



Teacher Stress: A Psychobiological Approach to Stressful Interactions in the Classroom

Alexander Wettstein^{1*}, Sandra Schneider^{1,2}, Martin grosse Holtforth^{2,3} and Roberto La Marca^{4,5}

¹Department of Research and Development, University of Teacher Education Bern, Bern, Switzerland, ²Clinical Psychology and Psychotherapy, Department of Psychology, University of Bern, Bern, Switzerland, ³Psychosomatic Medicine, Department of Neurology, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland, ⁴Clinica Holistica Engiadina, Susch, Switzerland, ⁵Clinical Psychology and Psychotherapy, Department of Psychology, University of Zurich, Zürich, Switzerland

Teachers report elevated levels of stress and psychosomatic illnesses compared to other professions. Teacher stress has far-reaching consequences on their health outcomes, the student's motivation, and the economy. However, research on teacher stress relies mainly on self-reports, hence, assesses stress on purely subjective perception. Personal or subjective aspects can strongly influence these measures, and biological stress may even be unnoticed. It is, therefore, necessary to include both subjective and objective measures to investigate stress, preferably in real-life situations. This review aims to demonstrate the importance of a psychobiological ambulatory assessment (AA) approach to investigate teacher stress, in contrast to purely subjective measures. We discuss classroom disruptions as the primary stress factor within the classroom and how a multimethod AA approach using psychological measures while simultaneously recording classroom disruptions and biological stress reactions of teachers would enable a much deeper understanding of stressful transactional processes taking place in the classroom that has not been achieved before.

Keywords: stress, teaching, ambulatory assessment, mixed method approach, psychobiology of stress

INTRODUCTION

The challenges of today's life often require great mental and physical effort (Mariotti, 2015) and can lead to long-term health and social consequences (La Marca, 2016). Teachers are a particularly stressed professional group and are affected more than average by psychological and psychosomatic complaints (Scheuch et al., 2015). In self-reports, teachers have almost unanimously identified classroom disruptions as the main stress factor in previous empirical studies (Scherzinger and Wettstein, 2019). Short-term psychosocial stressors, such as classroom disruptions, burden and impair the teacher-student relationship and negatively impact the students' learning and achievement (Klusmann et al., 2016). Also, short-term stress can lead to long-term stress, causing early dropouts from the profession and high follow-up health costs (Künzi and Oesch, 2016). The individual, social, and economic effects of work-related stress in teachers highlight the need for early detection of teachers' health status and the importance of preventive interventions (Salvagioni et al., 2017). However, it is still unclear under what conditions disruptions occurring in the class trigger acute psychological and physiological stress reactions in teachers (Wettstein et al., 2020). Research on teacher stress so far is mainly based on questionnaires suited for measuring

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*Correspondence:

Alexander Wettstein
alexander.wettstein@phbern.ch

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subjective stress experiences, ignoring essential data on real-time physiological stress reactions (Krause et al., 2013; Wettstein et al., 2020). Ambulatory assessment (AA) methods use various assessment methods, including self-reports, observational, and biological/physiological/behavioral measures, to research the participants in their “natural habitats” (Trull and Ebner-Priemer, 2013). This cannot be replicated in the laboratory. Further, AA helps minimize retrospective biases by assessing what is happening at the moment. Despite these advantages, AA methods have been underutilized. A multimethod AA approach using psychological measurements while simultaneously recording classroom disruptions and biophysiological stress reactions of teachers (e.g., by collecting salivary cortisol samples throughout the day and continuously recording teachers’ heart rate variability with mobile sensors) would enable a much deeper understanding of the transactional processes taking place in the classroom that has not been achieved before.

EFFECTS OF TEACHER STRESS

Prevalence and Economic Effects

Teachers have above-average burnout rates compared to other professions (Kyriacou, 2015), and the occupational stress among teachers has increased significantly over the last decade (Aloe et al., 2014). Around 30% of teachers report that the teaching profession is ‘very stressful’ or ‘extremely stressful’ (Kyriacou, 2015). The Gallup Report results from 2014 (Gallup, 2014) indicate that 46% of US teachers report very high daily stress during the school year. According to an SNF study on Swiss teachers from the fifth to the ninth school year, around one-third of teachers feel ‘very stressed’ (Kunz Heim et al., 2014a). Consequently, many teachers leave the profession or retire early (Ingersoll, 2001; Friedman, 2006). 40–50% of those starting their careers quit the job during the first 5 years, which costs US schools 2.2 billion US Dollars a year (Alliance for Excellent Education, 2017). The Swiss State Secretariat for Economic Affairs estimates the cost due to the working population’s stress at 6.5 billion Swiss Francs (approximately 7 billion US Dollars) (Gesundheitsförderung Schweiz, 2020). In the teaching profession alone, diseases due to occupational stress result in costs of 37.6 million Swiss Francs (approximately 40.5 million US Dollars) a year (Künzi and Oesch, 2016).

Effects on Teaching Quality and Students’ Motivation

The teacher’s instructional behavior is influenced by the teacher’s attitude to work and characteristic features like emotional self-regulation (Caprara et al., 2006; Frenzel et al., 2009; Kunter et al., 2013). That also means that stress and emotional exhaustion, a key symptom of burnout, negatively impact the teachers’ instructional behavior and, therefore, the students learning and achievement (Klusmann et al., 2016). The first empirical study to examine this relation included 1,102 German elementary school teachers and showed a significant negative relationship between

the teachers’ emotional exhaustion and the student’s achievement in the investigated mathematics class (Klusmann et al., 2016). Also, students notice teachers’ affective state, which influences the students’ valuation of the teachers’ instructional behavior (Evers et al., 2004). Further consequences of burnout symptoms lead to teachers reducing engagement and effort towards lesson planning (Klusmann et al., 2016). Teachers work less efficiently and might get an increasingly emotional and cognitive distance from their work. They may become more critical of students’ performances and less likely to encourage them (Klusmann et al., 2016). As a result, students may feel less competent and less motivated, affecting their academic achievements negatively. Accordingly, early recognition of teachers’ health status and preventive measures are of great value, not just for teachers but also for students (Klusmann et al., 2016; Salvagioni et al., 2017). The inclusion of biological measurement tools alongside self-reports could play an essential role in the early detection of stress-related illnesses (Gidlow et al., 2016).

SOURCES OF TEACHER STRESS

The sources of teacher stress are diverse and range from the usual stressors of life-phases, critical life events, everyday stress to social stressors (e.g., lack of social support) (Hillert et al., 2004; Rothland, 2013). Krause et al. (2013) summarize research to date on numerous potentially relevant psychosocial stress factors in the teaching profession. Significant links between stress in the classroom and resources such as support by the teaching staff and school management belonged to everyday school life.

Everyday School Life

Teachers consider disruptions by students during teaching (from now on referred to as ‘classroom disruptions’), a lack of student motivation, and problems with maintaining discipline in the classroom to be the main risk factors for teacher health, in addition to factors outside the school (Kyriacou, 2001). Especially in combination with time pressure and lack of recovery breaks, classroom disruptions prove to be predictors of stress consequences (Krause, 2004) and are closely related to burnout among teachers (Brouwers and Tomic, 1999; Brouwers and Tomic, 2000; Evers et al., 2004; Friedman, 2006).

Classroom Disruptions

Within the school, teachers cite classroom disruptions as the main reason for career exit (Ingersoll, 2001; Herzog et al., 2005; Lewis et al., 2005; Makarova et al., 2014) and early retirement (Helmke, 2009). There are different definitions and approaches of classroom disruptions: Ortner and Ortner (2000) focus on disruptive student behavior, i.e., actions and reactions against the teacher, fellow students, or the consciously disregarding of school norms by students. Eckstein et al. (2016) investigate the subjective sense of disruption of teachers and students. Winkel (2005) and Lohmann (2011) concentrate on the teaching-learning process and thus move away from an individual-centered perspective. They understand classroom disruptions as impairments or interruption of the teaching-learning

process by partly or entirely overriding the conditions under which teaching and learning can occur.

Wettstein et al. (2018) distinguish between aggressive and non-aggressive classroom disruptions. For teachers, aggressive classroom disruptions, especially attacks against the teacher's authority, seem highly stressful (Lehr, 2004; Scherzinger et al., 2017). Aggressive classroom disruptions include verbal or physical intentional behavior that leads to personal injury or destruction of property (Bandura and Olligschläger, 1979). Non-aggressive classroom disruptions include those behaviors that interfere with the teaching-learning process but do not characterize aggression. According to the results of a study by Scherzinger et al. (2018), about 80% of the cases are non-aggressive disruptions.

Teacher Aggression

A multimethod study (Scherzinger et al., 2018) showed that about 95% of the observed classroom disruptions originate from the students. However, since teaching is a reciprocal social event, it is essential to note that teachers can also contribute to classroom disruptions through their behavior and actions in class (Fend, 2008; Helmke, 2009). The most often observed forms of teacher aggression include exposure, denigration, and unfair treatment (Wettstein et al., 2018). Responding to perceived classroom disruptions with this kind of behavior contributes to further disruptions, and lengthy negotiations between teachers and students often follow (Wettstein, 2010). Research shows that some pedagogical interventions effectively influence students' behavioral outcomes than others (Foisy et al., 2020). Teachers who already have an increased stress level may react inadequately to unwanted student behavior, unintentionally contributing to further aggravation (Wettstein et al., 2010). Some teachers respond inappropriately due to a lack of skills and resources and, consequently, experience more stress. This raises the question of the causal link between classroom disruptions and the stress reactions of teachers.

Methodological-Didactical Setting

Finally, teacher stress also depends on the methodical-didactical setting. Methodical-didactical settings in the classroom are methods teachers use to structure lessons to promote student learning. They combine social forms and different activity classes, each having other demands on the teacher. There are so-called transition phases between the method changes, e.g., from frontal teaching to individualized student work. For teachers, it is challenging to transition students efficiently between teaching methods. Long or disorganized transition phases result in a loss of valuable time for teaching and learning and increase student misbehavior (Wettstein, 2008). Up to five times more aggressive student behavior occurs during transition phases than during actual teaching (Wettstein, 2008). Thus, we assume that teacher stress varies between different methodological-didactic settings in the classroom.

Here, a psychobiological approach in an AA design could be of great benefit: systematic video observations of lectures, including classroom disruptions, teacher aggressions, and the methodological-didactic settings while simultaneously

measuring teachers' biological stress responses and subjectively perceived stress. Combined, these methods would generate a high density of data that could give a much deeper understanding of the teachers' work environments and individual psychobiological stress responses than the one-sided use of self-reports, as discussed in the following.

A PSYCHOBIOLOGICAL APPROACH ON TEACHER STRESS

Psychological research on stress in the teaching profession has primarily focused on teachers' psychosocial stress through self-disclosure, i.e., subjective perceptions (Krause et al., 2013; Wettstein et al., 2020). These are, in general, retrospectively single-surveyed with questionnaires. But this one-sided and subjective approach is not only prone to social desirability (Furnham, 1986). It also makes it hardly possible for researchers to clarify whether different data on existing burdens can be attributed to objectively other working conditions or subjectively different teachers' perceptions. Furthermore, numerous unconscious physiological stress reactions are associated with psychosocial stress (Wettstein et al., 2020). When an individual responds to an internal or external stressor, the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis are activated (Black, 2002). Neuroendocrine circuits are stimulated, enabling the organism to respond to stress adequately before returning to its original state of homeostasis (Mariotti, 2015). The way an individual can predict and control a stressor usually determines how quickly and efficiently the resulting stress response is activated and adjusted and how quickly homeostasis is restored. Personality and socio-environmental factors are crucial in how well an individual can adapt to stress (Black, 2002). If an individual cannot cope adequately with a stressor because it is perceived as too intense or too long-lasting, homeostasis does not follow the stress response (Mariotti, 2015). Instead, the neuroendocrine parameters remain altered, and disease may occur.

AA on psychosocial stress in teachers, combined with physiological stress reactions, would be of great value in examining and predicting teacher stress. Therefore, to achieve a much higher information density, Krause et al. (2013) and Maslach and Leiter (1999) recommend that future research should not be limited to single retrospective self-disclosures by teachers. Instead, it should also include investigating teacher stress on a physiological level, for example, by assessing teachers' cortisol levels before, during, and after lessons (Klusmann et al., 2016).

Studies by Bickhoff (2002) and Steptoe et al. (2000) showed that teachers' cortisol levels increased during cognitive engagement with upcoming classroom situations while teaching itself did not strongly influence cortisol levels. A higher cortisol awakening response could reflect the upcoming day's demands (Kunz-Ebrecht et al., 2004). Furthermore, teachers' cortisol levels at the end of classes in the afternoon differed significantly from their cortisol levels on free days,

referring to ongoing cognitive challenges with incidents from the school day (Bickhoff, 2002).

Physiological stress research is increasingly turning to real-life settings (Kappeler-Setz et al., 2010; Gravenhorst et al., 2012; Kappeler-Setz et al., 2013; Papastefanou, 2013). More and more portable microcomputer systems and physiological measuring devices have been developed in recent decades, allowing investigations in everyday situations in the field, not only under controlled laboratory conditions (Fahrenberg et al., 2007). While laboratory research enables strict experimental control of possible interfering variables, field investigations show a lower standardization but can investigate physiological reactions to different everyday situations (La Marca, 2016). Laboratory and field research are complementary approaches. Combining both methods can obtain a robust and ecologically valid measure of teacher stress in concrete teaching situations and different situations throughout the day.

DISCUSSION

What are the theoretical and practical implications? From a theoretical point of view, the individual, social, and economic impact of work stress among teachers underlines the need for early detection of the teacher's health status and the importance of preventive interventions (Salvagioni et al., 2017). The inclusion of biological measures can be a valuable predictor of stress-related physical and mental illnesses (Gidlow et al., 2016). However, in research on stress among teachers, self-reports are the primary research tool (Krause et al., 2013; Wettstein et al., 2020). These are suitable for assessing teachers' subjective psychological stress, but difficulties in recalling memories from the past, subjective perceptions, and reporting biases can affect such measures (Gow, 2010; Prado-Gascó et al., 2019). Moreover, self-reports do not provide reliable data on biological stress responses. It is often challenging to interpret biological processes adequately (Campbell and Ehler, 2012; Pennebaker, 1982), and biological stress measurements are not always consistent with subjective stress perception (La Marca, 2016). Further, combining subjective and biological measures of stress using AA techniques such as observational and biological/physiological/behavioral measures would allow research in real-life situations in an ecologically valid manner in teachers' natural environments (Fahrenberg et al., 2007; Prado-Gascó et al., 2019). From a practical perspective, understanding teachers' psychobiological stress responses to classroom disruptions can help develop a theory to counteract negative behavioral responses to reduce work-related stress for teachers and the consequences for students. Moreover, a psychobiological AA approach would significantly improve our understanding of teacher stress, provide valuable information for a health-promoting school environment, and contribute to teachers' primary and secondary stress prevention.

In this review, we refer to psychobiological stress research on teachers in the context of classroom disruptions. However, teacher characteristics and personal factors such as emotional stability, work commitment, and life satisfaction should also be investigated as possible sources or protective factors of teacher stress. They may play a significant role in teachers' individual stress responses to classroom disruptions. The research team found gaps in the literature on a psychobiological approach to stress research in teachers. However, an ongoing study by the University of Teacher Education Bern, the University of Bern, the University of Zurich, and the Clinica Holistica Engiadina in Susch are now investigating how aggressive and non-aggressive classroom disruptions trigger acute stress responses in teachers that may affect teacher health in the medium to long term—using AA techniques and systematic classroom observation, self-reports, saliva samples, and HRV (re)activity that are continuously recorded during workdays and a free day. Future studies on this topic could help promote the effective use of AA technologies to apply research to real-life situations. In addition, future studies could deepen the investigation of the relationship between subjective and biological stress and determine what measures and under what circumstances a relationship does or does not exist, including consideration of teacher characteristics and psychological data.

CONCLUSION

The purpose of this review was to illustrate a psychobiological AA approach to the research of teacher stress. We discussed classroom disruptions as the primary stressor in the classroom and how a multimethod AA approach would provide a much deeper understanding of the stressful transactional processes occurring in the classroom. The inclusion of biological measures may be a valuable predictor of stress-related illnesses and provide feedback to teachers about the predominantly unconscious biological (re)activity that makes teachers aware of their stress responses under certain circumstances.

AUTHOR CONTRIBUTIONS

AW and RLM conceptualized the research. SS and AW prepared the first draft. RLM and MG provided insightful comments that critically improved the manuscript quality.

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