory of crime*. Palo Alto, CA: Stanford University Press.

Gollwitzer, P. M. (1999). Implementation Intentions: strong effects of simple plans. *American Psychologist*, *54*, 493-503.

Hendriks, V., van der Meer, M. C. W., & Blanken, P. (1991). *De Addiction Severity Index: ASI-r handleiding bij training en afname*. IVO, Rotterdam.

Laub, J. H., & Sampson, R. J. (2006). *Shared beginnings divergent lives: Delinquent boys to age 70*. Cambridge, Mass: Harvard University Press.

Loewenstein, G. (2000). Willpower: A decision-theorist's perspective. *Law and Philosophy*, *19*, 51-76.

Maruna, S. (2001). *Making good: How ex convicts reform and rebuild their lives*. Washington, DC. American Psychological Association.

Massoglia, M., & Uggen, C. (2007). Subjective desistance and the transition to adulthood. *Journal of Contemporary Criminal Justice*. *23*, 90-103.

McNeill, F. A., & Whyte, B. (2007). *Reducing reoffending. Social work and community justice in Scotland*. Cullompton: Willan Publishing.

Meisenhelder, T. N. (1982). Becoming normal: Certification as a stage in exiting from crime. *Deviant Behavior: An Interdisciplinary Journal*, *3*, 137-153.

Nelissen, P. Ph. (2003). *Binnen beginnen & buiten blijven*. Nelissen Onderzoek & Advies. Maastricht: Datawyse.

Nelissen, P. Ph. (2010). *Vastpakken en niet meer loslaten*. Nelissen Onderzoek & Advies. Maastricht: Datawyse.

O'Mahoney, P. (2009). *The risk factor prevention paradigm and the causes of youth crime: A deceptively useful analysis?* The National Association for Youth Justice. Dublin, Ireland: Sage Publications.

Piquero, A. (2004). Somewhere between persistence and desistance: the intermittency of criminal careers. In S. Maruna & R. Immarigeon (Eds.) *After crime and punishment* (pp. 152-181). Cullompton: Willan Publishing.

Prochaska, J. O. & DiClemente, C. C. (1984). *The transtheoretical approach: Crossing traditional boundaries of therapy*. Homewood Ill.: Dow Jones Irwin.

Rumgay, J. (2004). Scripts for safer survival: Pathways out of female crime**.** *The Howard Journal*, *43*, 405-416.

Sampson, R. J., & Laub, J. H. (1993). *Crime in the making, pathways and turning points through life*. Cambridge, Mass.: Harvard University Press.

Schreurs, P. J., & van de Willige, G. (1988). *De Utrechtse Copinglijst*, Lisse: Swets en Zeitlinger.

Shover, N. (1985). *Aging criminals*. Beverly Hills: Sage Publications.

Sullivan, H. W., & Rothman, A.J. (2008). When planning is needed: Implementation intentions and attainment of approach versus avoidance health goals. *Health Psychology*, *27*, 438-444.

Wikström, P. H., & Trieber, K. (2007). The role of self control in crime causation. Beyond Gottfredson and Hirschi's General Theory of Crime. *European Journal of Criminology*, *4*, 237-264.

Ward, T., & Maruna, S. (2007). *Rehabilitation*. UK: Routledge.

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The dynamics of children's science and technology talents: A conceptual framework for early science education

This article aims at discussing a theoretical framework for improving and evaluating science education for young children. This theoretical framework is intended to serve as a piece of usable knowledge for projects aiming to improve science education in primary schools. Major concepts such as science and technology talents of young children, the ability of adults to 'see' these talents, and the talent map (its dimensions and relation with brain development) are discussed. In our view, scientific talent is an emergent property. That is, talent for science and technology can emerge in every child if an upward dynamics can be established in the dynamical interaction between the child, the teacher and the material. In conclusion, general implications for schools with regard to science and technology talents in young children and how to promote these talents are discussed.
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In 2005, three Dutch scientists, among whom the president of the Dutch Academy of Sciences, started a research initiative to promote science and technology skills and interest in young children. The initiative was christened 'Talent Power' (Talententenkracht in Dutch). Although the official English translation of the program is 'Curious Minds', the literal translation of the Dutch *Talentenkracht*, Talent Power, better conveys the meaning and connotation that this word has for Dutch speakers. The word 'power' in the title is reminiscent of expressions such as 'girl power', which combine the concept of power with concepts that are not usually associated with it. The initiative emphasised that young children have a wealth of unexplored potentialities for scientific reasoning and exploring, and that adults, parents and teachers must learn to see these talents rather than ignoring them (Van Benthem, Dijkgraaf, & De Lange, 2005). Research groups were invited to participate in the initiative, which was hosted by a governmentally financed Institute for Educational Policy in Science and Technology (PBT, Platform Beta Techniek).

In 2009, the Ministry of Education launched a so-called Master Plan 'Opportunities for talent in science and technology', which explicitly endorses the principles of the 'talent power' initiative but also emphasises the importance of knowledge about brain development and neurocognitive processes for stimulating the science and technology talents of young children.

The aim of this article is to discuss a theoretical framework for improving and evaluating science education for young children, which is one of the results of a year of intensive cooperation between two academic research groups, two colleges for teacher education and five primary schools in the Netherlands (for a discussion of the other results we refer to Steenbeek, Van Geert, & Fraiquin, 2010). This theoretical framework, which resulted from work in the research schools spirit (Fischer, Goswami & Geake, 2010; Fischer, 2009), is intended to serve as a piece of usable knowledge for projects aiming to improve science education in primary schools.

Major concepts

The policy papers accompanying the Talent Power program refer to a number of crucial but not very well-defined concepts and terms associated with a particular (but again not very well defined) educational approach. This lack of clarity is probably not uncommon in policy documents, which challenges educators and scientists to come to clear but also usable specifications of the important terms.

The first major concept is that of (science and technology) talent. The advantage of using this concept is that it takes a positive stance and focuses on the existing talents of young children, instead of associating the aim of improving science education to a deficit approach ('we're lagging behind other countries!'). It uses a 'democratic' view on talent, in the sense that it assumes that every child is talented. In our observation, the disadvantage of the term talent is that most teachers, parents and school boards see it as a rare gift to the happy few. Even the scientific literature often puts it on a par with the concept of giftedness. For instance, the Oxford Dictionary of Education treats giftedness and talent basically as synonyms, and defines talent or giftedness as 'A term applied to pupils who have abilities which are developed to a level significantly above that of their year group, or who are judged to have the potential to develop such abilities' (Wallace, 2009). The literature seldom uses a fundamentally developmental notion of talent, as something that can emerge if the conditions are right. If teachers and policymakers tend to follow the dominant idea that talent is a gift, given to some but not all, they are likely to hold a so-called entity or dispositional view on talent. There is a wealth of research now that shows that such a dispositional view, in the learner and the teacher, is likely to hamper development and to reduce effort in learning and teaching. An incremental view on the other hand, defining an ability as something that can grow and develop as a consequence of educational effort, is likely to increase the teacher's and student's learning oriented activity, leading to higher development in comparison with disposition-oriented forms of teaching (see for instance Dweck, 2007; Dweck, Chiu, & Hong, 1995; Blackwell, Trzesniewski, & Dweck, 2007; Leroy, Bressoux, Sarrazin, & Trouilloud, 2007; Pajares, 1992; Calderhead, 1996; Runco & Johnson, 2002); people tend to adopt the dispositional versus incremental view of psychological abilities held by the organisation they work for (see Murphy & Dweck, 2010).

That is, the (implicit) theory of the teacher and the learner about a particular ability — in this case the ability to think scientifically in young children — is of great practical importance. Consequently, if there is any scientific evidence for the fact that particular abilities should in fact be seen as incremental instead of dispositional, and emergent instead of predisposed, this evidence should be made part of the (implicit) theories of science reasoning talent in teachers, also because the implicit theories of teachers have a major effect on the implicit theories of their students. Hence, there is a need for a usable, developmentally oriented notion of talent, if such a notion can be backed up by scientific evidence.

The second major concept in the programs is that of the adult's ability to 'see' the talented reasoning, acting and exploring of young children in the context of science and technology problems. This emphasis on the adult's ability to perceive is in line with the literature on expertise, which is that a crucial property of an expert is the ability to perceive, structure and evaluate information relevant to the field of expertise. In this case, it means that the expert has the ability to intuitively pick up the educationally relevant information in the child's behaviour (Hogan & Rabinowitz, 2009). It goes against the misunderstanding that experts are primarily characterised by explicit knowledge or by the ability to carry out highly protocolled chains of action. An advantage of this notion of expertise is that it forms an excellent starting point for an empowerment-oriented way of professionalising teachers, which must lead to better informed intuition and immediate and adaptive action. A disadvantage of this emphasis on the perceptual aspects of the expertise is that it may lead to the belief that seeing alone is enough and that the learning and development will take care of themselves. However, a developmentally oriented approach to science education requires that educational action and perception are coupled in a continuous dynamic loop. The question is of course to find out, together with the teachers, how such a loop can be established. In short, there is a need for a developmentally oriented notion of teachers' (and other adults') 'seeing' talented science reasoning, action and exploration.

The third major concept introduced in the programs is that of the *science talent map*. The Master Plan policy document defines the talent map as an evidence-based instrument that provides insight into the question which science talents children have (Master Plan, page 19). From this document, it is not particularly clear whether the talent map explores the child's science learning potential, or whether it is intended to describe a status quo, based on standard testing results, e.g. cognitive tests of what children can accomplish in the context of science and technology problems. What is needed, however, is a map of potentials of children as well as educators, which helps practitioners to stimulate development and explore new ways instead of unnecessarily

confining their actions to wrongly interpreted normative data.

In this article, we shall provide usable specifications of these major concepts that resulted from the close collaboration with educational practitioners. We shall defend the following position with regard to the children's talent for science and technology reasoning: talent is an *emergent*, *distributed* and *dynamic* property. Furthermore, we shall contrast this view with what we see as more or less the standard view on talent, which is that talent is something that is either present or not in the person (i.e. not emergent), that it is a property within the person (i.e. that it is not distributed across the person and beneficial contexts such as good teachers and rich learning environments), and finally that it is some sort of fixed property in the form of a gift (instead of being something dynamic and changing).

The scientific context

As early as kindergarten, science programs can lead to an understanding of scientific (including mathematical and technological) concepts, principles and practices that far exceed the level of understanding children would develop under more traditional forms of teaching (Mantzicopoulos Patrick, & Samarapungavan, 2008; Mantzicopoulos, Samarapungavan, & Patrick, 2009; Gelman & Brenneman, 2004; Scientific American, 2010; Tytler, Waldrip, & Griffiths, 2004; Sarama & Clements, 2009; Hapgood, Magnusson, & Palincsar, 2004; Lehrer & Schauble, 2005; Lehrer, Schauble, & Lucas, 2008; Metz, 2004, 2011). All successful programs are based on a smart mix of active and inquiry learning, the child's self-regulated exploration and questioning and educational guidance and teaching by teachers with high-level educational skills (Alfieri, Brooks, Aldrich, & Tenenbaum, 2010; Kirschner, Sweller, & Clark, 2006; Mayer, 2004). However, in the context of discovery learning, adequate support is not a trivial issue. On the one hand, it requires highly developed questioning skills that not all teachers possess and need to be thoroughly trained (Roth, 1996; Barber, & Mourshed, 2007). In successful science learning and education, the professional quality of the teacher is a key factor (Barber, & Mourshed, 2007; Van Aalderen-Smeets, Walma van der Molen, & Asma, in press). In order to obtain a better understanding of these processes of active inquiry learning and self-regulated exploration and questioning in the context of expert educational guidance, we apply the framework of complex dynamic systems theory to education and development (for general introductions see Van Geert, 1991, 1994; Van Geert & Steenbeek, 2005a).

The theory aims to explain how processes self-organise in the interaction between the short-term dynamics of action and the long-term dynamics of development. As regards the educational context, we rely on the following conceptual models. The first is a *dynamic model of (short-term) joint action* (Steenbeek & Van Geert, 2007, 2008, Van Geert & Steenbeek, 2005b; Steenbeek & Van Geert, submitted). According to this model, activities emerge through the intertwining of the actions of agents that participate in this event with particular interests or concerns, evaluations, communications and tools to realise their interests. In an educational context, the major interests or concerns are those of competence, autonomy and relatedness (e.g. Deci & Ryan, 2009). These major concerns apply to the children as well as to the adults, for instance the teacher. Concerns are not fixed, but self-organise in the interaction (for instance in the form of the science activity in the classroom actively involving both teacher and children; see Steenbeek & Van Geert, submitted).

A second source of background inspiration is *the dynamic model of (long-term) scaffolding and of co-adaptation* (Van Geert & Steenbeek, 2005b; Steenbeek, Jansen, & Van Geert, submitted; Van Dijk, Van Geert, & Steenbeek, 2010). According to this model, growth, learning and development are deeply transactional processes. They can be seen as 'push-me pull-you' kinds of processes, where the child's progress triggers the adult's adaptive action to the child, which forms a primary condition for the child's development. Transactional processes and co-adaptation can explain successful and even unexpected growth, as well as stagnation and eventually decline of development. The transactional nature of development and education makes those processes utterly complex and basically self-organising. An understanding of this self-organising complexity of the developmental and educational process is an antidote against simplistic views on how development can be enhanced by 'introducing better educational programs or curricula'. In line with the research schools concept (Fischer, 2009; Fischer, Goswami, & Geake, 2010; Doucerain & Schwartz, 2010), teachers can inform researchers about the concrete, here-and-now complexity of teaching, whereas researchers can inform teachers about dynamic systems and complexity thinking as a framework for understanding the activity of teaching and educational reform.

Explaining the development of science talent in young children

It is now widely accepted that science education is aimed at promoting conceptual and representational change in children (Carey, 2000; Mazens & Lautrey,

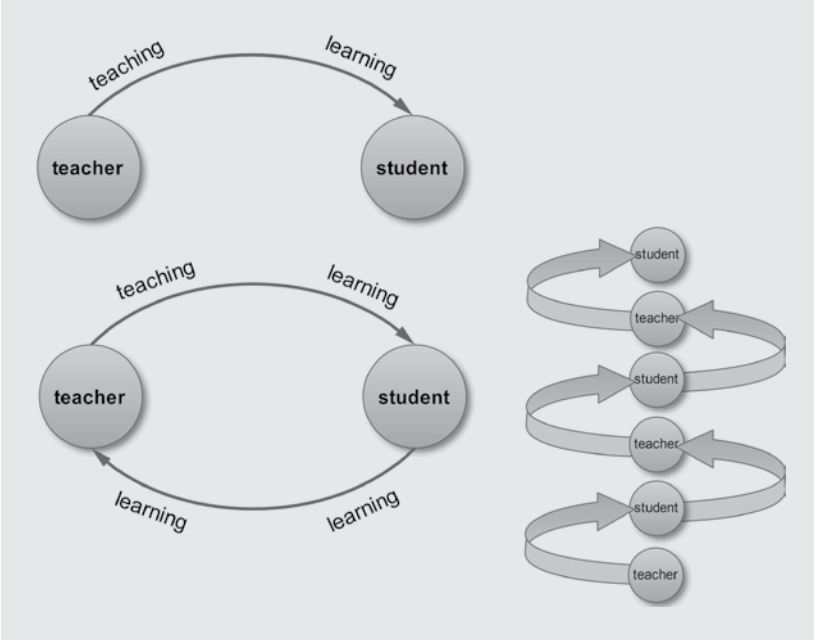
2003; Vosniadou, 1994; 2007, 2009; Vosniadou, Ioannides, Dimitrakopoulou, & Papademetriou, 2001; Singer, 2007). We see this conceptual and representational change as the long-term process of change in the child's ability to construct explanations, make predictions, solve concrete problems, select and manipulate contexts and to negotiate help and assistance in getting the job done in the context of situation-specific, real-time and embedded action (Van Geert, 2008; Van Geert & Steenbeek, 2005a), Van Geert & Fischer, 2009). That is, the child's science and technology talent takes the form of what Fischer has called a *dynamic skill* (Fischer & Bidell, 2006; Schwartz, 2009; Doucerain & Schwartz, 2010). However, research shows that children's ideas of physical and technological phenomena are often highly fragmented, consisting of more or less isolated bits and pieces (see for instance Hannust & Kikas, 2007, 2010; Straatemeijer, Van der Maas, & Janssen, 2008). Studies of teachers' mental models of various physical and technological phenomena have shown that teachers hold mental models with a variety of misconceptions, and are thus likely to transfer these misconceptions to their students. The process of conceptual change in teachers can be conceptualised by means of the same process notions as those applicable to children and thus in principle requires a comparable process of active reconstruction from the part of teachers (Trundle, Atwood, & Christopher, 2007; McDevitt & Ormrod, 2008; Abd-El-Khalick, & Akerson, 2004; Bulunuz & Jarrett, 2010; James & Scharmann, 2007; Kang, 2007; Kikas, 2004; Trumper, 2006).

The developmental question boils down to how the child's *dynamic skills in science and technology* become more *complex* – according to some specific *scale* or standard of competence – and more *autonomous and competent* in the performance of this skill. A dynamic skill always takes the form of a 'soft-assembled' (Thelen & Smith, 1994) or self-organised activity in real-time, on-the-spot and in the form of real physical action (Van Geert & Fischer, 2009; Schwartz, 2009). That is, a skill is not some sort of fixed procedure, stored somewhere on the shelf of the mental bookcase, ready to be retrieved if needed. The actual skill employed in a concrete here-and-now situation is, each time a new, assembled out of elements retrievable from the person's memory and elements emerging in the actual context of concrete actions (Thelen & Smith, 1994). If applied to science talent, scientific reasoning skills always take the form of a science and technology activity that emerges in the dynamics between child, adult and materials that unfolds in real-time (Steenbeek, Jansen, & Van Geert,, submitted, or; Steenbeek & Uittenbogaard, 2009; Meindertsma, Van Dijk, & Van Geert, 2010; Van der Steen, Steenbeek, & Van Geert, 2010). Thus, instead of focusing science talent assessment on the individual child, one should first of all focus on educational contexts such as classrooms. The question is: are they capable of producing emergent activities that are characterised by promoting high levels of insight, creativity and emotional commitment of all the participants involved? In order to be able to educate teachers and parents, and ourselves, about what is currently known about talent, we first carried out an extensive literature survey, from which we distilled the following elements. It should be noted that the picture that emerges from the literature contains certain tensions, for instance between giftedness and hard work, which must be solved in order to obtain a usable conceptual framework. We shall specify our own view later in this section.

A dispositional definition would describe talent as *a person's ability or collection of abilities that will enable a person to reach excellence in a particular domain if this ability or abilities are put to proper use* (Van Geert & Steenbeek, 2007; Simonton, 1999, 2001). Thus, talent is a property or, more likely, a collection of properties of a particular person that determines the effectiveness of learning events or experiences, such as practice, teaching, and exploring. For instance, some children profit more from a particular instructional demonstration than others, simply because of the trivial fact that they are more interested in the demonstrated phenomena than other children (Schiefele, Krapp, & Winteler, 1992; Renninger & Hidi, 2002; Neitzel, Alexander, & Johnson, 2008). A crucial factor lies in the notion of *excellence*, which refers to a relational property: one excels relative to some standard (the issue of which standards to use will be discussed later; e.g. Ericsson, 1996).

The literature often associates talent with a high level of performance (excellence) in a particular content domain. It says that talent differs from excellence per se in that talent implies a high potential for further development, and is seen as based on a genetic endowment or gift. Giftedness is talent that is not yet observable (Gagné, 2004). According to Simonton (2003), the distribution of talent across the population – which applies to the underlying genetic traits as well as the results of talented performance after many years – is strongly skewed, and talent is thus seen as a rare commodity. The excellence that comes along with that talent or the gift does not emerge spontaneously, but usually comes as a result of great an extended *effort (*Ericsson, Roring & Nandagopal, 2007; Colvin, 2008; Coyle, 2008: Howe, 1999). Talented people are willing to invest this effort because they are highly intrinsically motivated (Winner, 2000).
Current models of talent see it as a *multidimensional*

Figure 1 The upward teacher-student spiral



phenomenon consisting of a variety of components, which, within the same talent domain, can also differ among individuals (Simonton, 2001). Talent is *a developmental and dynamic* property. The same talent may emerge at different points in development for different persons, and maybe eventually disappear (Simonton, 2001; Horowitz, Subotnik, & Matthews, 2009). The emergence or development of talent cannot be explained by a simple linear accumulation of talent-promoting aspects or properties, but is based on non-additive interactions between those aspects or properties. Various authors have called this the *multiplicative model*, or the *multiplier effect* (Ceci, Barnett, & Kanaya, 2003; Simonton (1999, 2001; Lykken, McGue, Tellegen, & Bouchard, 1992; Walberg & Tsai, 1983). The multiplier effect is often applied in the form of the classical *Matthew effect model* or the *cumulative advantage model* (see for instance Scarborough & Parker, 2003; Walberg & Tsai, 1983; Bast & Reitsma, 1997; Stanovich, 1986; Burstall, 1978; Bakermans-Kranenburg, van IJzendoorn, & Bradley, 2005). For instance, a child with an observable talent for science reasoning is likely to attract the interest of parents or teachers who tend to invest special effort helping the child develop this talent, which cumulatively strengthens the talent and creates a positive talent spiral. The assumption is of course that these parents or teachers are capable of recognising this talent and providing the right kind of support, an observation which already introduces the chance element that is a crucial aspect of any developing talent; e.g. Barron, 2006.

The notion of talent development that results from the literature contrasts with the idea from Curious Minds that basically every child has a certain talent for science reasoning. The difference lies in the perspective one takes on the meaning of talent and its cousin excellence. If talent is defined as excellence in comparison with other persons, it follows by statistical definition that talent is exceptional and for the happy few. However, if talent is associated with the fact that every developmental trajectory implies a multiplicity of possible futures, the talent trajectory is the one that maximises the potential of the individual. According to our dynamic systems view, none of these possible trajectories is inherently given. Whatever comes out of development is a dynamic process, resulting in emergence and self-organisation. Such dynamics can emerge more or less automatically, but they can also be caused by a deliberate effort. The simplistic view on teaching is that it is a more or less unidirectional process, a process of transmission in which the teacher is teaching the child who learns as a consequence of the teaching (Fischer, Goswami, & Geake, 2010; see Figure 1, top left).

Instead of this unidirectional process, we propose a bidirectional process in which the learning of the child can help the teacher learn how to improve his or her own teaching. If this coupling can be made, a positive upward spiral will emerge, comparable with the Matthew effect, but without the requirement that it needs a very specific and dispositional talent in the child, which acts as an almost magical and unexplainable condition bestowed on a minority of children. For instance, the child's enthusiasm for science can stimulate the teacher to train him or herself in how science enthusiasm and reasoning in the child can be further stimulated, and this in turn will stimulate the teacher to go on with his or her attempts towards improving the teaching, until a more or less stable self-sustaining level is achieved, which is considerably higher than the level at which the educational interaction would have stabilised without the reciprocal stimulation. The emergence of such an upward spiral depends, in this particular case, on the continuous and balanced interplay between the teacher and the student(s) (Azevedo, 2006; Barron, 2006; Barron, Walter, Martin, & Schatz, 2010; Krapp, 2007; Hidi & Renninger, 2006). Such a spiral emerges only if certain conditions are fulfilled. It is easy to think of conditions in which such a process will not get off the ground, but the important point is that the conditions are not extremely specific. In fact, any *emergent* sign of talent or excellence may grow into real talent and excellence if it becomes immersed in a positive feedback loop, which will lead to a spiral of change in which not only that talent grows but also the conditions for its growth are improving. Such a small seed may take a variety of forms ranging from an existing particular interest

in science-related subjects to enthusiasm at the first confrontation with a real science subject in the classroom. In fact, we hypothesise that there is a considerable variability in conditions that facilitate the emergence of talent spiral. However, we also expect that successful conditions will have a distributed nature, i.e. that they reside in the dynamic interplay between the children, the adults and the culturally interpreted objects and material context (Barab & Plucker, 2002; Dai, 2005).

In the Curious Minds project we are trying to unravel the conditions that might lead to the emergence of such upward positive spirals, and we have found encouraging evidence that the emergence of such positive spirals is indeed possible (see Steenbeek, et al., 2010). One school, for instance, went through a process of change regarding more effective science and knowledge of teaching that was primarily fuelled by the social dynamics in the school's teaching team, in which creative application of science-related talent moments (an important concept which we will explain in the next section) became an issue among the teachers. In other schools, the spirals often start with the observation of teachers that the children are more enthusiastic and learn more if they, the teachers, know more about making science accessible to and interesting for their students. This observation often leads teachers to ask for personal coaching, to allow them to increase their teaching skills. Pedagogical efforts should primarily be invested in trying to create conditions for the emergence of talent moments leading to the creation of upward spirals, and less so in diagnosing 'real and rare talents' by means of standardised tests, with the aim of giving these children a pedagogical treatment that the non-talented children would probably not profit from.

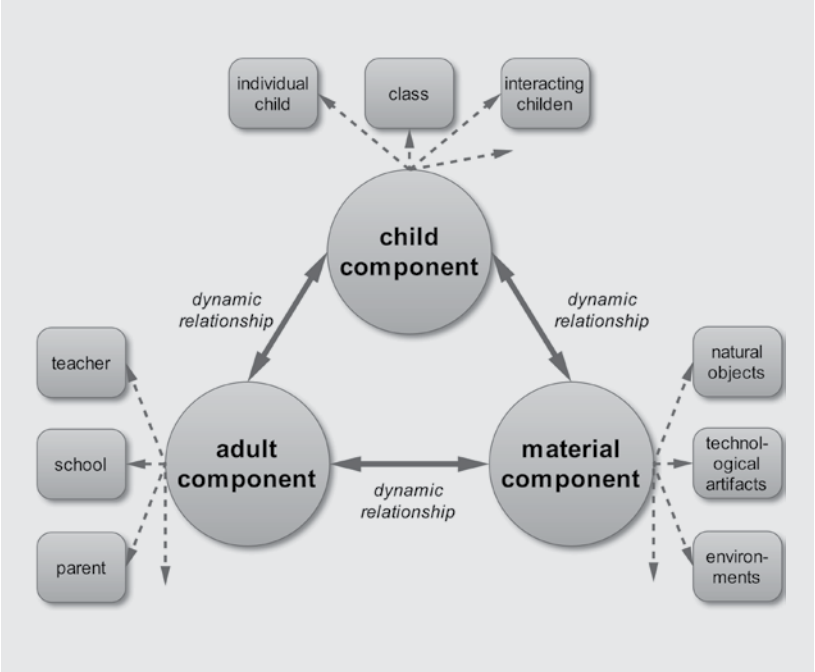
We shall now conclude this section with an attempt to describe talent for science and technology in young children as an emergent, distributed and dynamic property. We shall no longer define a talent as a disposition in the person, but rather as an ongoing process of transactions between (1) the children's abilities that enable them to reach excellence in the science and technology domain, to learn from rich educational contexts and to elicit rich educational interactions from their educators and teachers in particular, (2) their parents' or teachers' abilities to recognise the curiosity and interest of their children in the science and technology domain and to co-construct rich forms of science and technology thinking with them and (3) by creating and making use of material objects or contexts that are capable of eliciting rich and complex forms of science and technology thinking in both the children and their educators. When we speak about 'rich' and 'excellent' forms of science and technology thinking, we refer to a level of excellence relative to what we can expect from the children and educators under 'conditions-as-usual'.

Being a process, a particular talent for science and technology (in a particular child or children in their particular educational contexts) will emerge somewhere and some time, maybe because of a lucky circumstance that triggers the process of interest and activity in the child and its educators and that leads to the upward spiral described in this section.

Seeing science talent and creating the conditions for its emergence

The distributed and dynamic character of talent is represented in the form of the talent triangle (see Figure 2). The triangle represents a process of dynamic, reciprocal interactions between a child component, an adult component and a material component (educational models involving the combination of student, teacher and material objects involved in the teaching are far from new; however, what distinguishes the talent triangle from at least some of these models is that the talent triangle is a model of a dynamics, that is of actual real-time processes, and not a model of the statistical influences on one variable to another). Each component can be further specified (e.g., the child component can refer to a single child or a class). Two corners of the triangle, the child and the adult, refer to agents, and are described by means of building blocks adopted from our dynamic action model (Steenbeek & Van Geert, 2007; 2008), consisting of concerns, knowledge and insights, skills, motivation and drives, and emotions and appraisals. The corner representing the material objects or material context is specified in the form of affordances, i.e., properties that are perceived by the agents as 'invitations' for doing something (Foo & Hedberg, 2005; Bower, 2008). Although the educational concept of this child-adult-material triangle is not new, we give it new meaning by seeing it as a model of a distributed dynamics, namely as a process of short-term interactions between the components of the triangle, taking the form of real-time, talented science reasoning supported by an inspired teacher using talent-eliciting materials (Van Geert & Steenbeek, 2007; Steenbeek & Uittenbogaard, 2009). These components are mutually dependent, they are not to be treated as 'independent variables'. Talent development is the long-term dynamical process of changes in the properties of the talent triangle, e.g. in the level of abstraction of the interaction between the participants and the nature of the problems and contexts that support the talent.

Figure 2 The science talent triangle



Science talent of all participants involved manifests itself in the form of what we call *talent moments*. A talent moment is any classroom event ranging from a short spontaneous or elicited interaction to an entire lesson, in which a science or technology content forms the focus of attention. During such an event there is intensive communication between children and teacher. Such communication involves a to-and-fro process between child, adult and material contexts or objects, taking place on verbal and nonverbal activity levels, involving the dynamic construction of high-level cognitive representations (relative to the children's age and knowledge, and resulting from the interplay between the components of the triangle). Talent moments typically involve emotional absorption, enthusiasm, excitement and commitment to exploring what is as yet unknown or unexpected. The notion of talent moment is related to the well-known concept of the *teachable moment* (Bentley, 1995; Hyun & Marshall, 2003), but in comparison with the latter it emphasises the fact that the learning and enthusiasm is not only in the student, but also in the teacher and the teaching context. It is not only the student who learns from the teacher, but also the teacher and the school that learn from working with the students. During the course of the research collaboration with the schools, the teachers asked the researchers to help them find ways for introducing this concept in their classrooms. For this reason, we are currently developing a coaching module for teachers to help them create high-quality talent moments as a regular component of their teaching practice (Wetzels, Steenbeek, & Van Geert, 2011; Steenbeek, Van Geert, & Fraiquin, 2010).

The science talent map

The properties of the talent moments can be described in terms of the dimensions of the talent map, which we defined as 'a map of potentials of children as well as educators that helps practitioners to stimulate development' and, we might add, helps researchers to investigate and measure talent development. The talent map thus serves an applied goal, helping teachers to create optimal conditions for eliciting and improving the talent moments, and a scientific goal, helping researchers to define research questions and design instruments for assessing the properties of the talent moments, i.e. the expression of science talent in real-time, here-and-now interactions in the concrete context of the class. The talent map must describe the children's and teacher's functioning under optimal circumstances, and must thus help decide what these optimal circumstances should be and how non-optimal circumstances can be improved. Note that this idea is reminiscent of Fischer's distinction between optimal and functional levels of development (Fischer & Rose, 1994). The notion of the talent map can also be used in the broader context of the co-construction of science talent by the child and the adult, for instance in the family context (e.g., children visiting science museums with their parents).

Dimensions of the science talent map

In order to describe a map, one needs to specify its dimensions (e.g. latitude and longitude and a geographical map). Since the science talent map is an instrument for policy, including the planning of scientific research, its dimensions have been chosen on pragmatic grounds, in that we have been trying to find the smallest possible number of concretely specifiable dimensions covering the greatest number of aspects and properties that are relevant for educational practice as well as for scientific research. This pragmatic stance has resulted in the following five dimensions (see Figure 3).

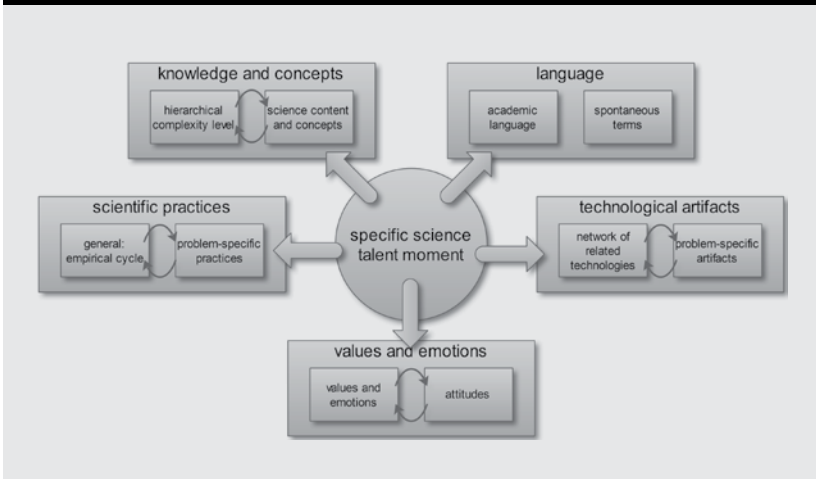
The first is that of **knowledge or cognition**. This dimension has two aspects. The first aspect is the *general cognitive level or complexity of the scientific reasoning* that the child and/or the teacher show during a particular process of thinking or exploration, i.e. the level on a developmental hierarchical scale as described by Dynamic Skill Theory (Fischer & Bidell, 2006; Dawson-Tunik, Commons, Wilson, & Fischer, 2005). This cognitive scale is content-neutral and applicable to thinking in naturalistic situations. The second aspect is the particular *science content* specific to the problem at issue, for instance contents referring to pressure and force, or contents referring to biological systems (Van Keulen, 2011).

The second dimension is that of science-related **language**, which Vygotsky already stressed as important for the emergence of higher order thinking and which is now often referred to by the term 'academic language' (Schleppegrell, 2004; Chamot & O'Malley, 1996; Henrichs, 2010). Language consists of the words and terms that scientific communities use to refer to particular concepts or knowledge, and which, by their specificity, help the cognitive processes of reasoning and understanding proceed in an adequate way.

The third dimension is that of **general and specific scientific practices or activity systems**, for instance the general practices of exploring a problem context to find an explanation for an unexpected observation, the practice of formulating hypotheses or expectations on the basis of existing knowledge, the empirical testing of such hypotheses in a way that allows for verification as well as falsification, and so on. It also concerns specific scientific practices related to experimenting with specific tools or objects. A simple and highly general model of scientific practice is that of the empirical cycle (De Groot, 1969), which can be introduced as a framework guiding the children's actions. The model of the empirical cycle can be extended with the model of the argumentation cycle (Toulmin, 1958/2003). Both models can be used as a general standard against which the science-related actions and argumentation of children can be specified.

The fourth dimension is that of **the technological artifacts or objects,** which constitute the range of material forms that scientific and technological concepts can take. For instance, the core concepts of pressure, volume and force are related to a host of technological tools ranging from balloons to bicycle pumps to combustion engines. These objects represent not only conceptual insights and knowledge, e.g. mental models of pressure and force, but also particular and culture-specific activity systems and affordances for action that children will gradually master. For the teacher it is important to understand which objects or material contexts generate affordances for action and understanding that are developmentally appropriate. Teachers can select and introduce such objects (and learn how to do so) and can learn to see such opportunities and affordances in the objects that are part of the natural school environment.

Figure 3 The dimensions of the science talent map



The fifth dimension is that of **attitudes, motivations values or emotions**, i.e., the 'movers' of one's action. Examples of attitudes and values are a positive evaluation of science and science-related practices, the absence of prejudice in judging scientific or observational data, the trust in the evidence provided by others, a critical attitude towards oneself and others and so on. As regards to science, a major 'mover' is the person's curiosity, the wish to find and understand new things, an emotion which should not only move the child but also the teacher (Deci & Ryan, 2009). Teachers can use the dimensions of the talent map in the form of a simple checklist of opportunities when they prepare or evaluate a science activity with their students. For instance, they can ask what the cognitive science concepts are that they wish to address or which language and science terms they can use or introduce. They can ask themselves in which practices or activity patterns they wish to introduce their exercise and which natural objects or technological artifacts they can use. Finally, they can ask which attitudes, evaluations and emotions the activity will elicit. At the individual child level, it can be assessed what the level of this child is with regard to the dimensions of the talent map, and the child's level can be compared with those of his peers. It can be used to bring weak students up to standard levels and to determine which aspects need additional educational attention. Researchers can measure the children's and teachers' science talent by observing real-time properties of learning and teaching interaction defined by the five dimensions. In order to be useful for that purpose, each dimension must be transformed into a 'developmental ruler', i.e., into a hierarchy of levels of cognitive, linguistic, pragmatic and evaluative complexity.

The science talent map and the brain

The dimensions of the science talent map can be described in the form of functional and constant properties, for instance specific cognitive contents, skills and activity patterns. However, such functional properties can only exist and develop by virtue of an underlying biological substrate, more precisely the human body. For instance, for children with physical,

sensory or motor handicaps, the trajectory through the talent map will be different to that for physically normally developing children. Of particular importance in this regard is the development of the brain. Questions that immediately come to mind are, for instance, whether a young child's brain is sufficiently developed to be able to understand the often abstract notions that science reasoning appears to require, or whether children with high talents for science have different brains than typically developing children. However, the talent triangle model suggests that questions regarding the brain should not be limited to the children, but should also extend to the adults, the teachers for instance, who participate in the educational science activities. Take for instance the issue of brain development, executive functions, planning and inhibition. At first sight, scientific reasoning requires well-developed executive and planning functions, which depends on the development of the prefrontal cortex, a process that begins in early childhood and extends far into adolescence (Christoff, Keramatian, Gordon, Smith, & Mädler, 2009; Fischer & Bidell, 2006; Hansen & Monk, 2002). However, Thompson-Schill, Ramscar, and Chrysikou (2009) claim that the 'underdeveloped' prefrontal cortex of the child is better suited for exploratory and curiosity-driven activity than the fully developed prefrontal cortex of the adult, which is better equipped for goal-directed action and impulse inhibition. Thus, what superficially seems to function as a disadvantage can also be an advantage if put to proper use. Instead of seeing the young child's prefrontal cortex as a limiting factor for science-related activities, it can also be seen as an important opportunity. On the other hand, the adults' highly developed inhibitory and goal-oriented skills are not necessarily facilitating science reasoning, but can also hamper it if they stand in the way of unbiased exploration, imagination and free flow of thoughts. In fact, the talent moments that teachers seek to enhance not only stimulate brain development in children, in that they provide the children with opportunities to explore in a controlled and reflective context, but also brain development in the adult teachers themselves, to the extent that the talent moments help the teachers to rediscover intellectual flexibility and free exploration.

A similar reasoning applies to the relationship between the development of the prefrontal cortex and the ability for abstract thinking. Since scientific and technological reasoning requires abstract thought, it is thus easy — but probably also wrong — to conclude that the brains of the 4 to 5 year olds who participate in the Curious Minds program are not yet suited for the abstract concepts that this kind of reasoning requires and that teachers should wait until at least the age of eight years before confronting their students with causal reasoning and explanation. However, research has shown that the brain is far from an 'independent variable'. In reality the brain is a complex self-organising tool that shapes its own structure as it is used and that is characterised by a high amount of experience-related plasticity (Dehaene, 2007; Stiles, 2000). Moreover, abstract thought is not an all-or-none phenomenon, and neither is it limited to what happens inside an individual person's brain. Abstraction is a distributed and context-supported activity that follows a continuous developmental process starting long before and continuing long after the age at which abstract thought is considered to be fully 'developed' (Schwartz, 2009). In order for this developmental process in the brain to occur, it must be educationally supported from its very beginnings onwards, and the concept of talent moment sketches the contours of a context in which this support might be realised.

One dimension of the talent map refers to the evaluative and emotional components of science activities in young children and their teachers. The addition of this dimension is explicitly supported by recent contributions of brain development studies to education, which have provided neurocognitive evidence for the integrated nature of rational thought and emotion (Immordino-Yang & Damasio, 2007) and the importance of emotionally valued concerns and interests for cognitive development (Immordino-Yang & Damasio, 2007; Van Geert & Steenbeek, 2007; Woltering & Lewis, 2009). Although the intimate relationship between emotion, thought and cognitive learning and development has always been one of the basic beliefs of good educators, emotion and its kin motivation have too often been treated as 'additional factors' of the learning and teaching process and not as inseparable parts of teaching-learning dynamics that apply to the student as well as the teacher.

The educational concepts of talent moment and the upward teacher-student spiral (see Figure 1) have been developed with 'the brain in mind'. The talent moment combines strong positive emotional involvement with a high level of cognitive processing, in a context supported by a competent adult and talent eliciting objects and materials. The talent moment provides an ideal context for regulating cognitive inhibition in the children. In young children it will structure and regulate the 'overdose of suggestions and actions that the children generate, and in older children and adults (teachers) it will stimulate the participants inhibitions and anxiety to express what comes to their minds (Thompson-Schill et al., 2009). Talent moments capitalise on learning in the context of strong positive emotions, which strongly contributes to learning and interactive specialisation in the brain

(Immordino-Yang & Damasio, 2007; and Lewis, 2005). It is a form of socially embedded learning that appeals to the neurocognitive triggers of the 'social brain' (Frith & Frith, 2010). The talent moment is an explicitly supportive environment, distributing the cognitive load of the task across the participants and objects, thus allowing for shared and distributed abstract thought. Talent moments are intended to occur often and repetitively, thus allowing the participants to invest in an extended, 'deep' and frequent practice. These are (according to Fields, 2006) likely to contribute to myelinisation and consolidation of networks in the brain). If the teacher and the children get into a durable, self-sustaining pattern of mutual stimulation, they have created a context for long-term development, including brain specialisation, which is characteristic of trajectories leading to excellence.
Finally, we admit that the discussion on the relationship between talents for science and technology in the brain is highly speculative and no more than a starting point for further discussion.

Conclusion: What schools, teachers and researchers should know about scientific talents in young children and what they can do with this knowledge

First, against the often heard claim that (scientific) talent is a property that some children have and others do not, we put the claim that scientific talent is an emergent property, if the right dynamic conditions can be created. That is, talent for science and technology can emerge in every child if an upward dynamics can be established. This upward dynamics takes place in the dynamic interaction between the child, the teacher and the material/context. For some interactions, the upward spiral will rise to greater heights than for others, and this difference will no doubt be due to complicated combinations of genetic endowment and good luck as to support and timing. For the teacher, the parent and the researcher, it is important to realise that the dynamics of the talent triangle imply that emergent talent not only applies to the child but also to the adult who is part of the dynamics. One cannot stimulate another person's curious mind without stimulating one's own.

Second, scientific talent, and scientific reasoning, are distributed processes taking place with and between persons and material contexts, and which take the form of a dynamic skill. The notion of dynamic skill also implies that the ability to reason scientifically and abstractly is not an all-or-none phenomenon which 'is there' or 'isn't there'. The ability will come and go and wax and wane dependent on the context and the opportunity, and in the process of development it will become a more or less consolidated property of the individual person, without ever losing its connection with other people and the material world.

Third, the science curriculum is a means for creating, increasing and maintaining the occurrence of 'talent moments' in which all the elements beneficial for constructive and well-guided learning come together, including the focus and absorption in the content, the enthusiasm and emotions, and the learning of both the student and the teacher.

Fourth, instead of confining the results of science education to changes in concepts in the representations, we introduce the picture of a 'science talent map' that is defined by a much richer structure of dimensions. General as well as content specific *knowledge* are closely related with *language* and specific words, with scientific and technological *practices* and action patterns, with natural, cultural and technological *artifacts*, and finally with a rich pattern of values and *emotions*.

In short, the framework presented in this article has scientific as well as applied consequences. As a theoretical framework, it is intended to guide research in learning and teaching processes based on a concept of 'talent' as a dynamic and distributed learning potential. It is a framework that can help the researcher to design tools for assessment that apply to concrete, real-time and here-and-now contexts of scientific reasoning in children and the supporting educators. As an applied framework, it gives teachers a theory of science and technology talent that goes beyond the dispositional and more or less static implicit theories about talent that they are most likely used to. This new theory, which emphasises the developmental, emergent and 'collective' (i.e. distributed) properties of talent, might help teachers to take a different educational stand towards the issue of talent, in particular in science and technology in young children. Maybe teachers will act differently if they no longer follow the metaphor that talent is a rare and hidden nugget of gold that they are likely to find only in very few children, and adopt the metaphor that talent is something that grows in a garden on rich and fertile soil and should be sown, nurtured and harvested.

References

Abd-El-Khalick, F., & Akerson, V. L. (2004). Learning as conceptual change: Factors mediating the development of preservice elementary teachers' views of nature of science. *Science Education*, *88*, 785-810.

Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2010). Does discovery-based instruction enhance learning? *Journal of Educational Psychology*. doi: 10.1037/a0021017.

Azevedo, F. S. (2006). Personal excursions: Investigating the dynamics of student engagement. *International Journal of Computers for Mathematical Learning*, *11*, 57-98.

Bakermans-Kranenburg, M., Van IJzendoorn, M., & Bradley, R. (2005). Those who have, receive: The Matthew effect in early childhood intervention in the home environment. *Review of Educational Research*, *75*, 1-26.

Barab, S. A., & Plucker, J. A. (2002). Smart people or smart contexts? Cognition, ability, and talent development in an age of situated approaches to knowing and learning. *Educational Psychologist*, *37*, 165-182.

Barber, M., & Mourshed, M. (2007). *How the world's best-performing school systems come out on top*. London: McKinsey and Company.

Barron, B. (2006). Interest and self-sustained learning as catalysts of development: A learning ecology perspective. *Human Development*, *49*, 193-224.

Barron, B., Walter, S. E., Martin, C. K., & Schatz, C. (2010). Predictors of creative computing participation and profiles of experience in two Silicon Valley middle schools. *Computers & Education*, *54*, 178-189.

Bast, J., & Reitsma, P. (1997). Matthew effects in reading: A comparison of latent growth curve models and simplex models with structured means. *Multivariate Behavioral Research*, *32*, 135-167.

Bentley, M. L. (1995). Making the most of the teachable moment: Carpe diem. *Science Activities*, *32*, 23-27.

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development*, *78*, 246-63.

Bower, M. (2008). Affordance analysis--matching learning tasks with learning technologies. *Educational Media International*, *45*, 3-15.

Bulunuz, N., & Jarrett, O. S. (2010). The effects of hands-on learning stations on building American elementary teachers' understanding about earth and space science concepts. *Science*, *6*, 85-99.

Burstall, C. (1978). The Matthew effect in the classroom. *Educational Research*, *21*, 19-25.

Calderhead, J. (1996). Teachers: Beliefs and knowledge. In D. C. Berliner & R. C. Calfee, (Eds.), *Handbook of educational psychology* (pp. 709-725). New York, London: Macmillan.

Carey, S. (2000). Science education as conceptual change. *Journal of Applied Developmental Psychology*, *21*, 13-19.

Ceci, S. J., Barnett, S. M., & Kanaya, T. (2003). Developing childhood proclivities into adult competencies: The overlooked multiplier effect. In R. J. Sternberg, E. L. & Grigorenko (Eds.), *The psychology of abilities, competencies, and expertise* (pp. 70-92). New York, NY: Cambridge University Press.

Chamot, A. U., & O'Malley, J. M. (1996). The cognitive academic language learning approach: A model for linguistically diverse classrooms. *The Elementary School Journal*, *96*, 259-273.

Christoff, K., Keramatian, K., Gordon, A. M., Smith, R., & Mädler, B. (2009). Prefrontal organization of cognitive control according to levels of abstraction. *Brain Research*, *1286*, 94-105.

Colvin, G. (2008). *Talent is overrated*. Boston: Nicholas Brealy Publishing.

Coyle, D. (2009) *The Talent Code: Greatness isn't born. It's grown. Here's how*. New York: Bantam Books.

Dai, D. Y. (2005). Reductionism versus emergentism: A framework for understanding conceptions of giftedness. *Roeper Review*, *27*, 144-151.

Dawson-Tunik, T., Commons, M., Wilson, M., & Fischer, K. W. (2005). The shape of development. *European Journal of Developmental Psychology*, *2*, 163-195.

Deci, E. L., & Ryan, R. M. (2009). Self-determination theory: A consideration of human motivational universals. In G. Matthews (Ed.), *The Cambridge handbook of personality psychology* (pp. 441-456). New York, NY: Cambridge University Press.

De Groot, A. D. (1969). *Methodology. Foundations of inference and research in the behavioral sciences*. The Hague: Mouton.

Dehaene, S. (2007). A few steps toward a science of mental life. *Mind, Brain, and Education*, *1*, 28-47.

Doucerain, M., & Schwartz, M. S. (2010). Analyzing learning about conservation of matter in students while adapting to the needs of a school. *Mind, Brain, and Education*, *4*, 112-124.

Dweck, C. S. (2007). The perils and promises of praise. *Educational Leadership*, *65*, 34-39.

Dweck, C., Chiu, C., & Hong, Y. (1995). Implicit theories and their role in judgments and reactions: A word from two perspectives. *Psychological Inquiry*, *6*, 267-285.

Ericsson, K. A. (1996). The acquisition of expert performance: An introduction to some of the issues. In K. A. Ericsson (Ed.), *The road to excellence: The acquisition of expert performance in the arts and sciences, sports, and games*(pp. 1-50). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Ericsson, K. A., Roring, R. W., & Nandagopal, K. (2007). Giftedness and evidence for reproducibly superior performance: An account based on the expert performance framework. *High Ability Studies*, *18*, 3-56.

Fields, R. D. (2006). Myelination: An overlooked mechanism of synaptic plasticity? *The Neuroscientist, 11*, 528-531.

Fischer, K. W. (2009). Mind, brain, and education: Building a scientific groundwork for learning and teaching 1. *Mind, Brain, and Education*, *3*, 3-16

Fischer, K. W., & Bidell, T. R. (2006). Dynamic development of action and thought. In W. Damon (Ed.), *Handbook of child psychology (6th ed.): Vol 1, theoretical models of human development*. (pp. 313-399). Hoboken, NJ: John Wiley & Sons Inc.

Fischer, K. W., Goswami, U., & Geake, J. (2010). The future of educational neuroscience. *Mind, Brain, and Education*, *4*, 68-80.

Fischer, K. W., & Rose, S. P. (1994). Dynamic development of coordination of components in brain and behavior: A framework for theory and research. In G. Dawson & K. W. Fischer (Eds.) , *Human behavior and the developing brain* (pp. 3-66). New York, NY: Guilford Press.

Foo, S. Y., & Hedberg, J. G. (2005). Teacher understandings of technology affordances and their impact on the design of engaging learning experiences. *Educational Media International*, *42*, 297-316.

Frith, U., & Frith, C. (2010). The social brain: Allowing humans to boldly go where no other species has been. *Philosophical transactions of the Royal Society of London. Series B, Biological Sciences*, *365*, 165-176.

Gagné, F. (2004). Transforming gifts into talents: The DMGT as a developmental theory. *High Ability Studies*, *15*, 119-147.

Gelman, R., & Brenneman, K. (2004). Science learning pathways for young children. *Early Childhood Research Quarterly*, *19*, 150-158.

Hannust, T., & Kikas, E. (2007). Children's knowledge of astronomy and its change in the course of learning. *Early Childhood Research Quarterly*, *22*, 89-104.

Hannust, T., & Kikas, E. (2010). Young children's acquisition of knowledge about the Earth: A longitudinal study. *Journal of Experimental Child Psychology*, *107*, 164-180.

Hansen, L. & Monk, M. (2002). Brain development, structuring of learning and science education: Where are we now? A review of some recent research. *International Journal of Science Education*, *24*, 343-356.

Hapgood, S., Magnusson, S., & Palincsar, A. S. (2004). Teacher, text, and experience: A case of young children's scientific inquiry. *The Journal of the Learning Sciences*, *13*, 455-505.

Henrichs, L. F. (2010). *Academic language in early childhood interactions. A longitudinal study of 3- to 6-year-old Dutch monolingual children*. Amsterdam: Doctoral dissertation. University of Amsterdam.

Hidi, S., & Renninger, K. A. (2006). The Four-Phase Model of Interest Development. *Educational Psychologist*, *41*, 111-127.

Hogan, T., & Rabinowitz, M. (2009). Teacher expertise and the development of a problem representation. *Educational Psychology*, *29*, 153-169.

Horowitz, F. D., Subotnik, R. F., & Matthews, D. J. (Eds). (2009). *The development of giftedness and talent across the life span*. Washington, DC: American Psychological Association.

Howe, M. J. A. (Ed.). (1990). *Encouraging the development of exceptional skills and talents*. Oxford, England: British Psychological Society.

Hyun, E., & Marshall, J. D. (2003). Teachable-moment-oriented curriculum practice in early childhood education. *Journal of Curriculum Studies*, *35*, 111-127.

Immordino-Yang, M., & Damasio, A. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain, and Education*, *1*, 3-10.

James, M. C., & Scharmann, L. C. (2007). Using analogies to improve the teaching performance of preservice teachers. *Journal of Research in Science Teaching*, *44*, 565-585.

Kang, N.-H. (2007). Elementary teachers' epistemological and ontological understanding of teaching for conceptual learning. *Journal of Research in Science Teaching*, *44*, 1292-1317.

Kikas, E. (2004). Teachers' conceptions and misconceptions concerning three natural phenomena. *Journal of Research in Science Teaching*, *41*, 432-448.

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist*, *41*, 75-86.

Krapp, A. (2007). An educational-psychological conceptualisation of interest. *International Journal for Educational and Vocational Guidance*, *7*, 5-21.

Lehrer, R., & Schauble, L. (2005). Developing modeling and argument in the elementary grades. In T. A. Romberg, T. P. Carpenter & F. Dremock, (Eds.), *Understanding mathematics and science matters* (pp. 29-53). Mahwah, NJ: Lawrence Erlbaum Associates.

Lehrer, R., Schauble, L., & Lucas, D. (2008). Supporting development of the epistemology of inquiry. *Cognitive Development*, *23*, 512-529.

Leroy, N., Bressoux, P., Sarrazin, P., & Trouilloud, D. (2007). Impact of teachers' implicit theories and perceived pressures on the establishment of an autonomy supportive climate. *European Journal of Psychology of Education*, *22*, 529-545.

Lewis, M. D. (2005). Self-organizing individual differences in brain development. *Developmental Review*, 25, 252-277.

Lykken, D., McGue, M., Tellegen, A., & Bouchard, T. (1992). Emergenesis: Genetic traits that may not run in families. *American Psychologist*, 47, 1565-1577.

Mantzicopoulos, P., Patrick, H., & Samarapungavan, A. (2008). Young children's motivational beliefs about learning science. *Early Childhood Research Quarterly*, *23*, 378-394.

Mantzicopoulos, P., Samarapungavan, A., & Patrick, H. (2009). 'We learn how to predict and be a scientist': Early science experiences and kindergarten children's social meanings about science. *Cognition and Instruction*, *27*, 312-369.

Masterplan Ruimte voor talent, ruimte voor wetenschap en techniek. http://www.kwtg.nl/sites/kwtg/nieuws/masterplan-ruimte-voor-ta/index.xml

Mayer, R. E. (2004). Should there be a three-strikes rule against pure discovery learning? The case for guided methods of instruction. *The American Psychologist*, *59*, 14-9.

Mazens, K., & Lautrey, J. (2003). Conceptual change in physics: Children's naive representations of sound. *Cognitive Development*, *18*, 159-176.

McDevitt, T. M., & Ormrod, J. E. (2008). Fostering conceptual change about child development in prospective teachers and other college students. *Child Development Perspectives*, *2*, 85-91.

Meindertsma, H., Van Dijk, M., & Van Geert, P. (2010). *Children's scientific reasoning in the context of child-adult interaction*. Unpublished manuscript, University of Groningen.

Metz, K. E. (2004). Children's understanding of scientific inquiry: Their conceptualization of uncertainty in investigations of their own design. *Cognition and Instruction*, *22*, 219-291

Metz, K. (2011). Disentangling robust developmental constraints from the instructionally mutable: Young children's epistemic reasoning about a study of their own design. *Journal of the Learning Sciences*, *20*, 50-110.

Murphy, M. C., & Dweck, C. S. (2010). A culture of genius: How an organization's lay theory shapes people's cognition, affect, and behavior. *Personality & Social Psychology Bulletin*, *36*, 283-96.

Neitzel, C., Alexander, J. M., & Johnson, K. E. (2008). Children's early interest-based activities in the home and subsequent information contributions and pursuits in kindergarten. *Journal of Educational Psychology*, *100*, 782-797.

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, *62*, 307-332.

Renninger, K. A., & Hidi, S. (2002). Student interest and achievement: Developmental issues raised by a case study. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation*. (pp. 173-195). San Diego, CA: Academic Press.

Roth, W.-M. (1996). Teacher questioning in an open-inquiry learning environment: Interactions of context, content, and student responses. *Journal of Research in Science Teaching*, *33*, 709-736.

Runco, M., & Johnson, D. (2002). Parents' and teachers' implicit theories of children's creativity: A cross-cultural perspective. *Creativity Research Journal*, *14*, 427-438.

Sarama, J., & Clements, D. (2009). Teaching math in the primary grades: The Learning Trajectories Approach. *Young Children*, *64*, 63-65.

Scarborough, H., & Parker, J. (2003). Children's learning and teachers' expectations: Matthew effects in children with learning disabilities: Development of reading, IQ, and psychosocial problems from grade 2 to grade 8. *Annals of Dyslexia*, 5347-5371.

Schiefele, U., Krapp, A., & Winteler, A. (1992). Interest as a predictor of academic achievement: A meta-analysis of research. In K. A. Renninger, S. Hidi & A. Krapp, (Eds.), *The role of interest in learning and development* (pp. 183-212). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Schleppegrell, M. J. (2004). *The language of schooling: a functional linguistics perspective*. London: Lawrence Erlbaum Associates.

Schwartz, M. (2009). Cognitive development and learning: Analyzing the building of skills in classrooms. *Mind, Brain, and Education*, *3*, 198-208.

Simonton, D. (1999). Talent and its development: An emergenic and epigenetic model. *Psychological Review*, *106*, 435-457.

Simonton, D. (2001). Talent development as a multidimensional, multiplicative, and dynamic process. *Current Directions in Psychological Science*, *10*, 39-43.

Simonton, D. K. (2003). Scientific creativity as constrained stochastic behavior: The integration of product, person, and process perspectives. *Psychological Bulletin*, *129*, 475-494.

Singer, F. M. (2007). Beyond conceptual change using representations to integrate domain-specific models in learning mathematics., *Mind, Brain and Education*, *1*, 84-97

Stanovich, K. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, *21*, 360-406.

Start science sooner (2010). *Scientific American*, *302*, 28. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=47886562&site=ehost-live&scope=site.

Steenbeek, H., & Uittenbogaard, W. (2009). Bèta-talenten van jonge kinderen in kaart. *Panama-Post. Reken-wiskundeonderwijs: onderzoek, ontwikkeling, praktijk*, *28*, 89-100.

Steenbeek, H. Jansen, L., & Van Geert, P. (Submitted). Scaffolding dynamics during instruction and its role in the emergence of problematic learning trajectories.

Steenbeek, H., Meissner, R., Hageman, N., & Van Vondel, S. (2010). 'Having eyes, giving eyes, receiving eyes'. RUG Contribution to the 2010 VTB – Pro 2010 Annual report.

Steenbeek, H., & Van Geert, P. (Submitted). A complex dynamic systems approach to teaching-learning processes in primary education.

Steenbeek, H., Van Geert, P., & Fraiquin, M. (2010). Pilot research project 'Expert center talent schools'. Internal report, submitted to Platform Betatechniek.

Steenbeek, H. & Van Geert, P. (2008). The empirical validation of a dynamic systems model of interaction; Do children of different sociometric statuses differ in their dyadic play interactions? *Developmental Science*, *11*, 253-281.

Steenbeek. H., & Van Geert, P. (2007). A dynamic systems approach to dyadic interaction in children: Emotional expression, action, dyadic play, and sociometric status. *Developmental Review*, *27*, 1-40.

Stiles, J. (2000). Neural plasticity and cognitive development. *Developmental Neuropsychology*, 18, 237-72.

Straatemeier, M., Van der Maas, H. L. J., & Jansen, B. R. J. (2008). Children's knowledge of the earth: A new methodological and statistical approach. *Journal of Experimental Child Psychology*, *100*, 276-96.

Thelen, E., &. Smith L. B. (1994). *A dynamic systems approach to the development of cognition and action*, Cambridge, MA: MIT Press.

Thompson-Schill, S., Ramscar, M., & Chrysikou, E. G. (2009). Cognition without control: When a little frontal lobe goes a long way. *Current Directions in Psychological Science*, *18*, 259-263.

Toulmin, S. (1958/2003). *The Uses of Argument*. Cambridge: Cambridge University Press, 1958.

Trumper, R. (2006). Teaching future teachers basic astronomy concepts – seasonal changes – at a time of reform in science education. *Journal of Research in Science Teaching*, *43*, 879-906.

Trundle, K. C., Atwood, R. K., & Christopher, J. E. (2007). A longitudinal study of conceptual change: Preservice elementary teachers' conceptions of moon phases. *Journal of Research in Science Teaching*, *44*, 303-326.

Tytler, R., Waldrip, B., & Griffiths, M. (2004). Windows into practice: Constructing effective science teaching and learning in a school change initiative – research report. *International Journal of Science Education*, *26*, 171-194.

Van Aalderen-Smeets, S.I. Walma van der Molen, J.W., & Asma, L.J.F (in press). *Primary teachers' attitudes towards science and technology: A new theoretical framework*.

Van Benthem, J., Dijkgraaf, R., & De Lange, J. (2005). *Talentenkracht*. Den Haag: PBT.(http://cms.dynaweb3.nl/users/talentenkracht//docs/Publicaties/talentenkracht.pdf)

Van der Steen, S., Steenbeek, H., & Van Geert, P. (2010). *The development of understanding scientific concepts*. Groningen: Unpublished manuscript, University of Groningen.

Van Dijk, M., Van Geert, P., & Steenbeek, H. (2010). De Talententuin: een nieuwe benadering van W&T talent. *TK-Magazine*. The Hague: PBT.

Van Geert, P. (1991). A dynamic systems model of cognitive and language growth. *Psychological Review*, 98, 3-53.

Van Geert, P. (1994). *Dynamic systems of development. Change between complexity and chaos*. New York: Harvester.

Van Geert, P. (2008). Nonlinear-complex-dynamic-systems in developmental psychology. In S. Guastello, M. Koopmans, & D. Pincus (Eds.), *Chaos and complexity in psychology - The Theory of Nonlinear Dynamical Systems* (pp. 242-281). Cambridge: Cambridge University Press

Van Geert, P. (2009). Complex dynamic systems of development. In R. A. Meyers (Ed.), *Encyclopedia of complexity and system science*. *Vol. 2 Applications of physics and mathematics to social science* (A. Nowak, Ed.) (pp. 1872-1916). New York: Springer.

Van Geert, P. & Steenbeek, H. (2005a). Explaining after by before. Basic aspects of a dynamic systems approach to the study of development. *Developmental Review*, *25*, 408-442.

Van Geert, P. & Steenbeek, H. (2005b). The dynamics of scaffolding. *New Ideas in Psychology*, *23*, 115-128.

Van Geert, P. & Steenbeek, H. (2007). *Waar ligt de kracht: een definitie van talent en talentontwikkeling*. Intern Rapport TK/RuG.

Van Geert, P. L. C., & Fischer, K. W. (2009). Dynamic systems and the quest for individual-based models of change and development. In J. P. Spencer, M. S. C. Thomas, & J. McClelland (Eds), *Toward a new Grand Theory of Development? Connectionism and Dynamic Systems Theory reconsidered*. Oxford: Oxford University Press.

Van Keulen, A. (2011). *Wetenschap en techniek: IJkpunten voor een domein in ontwikkeling* [Science and Technology: standards for a domain in development]. The Hague: Platform Beta Techniek.

Vosniadou, S. (1994). Capturing and modeling the process of conceptual change. *Learning and Instruction*, *4*, 45-69.

Vosniadou, S. (2007). The cognitive-situative divide and the problem of conceptual change. *Educational Psychologist*, *42*, 55-66.

Vosniadou, S. (2009). 'Conceptual metaphor meets conceptual change': Yes to embodiment, no to fragmentation. *Human Development*, *52*, 198-204.

Vosniadou, S., Ioannides, C., Dimitrakopoulou, A., & Papademetriou, E. (2001). Designing learning environments to promote conceptual change in science. *Learning and Instruction*, *11*, 381-419.

Vygotsky, L. (1934/1986). *Thought and language*. Cambridge (Ma): MIT Press.

Walberg, H., & Tsai, S. (1983). Matthew effects in education. *Educational Research Quarterly*, *20*, 359-373.

Wallace, S. (2009). *A Dictionary of Education*. Oxford: Oxford University Press.

Walma van der Molen, J.H. (2009). Attitude ten opzichte van techniek en wetenschap onder leerkrachten in het basisonderwijs.[Attitude towards science and technology of primary school teachers]. In H. van Keulen & J. H. Walma van der Molen (Eds.), *Onderzoek naar wetenschap en techniek in het basisonderwijs*. [Research into science and technology in elementary education]. Proceedings Onderwijs Research Dagen 2008.

Wetzels, A., Steenbeek, H., & Van Geert, P. (2011). Teachable science moments in the classroom and how to promote them. Groningen: Unpublished manuscript. University of Groningen.

Winner, E. (2000). The origins and ends of giftedness. *The American Psychologist*, 55, 159-169.

Woltering, S., & Lewis, M. D. (2009). Developmental pathways of emotion regulation in childhood: A neuropsychological perspective. *Mind, Brain and Education*, *3*, 160-169.

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Notes for contributors

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