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## Impact of an in-service training in neurocognitive insights on teacher stress, teacher professionalism and teacher student relationships

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### ABSTRACT

The stressful nature of the teaching profession is recognised worldwide. Consistent with the recent international attention regarding the connection between neurocognition and education, the study 'Learn2be@school' introduced a training for teachers about the occurrence of stress and the relationship between human behaviour and the functioning of the human brain. This study investigates whether neurocognitive insights contribute to stress reduction in the professional and personal functioning of teachers, and focuses more specifically on the impact of the training on their attitudes (attitude level), understanding (knowledge level) and handling (application level) of complex stress situations. Using a quasi-experimental study design with 12 participants and 28 non-participants, data were gathered twice through the use of vignettes and in-depth interviews. The results indicated an impact of the training, not only on the stress experienced by teachers in their professional and personal functioning, but also at the level of the teacher–student relationship and team functioning.

### KEYWORDS

In-service training; neurocognition; teacher stress reduction; teacher–student relationship; vignette technique

### Introduction

In the past decades, research has focused increasingly on teachers' well-being. This growing attention is a result of social changes, of which the consequences are also felt professionally. Through the years, working conditions, objectives and professional profiles have been subject to change as a result of changing societal expectations and needs (Klassen et al. 2009; Nübling et al. 2011).

These developments have inevitably had an impact on individuals' well-being, as has been frequently demonstrated (Carlyle and Woods 2004; Lhospital and Gregory 2009; Mazzola, Schonfeld, and Spector 2011). Stress is one indicator of low well-being. When looking at all life domains, stress is mostly experienced professionally (Austin, Shah, and Muncer 2005). On average, people report 5.2 stressful work events a week. With regard to the teaching

profession, it is recognised worldwide that it is one of the most stressful jobs (Carlyle and Woods 2004; Lhospital and Gregory 2009; Nübling et al. 2011). Johnson et al. (2005) stated that teachers score below average on physical health, psychological well-being and job satisfaction. They also have an increased risk of burnout and a higher prevalence rate of psychosomatic complaints. In addition, the number of therapeutic treatments of stress-related disorders is growing, such as depression (Austin, Shah, and Muncer 2005), and some teachers may retire early because of medical health issues, causing teacher shortages (Nübling et al. 2011).

Since the 1990s, in an attempt to help teachers' well-being, there has been growing attention in education research regarding the functioning of the human brain. Contemporary names, such as 'neuro-education' and 'educational neuroscience', refer to the relationship between both scientific disciplines (Ansari, Coch, and De Smedt 2011; Ferrari 2011; Schrag 2013). Since the brain plays a crucial role in learning and development, the attention of educational scientists regarding neurocognition is not surprising. This attention manifests itself in a recent international trend towards the application of neurocognitive insights in the classroom and school context (Ansari, Coch, and De Smedt 2011; Ferrari 2011). In this study, neurocognitive insights were applied by means of a teacher-training programme, based on the Neurocognitive and Behavioural Method (NBM), aiming at effectively handling and reducing teacher stress in their professional and personal functioning.

### **Teacher stress**

The emotionally burdensome nature of the teaching profession plays a crucial role in the high degree of stress experienced (Bakker and Demerouti 2007; Simbula et al. 2012). Johnson et al. (2005) identified the teaching profession as an emotionally taxing job. Therefore, they concluded that teachers are at greater risk of stress. In addition, interpersonal conflicts are regarded as the most common stressors for teachers (Mazzola, Schonfeld, and Spector 2011; Nübling et al. 2011). Conflicts with parents or colleagues, role ambiguity, a poor self-efficacy and an imbalance between work and family are other important stressors mentioned by teachers (Saleem and Shah 2011; Simbula et al. 2012).

Worldwide, it is recognised that stress has a negative impact on the overall well-being of teachers (Carlyle and Woods 2004; Johnson et al. 2005; Lhospital and Gregory 2009; Mazzola, Schonfeld, and Spector 2011; Nübling et al. 2011). From a physiological perspective, Ganster and Rosen (2013) state that stress affects well-being because it leads to complaints (physical, psychological and psychosomatic) or changes in the functioning of the metabolic, cardiovascular and immune system. Furthermore, stress may affect teachers' professional development and the teaching practice. Lhospital and Gregory (2009) focus on the effect of stress on the teacher-student relationship. Stress impacts the way a teacher supports his students, with stressed teachers being less tolerant with regard to student behaviour, having less-efficient classroom management strategies and having poorer relationships with 'difficult' or 'troubled' students; students from a stressed teacher exhibit adjustment problems and have poorer school performances. Shaped by one's beliefs and experiences in social interaction with others, also teachers' professional identity (i.e. the way teachers define themselves) and reflective thinking (e.g. problem-solving and responsiveness to innovations) are negatively affected by teacher stress (Slay and Smith 2011; Urzúa and Vásquez 2008).

The way in which teachers deal with stress and its negative effects is referred to as 'coping' (Mazzola, Schonfeld, and Spector 2011). According to Verešová and Malá (2012), proactive coping is the most effective way to reduce stress. Together with physical and social activities and systematic problem-solving, relaxation is the most popular coping strategy reported by teachers (Austin, Shah, and Muncer 2005). Mindfulness training, such as Mindfulness-Based Stress Reduction (MBSR), has been found to decrease perceived stress through the use of meditation techniques (Gold et al. 2010; Nyklíček and Kuijpers 2008). Austin, Shah, and Muncer (2005) further believed that training with attention to insight in stress factors, aggression management and the correction of negative coping are effective strategies to help teachers cope with stress.

### ***Neurocognitive and Behavioural Method (NBM)***

The Neurocognitive and Behavioural Method (NBM) was developed by Jacques Fradin and focuses on the relationship between human behaviour and the structure and the functioning of the human brain (Fradin and Fradin 2006). According to Fradin (2011), human behaviour is driven by the four brain areas, each with a separate function and way of functioning (Carter et al. 2009).

The NBM considers stress as a result of a conflict between two brain areas: the neo-limbic area (or automatic way of cognitive functioning), which controls everyday functioning and automatic behaviour, and the prefrontal area (or prefrontal way of cognitive functioning), which makes it possible to adapt to new or complex situations. Stress and serenity are the main characteristics of these two mental modes. A switch from an automatic to a prefrontal mode is needed when the automatic way of functioning does not comply because of a new or complex situation. If, in such a new or complex situation, the switch does not occur, stress arises (Fradin 2011). Imagine, for example, a teacher who has to implement a new evaluation method. A more refusing attitude would automatically dominate in everyday life, characterised by fear of the new, stubbornness, black and white thinking, and possibly by stress. A reaction such as 'Let's try this new evaluation method', however, reflects a more prefrontal way of functioning, characterised by an open, nuanced and relativistic perspective, curiosity, flexibility, empathy and inner peace (Fondation n.d.).

In line with NBM's objectives to promote more serenity and an increased sense of well-being, the training aims to give teachers more insight and awareness of their own and others' functioning, as well as in the relationship between this behaviour and neurocognition.

### ***Current study***

The current study examines whether such a training helps teachers in mainstream elementary education to respond to stress. The first research question was: 'What is the impact of the training on the teachers' experienced stress in their professional and personal functioning?'. In line with the study of Nübling et al. (2011), which demonstrated that an imbalance between work and privacy is a major stress factor, we studied both teachers' professional and personal functioning. In addition, we studied not only a short-term impact, but also the impact over time. The second research question was: 'What is the short-term and medium- to long-term perceived impact of the training?'

## Methods

### Design

Within a quasi-experimental research design, the impact of the training was examined using an experimental and a control group. Qualitative data were collected through the use of vignettes and in-depth interviews, indicating a mixed-method research design. For the experimental group, the interviews and the vignettes were orally administered at two moments: June and October 2013. Due to prolonged absence, one teacher did not participate in October. For the control group, the vignettes were administered in written form in June. Because it was not feasible to interview all teachers of the control group within the time frame, a written enquiry of the vignettes for the non-participating teachers was a deliberate choice.

### Training

The training consisted of four theoretical (whole day) and four practical sessions (half a day), spread over the period November 2012–May 2013. Module I considered relational stress management and the control of the mental modes (automatic and prefrontal cognitive functioning). Module II was about aggression management, and Module III considered the relationship between personalities and (de)motivation (Fondation n.d.).

### Research method

#### Vignettes

Vignettes are fictitious, but realistic situations, which the respondents may face in their daily functioning. The goal is to get a picture of their perceptions, beliefs, values and attitudes, and the way they deal with these situations as they reflect on the vignettes (Barter and Renold 1999; Hughes 1998; Jenkins et al. 2010). Two similar sets of three vignettes were developed in cooperation with the organisers of the training and covered the topics that were addressed in the training since the use of a maximum of four vignettes is desirable during one enquiry (Bloor and Wood 2006; Finch 1987). In each set, Vignettes 1 and 2 focused on the professional functioning and Vignette 3 focused on the teachers' personal functioning (see Table 1). Because we were not only interested in how they deal with the situations, but also in the recognisability and the degree of stress related to these situations, the following questions were presented after each vignette: (1) 'How recognisable is this situation for you on a 10-point Likert scale ranging from 1 ('not at all recognisable') to 10 ('very recognisable')?'; (2) 'How much stress would you experience in this situation on a 10-point Likert scale ranging from 1 ('no stress') to 10 ('a lot of stress')?'; and (3) 'How would you deal with this situation?'. For the participants (experimental group), a fourth question was added: (4) 'Imagine being confronted with this situation before participating in the training, would your reaction be any different?'. The questions were explicitly formulated to be neutral and open, to be able to address the respondents' experiences and interpretations.

#### In-depth interviews

With the interviews, we wanted to obtain more in-depth information on the perceived impact of the training. Interview 1 (June) focused on the impact on the professional, personal,

**Table 1.** Three vignettes (June).

Vignette 1	Victor has insufficiently mastered the taught curriculum; therefore his school results are substandard. He takes little to no initiative and asks no questions. It seems that he is not concerned with what happens in the classroom because he always sits quietly in the back of the class, looking at his books. In the playground, he is often alone. The end of the school year is approaching and during a conversation with his parents you want to discuss the alarming situation. However, they are very demanding and they do not accept their son's school results. You have already had some difficult conversations with his parents during the course of the school year.
Vignette 2	Frederik often disturbs the lesson. He is very active, a real joker and he likes to seek danger. As a result, he sometimes distracts other students. His mother is coming to see you so you can discuss the situation. However, because she has been aggressive in the past you do not feel like talking to her.
Vignette 3	It is 7 pm. You are at home preparing tomorrow's meeting with one of your student's parents. You also have some other administrative work that has to be done by the end of the week. In addition, your son came home sick from school and he requires a lot of your attention. You are very busy and you do not know what to do first.

student and school levels. In interview 2 (October), similar questions were asked to examine whether any differences in the participants' experiences had occurred. We used semi-structured questions (Cohen, Manion, and Morrison 2011).

### Respondents

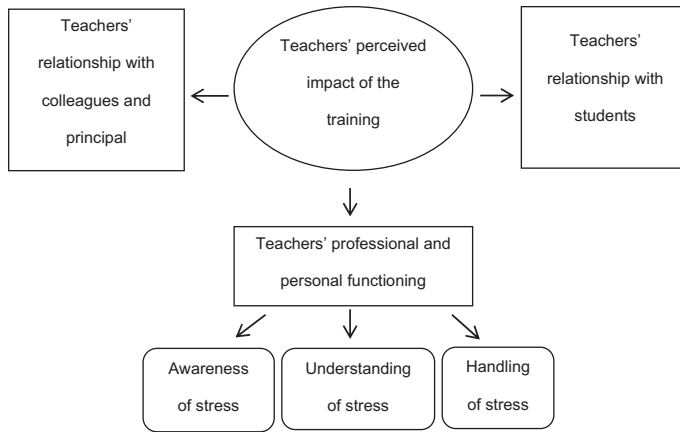
The experimental group consisted of 12 participants (teachers and principals) from six elementary schools situated in Flanders (Belgium), who subscribed voluntarily to the training. Eleven participants were females and one was male. Ten participants were full-time employed and two participants worked part-time. The average age was 38 years ( $SD = 9.79$ ); the participants had an average of 15 years ( $SD = 11.44$ ) of teaching experience (with a minimum and maximum of 1.5 and 38 years).

Fifty-five non-participants (colleagues of the participants who did not attend the training) were invited to participate in the study by letter and received the same set of vignettes and questions, as developed for the experimental group. Twenty-eight non-participants completed the forms and gave comprehensive responses, 25 were females and 3 were males. Twenty-five non-participants were full-time employed and two worked part-time. The average age was 33 years ( $SD = 7.74$ ) and the average work experience as a teacher was 11 years ( $SD = 7.71$ ) (with a minimum and maximum of 1 year and 30 years).

### Data analysis

The responses to the vignettes were analysed in a qualitative and quantitative way. First, we examined whether there was an impact of the training on three levels: attitude level (emotional state and awareness); knowledge level (knowledge of the training); and application level (application of knowledge in simulated real-life situations). Given her expertise in the NBM, the trainer participated in this analysis. The analysis showed to what extent the respondents reflected an impact of the training on these three levels, ranging from a limited (–) to a very high impact (+++). Second, descriptive statistics were performed on the recognisability and stress scores of the participants and non-participants.

The in-depth interview data were analysed using NVivo (Richards 1999). All the information was encoded by using open coding to label and sort the information. A basic coding



**Figure 1.** Theoretical concepts of the study identified during the coding process of the in-depth interview data.

scheme, based on the interview guidelines, was used and adjusted with the creation of codes during the coding process itself. Furthermore, the concepts in the study were defined and the codes were further refined and deepened, using axial and selective coding (see Figure 1). The analysis of the in-depth interview data aimed at gaining insight into the teachers' perceived impact of the training. This impact was studied on three levels, more specifically the teachers' professional and personal functioning (i.e. impact on individual level) – specified as teachers' awareness of stress on attitude level and their understanding and handling of stress situations on knowledge and application level – as well as teachers' interactions and relationships with students (i.e. impact on student level), colleagues and the principal (i.e. impact on school level).

## Results

### Vignettes

Table 2 shows the results of the analysis of the recognisability and stress scores of the participants and non-participants, in June and October.

**Table 2.** Recognisability and stress scores.

	Recognisability scores		Stress scores	
	Jun	Oct	Jun	Oct
Participants				
Vignette 1	6.8	6.5	5.4	5.2
Vignette 2	8.5	6.6	7.1	7.0
Vignette 3	7.0	6.1	6.4	5.2
Non-participants				
Vignette 1	6.4	/	5.5	/
Vignette 2	4.5	/	5.2	/
Vignette 3	5.5	/	5.9	/

Note: Jun = June; Oct = October.

### Recognisability

Vignette 2 was most recognisable for the participants, whereas Vignette 1 was most recognisable for the non-participants. The Mann-Whitney U Test revealed a significant difference in recognisability of Vignette 2 for the participants, compared to the non-participants ( $U = 17$ ;  $z = -3.64$ ;  $p < .001$ ;  $r = -.56$ ). In addition, we noticed an overall decrease in recognisability between June and October for the participants.

### Experienced stress

The participants considered Vignette 2 as the most stressful, while the non-participants considered Vignette 3 as the most stressful. The Mann-Whitney U Test revealed a near statistical significant difference between the participants' and the non-participants' experienced stress concerning Vignette 2 ( $U = 71.5$ ;  $z = -1.95$ ;  $p = .05$ ;  $r = -.31$ ).

### Attitude, application and knowledge level

Table 3 shows the results concerning the responses of the experimental group to the vignettes, more specifically to what extent the teachers' responses point to changes in attitude, application and knowledge level, ranging from in a very limited (–) to a very strong (+++) degree.

The highest impact of the training was situated at the attitude level. The participants showed a greater awareness of their own state of mind, their own and others functioning, and the degree of stress related thereto. A response as 'I can see that this parent finds herself in a stressful situation, so I first need to work on that before I can have a constructive conversation' (Emily), illustrates this. A reply like 'Trying much more to find out whether the problem might be me or the other to see whether we can do something about it' (Grace), points to an open and relational perspective, and to the manifestation of a prefrontal attitude. The non-participants' responses showed that they not only had a lesser degree of awareness of their own state of mind, functioning and stress, but also a more automatic way of cognitive functioning. They interpreted the vignettes in a more limited way by showing more prejudiced reactions, making external attribution and not reflecting on the behaviour described in the vignettes: 'I find it very difficult to deal with such pupils, it is not always necessary to respond because they often seek negative attention' (River); 'It's unfortunate that parents refuse to see the problem' (Jake); and 'The problems are clearly a result of a very poor well-being' (Matt). The

**Table 3.** Data analysis of the responses to the vignettes.

	Attitude		Application		Knowledge	
	Jun	Oct	Jun	Oct	Jun	Oct
Brianna	+	+	+	+	+-	-
Brooke	+	+	+-	+-	-	--
Emily	++	+++	+	++	++	+
Grace	+	+	+-	+-	-	--
Kayla	+-	+	-	+-	-	--
Katherine	+-	-	+-	-	+-	-
Kylie	+	+	+	+	+	+-
Lilly	+	+	+	+	+	+-
Morgan	++	/	++	/	++	/
Nicole	+	++	+	++	+	+-
Natalie	+	++	+	++	+	+-
Pete	+	+	+-	+-	+-	-

Note: Jun = June; Oct = October. We used fictitious names.



non-participants' stress scores were also lower than those for the participants (see Table 2), indicating less awareness of the state of mind and functioning in relation to stress.

Compared to June, 10 participants in October experienced a lasting (six participants) or even growing (four participants) impact of the training. Responses to the vignettes reveal a greater awareness of their own functioning and state of mind while dealing with stressful situations, a stronger ability to put things into perspective and a greater self-confidence. Nicole, for example, said: 'Being able to let go now is the difference. I have learned that things are just the way they are' (Nicole). Only one participant (Katherine) showed a decline or negative evolution, in terms of a prefrontal attitude.

To a lesser extent, the participants experienced an impact in terms of actually applying the neurocognitive insights in their professional and personal functioning. With regard to Vignette 2, for example, a teacher said to use insights concerning the management of aggression: 'In case of dominant parents, now I know that I have to be dominant as well. Neutral, not emotional and stick to the facts. I try to do that, whereas before the training I would have acted more emotionally' (Katherine). Most participants experienced a persistent or growing impact in October compared to June. The non-participants had a more general, non-individualised and solution-oriented approach to the situations described in the vignettes, and more often referred to external help from, for example, the principal or student guidance services. Answers, such as 'Give clear and adequate messages to the parents' (Joe); 'Talk with the parents in cooperation with a student counsellor' (Sean); and 'Consult a therapist' (Flynn), were very common among non-participants.

Finally, for some participants and to a lesser extent than the other levels, an impact on the knowledge level was demonstrated. Reactions in which teachers spoke about 'students with inhibition stress [as one of the stress forms referring to Vignette 1]' (Morgan) and 'little animators in the classroom [as a personality type referring to Vignette 2]' (Nicole), illustrate such theoretical insights, in particular by the use of NBM-related terminology. In October, even less participants used specific terminology or made referrals to what was learned during the training. As expected, non-participants made no use of specific terminology as they did not attend the training.

### ***In-depth interviews***

Additional information about the experienced impact was collected using interviews, which focused on changes in the teachers' personal and professional functioning, in interaction with students, their parents, colleagues and the principal.

### ***Impact on attitude, application and knowledge level***

All participants reported a strong effect of the training in terms of a greater awareness (attitude level) and understanding (knowledge level) of stressful situations and persons in their professional and personal functioning (e.g. in relation to raising their own children), and in terms of application of what was learned during the training (application level). For example, Pete told us about his professional functioning:

I think that I have more resources now ... that I have other ways to look at something. For example, the three types of stress and how to use these insights: to identify with parents; to adjust the approach when you know that people who will attack rather quickly [fight stress]; that you know that the emphasis in the beginning really must be on I need to set them at ease (Pete).

Morgan shared these personal experiences in relation to her son:

When I say in advance, 'You are not going to cry when I will come and get you later', that has no effect, that does not work. If I go and get him now and he sees me and he says 'I don't want to go home', then I say that I understand it and I become very gentle and my voice drops a little. Then we will talk briefly about something else, and then we go back to that feeling. Then I say what we are going to do. Surprisingly, things are stress-free back home. Just because you are aware that it is stress (Morgan).

Also Kylie, for example, talked about an exercise done during the training, in which the participants had to imagine that they were seaweed in order to distract the students from their stress: 'I often use the exercise of seaweed in the classroom. The children have their own towel and then we are on the beach. Seaweed tickles our toes. Really, it helps a lot' (Kylie).

In October, half of the participants experienced a greater impact than in June, both in terms of awareness (attitude level) and an increased use of the acquired insights of the training (application level), especially in their professional life. The other participants experienced less impact, both at the professional and personal level. Although some participants indicated that the time between the two interviews was too short to really experience an evolution, the majority mentioned the start of the school year as a possible explanation. Grace, for example, mentioned:

Last school year [at the time of the first interview] I really had the feeling that it was going very well, but now I rather think 'Did I follow the training?'. It seems that I am experiencing even more stress than before. I still try to keep calm and not to show the students that I am stressed, but it is hard when they misbehave. I really believe in the training, but I am not consciously paying attention to it now. I don't have the time to do that, it is the start of the school year and there are so many things I have to think about. I cannot think, for example, 'I have to distract a student', when he/she is in stress. The syllabus has also been stored in my closet during the summer holiday (Grace).

Finally, we noticed that the participants' responses in October were more general or vague, with fewer explicit references to the training. For example, in June, Lilly expressed a certain understanding of stress concerning the students in her class: 'Now I can recognise stress much faster and I can relate fight stress to aggressive behaviour, I think I also respond in a much calmer way now' (Lilly). Where, in October, she stated: 'It sometimes still happens that I shout. At that time I think "no, just keep quiet"' (Lilly).

### ***Perceived impact on teachers***

The majority of the participants reported less stress as a result of the training, both in their daily professional and personal activities. Lilly, for example, told us: 'I have found more peace. Instead of roaring, I now try to keep calm. I think that if you begin to roar and get stressed yourself, the children will also become very nervous' (Lilly). In October, half of the participants even indicated that they were more able to keep calm than in June. The other reported the opposite. In addition, a smaller number of participants experienced an impact in terms of more confidence, less impulsiveness and a larger ability to put things into perspective, in their professional and personal functioning. A statement, such as: 'If things are not done, things are not done. If homework is not done, sadly, I will write it in the school diary. Earlier, it was all my responsibility' (Brianna), illustrates this. In October, this impact was less explicitly mentioned.

### ***Impact on the teacher–student relationship and team functioning***

The majority of the participants indicated an impact of the training on their relationship with students and their functioning in the school team, but to a lesser extent in October compared to June. With respect to the relationship with students, they mentioned: less student stress, a more positive classroom climate, improved teacher–student relationships and a decrease of difficulties and unwanted, problematic student behaviour. Emily said about one of her students: ‘Because I can see that he is stressed, I respond differently. At the beginning of the school year there were moments that he really had aggression-attacks, in the last half year this has no longer occurred’ (Emily). Also, Morgan noticed a positive evolution in her reaction to the behaviour of one of her students:

A child in our school has been experiencing difficulties for a long time. When she is with me, I think her behaviour alternates between all possible forms of stress. As a result of me learning how to deal with that kind of behaviour, she can confess that she has done something wrong. Currently, I first go along with it until I notice that she calmed down and I can really talk to her. So yes, I think that is an amazing result that I ascribe to the training (Morgan).

At the school level, positive changes in the relationships with colleagues and the principal were reported, such as experiences of comradeship and fewer disputes. Reactions, such as ‘There were colleagues who sometimes bothered me, who annoyed me. Since the training it is much better. I have learned to be more assertive’ (Brianna) and ‘It is weird but I experience it also from the side of the principal, I feel that he is also a lot calmer’ (Kylie), illustrate this.

### **Discussion**

This small-scale study investigated the impact of a training in neurocognitive insights on stress experienced by elementary school teachers in their professional and personal functioning. Overall, the participants and non-participants considered the vignettes to be recognisable and stressful. These results are consistent with the worldwide recognised stressful nature of the teaching profession (Carlyle and Woods 2004; Lhospital and Gregory 2009; Mazzola, Schonfeld, and Spector 2011; Nübling et al. 2011).

Based on the results of both the vignettes and in-depth interviews, we conclude a positive perceived impact of the training on teachers’ stress levels, with regard to their professional and personal functioning. The greatest impact was situated at the attitude level. With regard to their attitudes and as a result of the training, the participants perceived stress more as a symptom of a specific way of cognitive functioning (Fradin 2011). Their responses to the vignettes, compared to those of the non-participants, showed that they were more able to switch from an automatic to a prefrontal mental mode, which was one specific goal of the training. Because the participants indicated that they experienced less stress in their professional and personal functioning, this switchover can be considered as an effective strategy in the reduction of or coping with stress. The participants’ higher stress scores to the vignettes (in comparison to the non-participants), however, do not match this finding, when we expect that effective stress coping leads to a decrease in experienced stress (Austin, Shah, and Muncer 2005; Verešová and Malá 2012). Alternatively, the higher stress scores of the participants possibly reflect the greater awareness of stress. Since this greater awareness refers to another outcome of the training, the higher stress scores can also be seen as a positive result. Further investigation is needed to study the relationship between stress awareness, perceived stress and prefrontal cognitive functioning as an effective coping strategy.

The positive changes in relation to their students that teachers experienced as a result of the training, are consistent with previous findings of Lhospital and Gregory (2009). According to their findings, a stress management training resulted in a more positive classroom climate, improved relationships with students and a decrease in students' unwanted or problem behaviour.

Because data were gathered at two moments (June and October), an evolution in the experienced impact and a possible medium–long impact could be examined. Despite positive evolutions of the perceived impact of the training over time (e.g. in terms of a greater awareness and a greater use of learned insights), participants also indicated that they experienced less impact in October (on attitude and knowledge level). In addition, they still showed a prefrontal attitude and still used insights from the training to approach stressful situations and persons, but far less explicit. The less-reported impact in October can be explained by the lack of need for teachers to revert to insights from the training, as a result of an internalisation of these insights and/or as a result of less-experienced stress. Reducing teachers' stress level was actually an explicit goal of the training and can therefore be seen as a positive result of the training. The lower stress scores of the participants in October are in line with this explanation and can be perceived as an indication of the medium- to long-term impact. Alternatively, as also stated by Baldwin and Ford (1988), the participants who reported less-experienced impact possibly failed to transfer the learned insights to the work context due to a violation of the conditions of transfer, namely the generalisation of the learned insights to the job and the maintenance of the learned material over a period of time on the job (Ford and Weissbein 1997). Since the second enquiry took place after the summer break and, at the same time, relatively shortly after the end of the training, especially, the violation of the second condition seems plausible.

In sum, the established and perceived impact of the training on the participants' attitudes (attitude level), handling (application level) and understanding (knowledge level) of stressful situations, strengthen the plea of Austin, Shah, and Muncer (2005) for more training with attention to insights in stress, cognitive-behavioural skills and aggression management. Where Austin, Shah, and Muncer (2005) used questionnaires, in this study, we collected qualitative data concerning the impact of training on teachers' stress using vignettes and in-depth interviews. In addition to interviews, which are more traditionally used to question experiences, perceptions and beliefs, vignettes were used in the current study. These fictitious, but at the same time realistic situations, have been proved to be very useful to complement the data based on self-perceptions because they make it possible to study concrete reactions and underlying insights and attitudes as well. In this way, vignettes are a good alternative for, for example, observations, in order to get a picture of concrete actions or practices of the individual.

Despite the valuable data found in this study, there are also a number of limitations and thus suggestions for future research. In the current study, the comparison between the results of the participatory and non-participatory group made it possible to conclude that the training did have an impact on the participants. The vignettes, however, were presented in a different manner to the participants (oral form) and non-participants (written form). Notwithstanding the fact that this distinction was a well-considered choice due to practical reasons, the written forms could have limited the non-participants in their chance to give an extensive and detailed reaction. Furthermore, the non-participants were not interviewed, so no additional questions or further explanations on their reactions were asked. Further,

given the time frame of the project, the retention measurement was done in October, shortly after the summer holiday (July–August), at the beginning of the school year. In order to draw even more powerfully supported conclusions concerning the impact experienced from the training, using pre-measurement data (before the start of the training) and a retention measurement during the next school year would add value to future research.

## Conclusion

The current study examined the impact of a training in neurocognitive insights on teachers' stress. Using the vignette technique, the training had a significant impact in terms of a change in attitudes (attitude level) and with regard to the application of insights (application level), but a lesser impact on the teachers' conceptualisation of theory (knowledge level). Participants showed a greater awareness of functioning, state of mind and stress, as well as clear prefrontal attitudes. The results of the interviews confirmed these findings. Furthermore, the in-depth interviews shed light on the nature of the perceived impact. Participants experienced less stress, more confidence, less impulsiveness and a larger ability to put things into perspective. They mentioned changes within themselves and their professional environment. The participants indicated that there was less stress in the classroom, teacher–student relationships were improved and unwanted or problematic students' behaviour was decreased. Also, they mentioned positive changes in their own attitude and their relationship with colleagues and the principal. By interviewing the participants on two occasions, a medium- to long-term impact of the training could be examined, but not with all teachers.

Given the significant positive impact of the training that could be demonstrated on multiple levels with regard to the teacher and the teaching practice, we believe that it would be very useful to implement trainings or courses about neurocognitive insights in pre-service teacher education, to contribute to the preparation of student teachers for their highly stressful future job. Special attention should be given by teacher educators to student teachers' conceptualisation of theory since the impact of the training in this study was perceived to a lesser extent on knowledge level, in comparison to attitude and application level. Furthermore, student teachers should have sufficient opportunities to develop their understanding of the learned insights in practice in order to establish and/or strengthen a possible impact on application level and in order to enhance a possible transfer to the later job context.

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