

Presentation and evaluation of the stress lab - A tool to prepare physical education students to handle stressful teaching situations

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Abstract:

Introduction and study purpose: Research indicate that prospective physical education teachers experience stress. To address this, the stress lab was developed to prepare physical education students to handle stressful teaching situations. The tool comprises an e-learning unit for acquiring knowledge on stress-related topics and a practical unit for hands-on experience in handling stressful teaching situations demonstrated through videos. This paper aims to introduce the stress lab as an interactive tool for physical education students and outlines three evaluation studies. **Method:** The initial study sought to confirm whether, upon completing the e-learning unit, participating physical education students accepted the tool and experienced positive outcomes, as demonstrated through knowledge about stress. The second study aimed to evaluate the appropriateness of the videos used in the practical unit. The third study aimed to verify whether, upon completing the practical unit, the participating physical education students accepted the unit and experienced positive outcomes, presented in the form of stress-related practical competences. **Results:** The results of the first study showed high levels of acceptance and stress-related knowledge after physical education students participated in the e-learning unit. Following an assessment of the appropriateness of the videos in the second study, six videos were selected for the practical unit. In the third study, physical education students reported a high level of acceptance and a high level of competence after participating in the practical unit. **Conclusion:** From this, various implications in terms of content and didactics can be deduced for the stress lab. In the future, the stress lab will be integrated into university training of prospective physical education teachers.

Key Words: - teacher education, teaching tool, stress, coping, acceptance, learning outcomes

Introduction

Studies have shown that physical education teachers (PETs) experience high levels of stress and burnout symptoms and leave their profession early (Gavish & Friedman, 2010; Mäkelä et al., 2014). Physical education pre-service teachers (PEPTs), in particular, perceive more stress than their more experienced colleagues (Schäfer et al., 2019). Thus, stress management training needs to be added to teacher education programs to better prepare physical education students (PESs) for the stressful situations they will face as they enter the pre-service phase (Alsahhe et al., 2021; Darius et al., 2021). Therefore, the overall aim of this paper was to introduce and evaluate the stress lab as an interactive tool for PESs that prepares them to handle stress and potentially stressful situations and can be used by teacher educators in university settings.

Stress and stressful situations

Theoretical background

In reference to Lazarus and Folkman (1984), individuals and their environment influence each other and are in constant transaction. Any situation that occurs within the transaction is potentially stressful for the individual. A stressful situation is an event in which environmental or internal demands strain or exceed the individual's available resources (Lazarus & Folkman, 1984). Individuals appraise the stress level of a situation through a twofold process – the primary appraisal and the secondary appraisal. In the primary appraisal, individuals assess a situation in a transaction according to its potential influence on their well-being (i.e., positive, irrelevant or stressful).

During the secondary appraisal, individuals evaluate the situation-oriented coping strategies and resources available. Through this process, they will appraise a situation as stressful when, for example, they associate the consequences of the situation with a loss or evaluate them as harmful, threatening or challenging while, at the same time, assessing the coping strategies and resources available as insufficient or low. Primary and secondary appraisals determine the intensity and quality of the emotional reaction to the situation. The consequences of a stressful situation are negative emotions, such as anxiety or anger (Lazarus & Folkman, 1984).

State of research

While teaching, PETs are confronted with many sources of stress due to the unique structure and demands of physical education (PE) classes. According to a recent systematic review (Haaren-Mack et al., 2020), inadequate facilities and equipment and pupils' discipline problems are the most important teaching-related sources of stress for PETs (Haaren-Mack et al., 2020). However, PETs at different career stages perceive the sources of stress differently. For example, PESs perceive the occurrence of inadequate facilities and equipment, pupils' discipline problems or pupil's lack of motivation significantly more frequently than PEPTs and PETs do (Pels et al., 2022). The differences between the perceptions of sources of stress at different career stages can be explained by the fact that PESs and PEPTs feel insecure in their ability to cope with teaching situations because they lack the necessary skills and knowledge (Shoval et al., 2010). Therefore, PESs need to be prepared with the skills and knowledge necessary to cope with stressful situations. According to a study by Weigelt et al. (2016), pre-service teachers benefited from gaining knowledge about stress and coping strategies during their studies. The benefits were reflected in health-related risk factors, such as higher resilience and ability to distance themselves from their work (Weigelt et al., 2016).

*Coping**Theoretical background*

Coping is defined as any cognitive or behavioral effort that is employed to handle stressful situations. This effort can be problem-focused or emotion-focused (Lazarus & Folkman, 1984). Problem-focused coping directly addresses the stressful situation. For example, this includes planning active steps (active coping) or seeking emotional support (support coping) to solve the problem. In contrast, emotion-focused coping addresses the emotional reaction during the stressful situation. This includes, for example, the attempt to manage negative emotions by expressing the emotions (evasive coping) or by accepting the situation and its consequences (Knoll et al., 2005). The implicit or explicit choice of a coping strategy in a particular situation varies for each individual (Lazarus & Folkman, 1984). Whether a coping strategy fits a given stressful situation depends on the perceived controllability of the situation, as coping with controllable stressful situations, requires different strategies than coping with uncontrollable circumstances (Forsythe & Compas, 1987). Nevertheless, the process of selecting a suitable strategy in a stressful situation can be constantly adjusted and improved (Lazarus & Folkman, 1984).

State of research

Coping has been shown to influence the well-being of (PE) teachers of all career stages. Studies have provided evidence that prospective teachers (students and pre-service teachers) who already have a repertoire of strategies for coping with stress were associated with a healthy sense of well-being (McCallum & Price, 2010; Väisänen et al., 2018). Conversely, prospective teachers who have trouble coping with stressful situations are more likely to experience stress and exhaustion (Gustems-Carnicer & Calderón, 2014). In the particular context of PE, PEPTs experience more stress than PETs and use coping strategies more often (Schäfer et al., 2019). According to Gustems-Carnicer et al. (2019), the use of specific coping strategies can impact the academic achievement of education students. Results of their study showed that many students perceived stress and achieved less academically. Moreover, students who employed problem-focused coping more than avoidance coping enjoyed greater academic achievements (Gustems-Carnicer et al., 2019). Given the goodness-of-fit-hypothesis, the conclusion can be drawn that problem-focused coping has been a good fit for stressful academic situations and the respective situations were appraised as controllable. Thus, practicing the use of various coping techniques seems an appropriate strategy to improve students' ability to cope with a variety of stressful situations (Caires et al., 2012).

Existing stress interventions for teachers

To date, no stress interventions have been developed especially for PETs. However, various stress interventions for teachers in general exist (Embse et al., 2019), including knowledge-based and application-based interventions. Knowledge-based interventions include, for instance, psychosocial trainings on knowledge about stress and stress management strategies (Cicotto et al., 2014). The effect sizes for stress reduction in these interventions have been medium to large. However, using only knowledge-based stress interventions without promoting the acquisition of skills and without an opportunity to practice may not lead to maintenance and long-lasting improvements (Embse et al., 2019). The application-oriented interventions mostly include behavioral, cognitive-behavioral and mindfulness approaches to acquire, apply and practice competences. These competences help to handle stress in the long term (e.g., meditation; Anderson et al., 1999) and in the short term (e.g., coping with acute stress reactions; Jeffcoat & Hayes, 2012). Effect sizes for stress reduction in application-oriented interventions have also been medium to large (Embse et al., 2019). However, to date, application-oriented interventions consist only of general stress prevention methods. No interventions can be found that address the specific teaching-related sources of stress in PETs.

Despite the application-oriented interventions, interventions generally have not involved the use of materials that closely reflect teaching situations. Intervention studies in other areas (i.e., teaching in general) have shown that video material can be used to demonstrate complex teaching situations and give prospective

teachers an authentic first impression of difficult teaching situations (Gaudin & Chaliès, 2015). According to the review of Gaudin and Chaliès (2015), prospective teachers benefit from video-based teacher training because videos stimulate realistic cognitive, emotional and motivational processes. Therefore, videos can be used to prepare for handling stressful situations.

Research gap and overall aim

The review of the current state of research regarding stress interventions in (PE) teachers reveals a threefold gap. First, no interventions have been developed especially for PETs to prepare them to handle stress and stressful teaching situations. Second, no interventions of any kind have been developed for PETs that combine both knowledge acquisition and competence acquisition with the help of practical application exercises. Third, no interventions have been developed involving exercises that closely replicate teaching situations. Given this threefold research gap and given the general relevance of stress in PETs, the overall aim of this paper was (1) to introduce and (2) to evaluate the stress lab as an interactive tool for PESs that overcomes the deficiencies of previously developed interventions. The development of the stress lab was based on the transactional model of stress (Lazarus & Folkman, 1984) and continuously guided by the three research gaps. The stress lab was evaluated through three sub-studies.

Presentation of the stress lab

The stress lab developed was composed of two parts – an e-learning unit and a practical unit – to address two primary educational objectives: to teach PESs knowledge about stress (e-learning unit) and to give PESs the opportunity to practice the competences for handling stress (practical unit). Accordingly, the content of the stress lab was based on the cumulative acquisition of competences according to Bloom's taxonomy (Bloom et al., 1956) to ensure effective acquisition of competences for PESs. Thus, each competence built upon the previous skill developed; therefore, the first competence had to be acquired before the following competence could be achieved and so forth (Bloom et al., 1956). In the stress lab, the competences learned in the e-learning unit on knowledge and understanding formed the basis for PESs to acquire the competences in the practical unit, where the knowledge was applied.

Structure and specific aims of the e-learning unit

The e-learning unit was situated on a professional e-learning platform and comprised three sections. Each started with a quiz as a self-check of previous knowledge, which was followed by interactive learning content presented through diagrams and informational text as the core of the section. The first section was designed to teach basic knowledge about the development and effects of stress, and the second section addressed sources of stress that can occur while teaching PE, while the third outlined resources and various types of strategies for coping (see supplement Table S1). After finishing all sections, PESs completed a final quiz to assess their learning outcome. Approximately one hour was needed to work through all sections.

Structure and specific aims of the practical unit

The e-learning unit was followed by the practical unit, in which PESs applied the knowledge and practiced handling stress and stressful situations in one session. The core of the practical unit was the confrontation of the PESs with 'real-life' video sequences showing various potentially stressful teaching situations that were filmed in two PE classes at a secondary school. In the practical unit, PESs worked with materials like printed scripts, tablets, headphones and heart rate monitors. The practical unit started with a short introduction given by the lecturer. The remainder of the lesson was divided into three phases; during each phase, PESs worked on tasks to gain competences (see supplement Table S2).

Phase 1

The specific aim of phase 1 was to teach PESs the competences of (1a) reflecting on and perceiving one's own and others' stress reactions, cognitive appraisal processes and (1b) the use of coping strategies. After watching a video of a 'real-life' teaching situation, PESs worked on tasks assigned in the script that encouraged self-reflection, and then they discussed their answers in the plenary.

Phase 2

Phase 2 was divided into four sub-phases that were intended to teach PESs the competences related to (2a) perceiving and handling their own reactions to stress, (2b) assessing stressful situations and (2c) creating and representing appropriate solutions to handle the situations. The final phase (2d) integrated all previous competences and additionally confronted the PESs directly with a real-life stressful situation. In this phase, the PESs were divided into groups of five; each group was given a tablet and five headphones for watching and listening to the videos. Following the script, each PES was assigned to play one of three roles: the active teaching person (A), the observers (B) or the passive teaching persons (C). Each role was associated with certain tasks that the PESs had to work on while watching the videos. The active teaching (A) person's task was to perceive the situation from the perspective of the teacher. (A) also wore the heart rate monitor for a physiological stress assessment. Meanwhile, two PESs (B) observed (A). Following this procedure, (A) should have felt observed by (B) and, therefore, additionally stressed. The remaining two PESs (C) worked on the same tasks as

(A), but without being observed. After a short discussion about each task and their different perceptions of the situation, the PESs went on to select a new video and change their roles. (For a detailed overview of the schedule, see supplement Table S2)

Phase 3

The specific aim of phase 3 was to teach the competence of transferring what has been learned into one's own life as a future PET. PESs gave feedback in a plenary session and drew conclusions for themselves about the content of the stress lab and their learning process. They discussed the relevance of the content and were asked to generate their individual take-home messages.

Evaluation of the stress lab

The evaluation of the stress lab was centered on two objectives. The first was to verify whether PESs gained positive outcomes through the practical application of the tool. Thus, this called for measuring PESs' immediate outcomes as a result of participating in the stress lab (McNamara, 2008), including their knowledge acquired and competences gained. The second purpose of the evaluation was to check for potential influencing variables that may have affected the learning outcomes. These variables included the target group's acceptance of the tool and the appropriateness of the videos as a central part of the practical unit. Adapted from 'treatment acceptance' (Kazdin, 1977), acceptance was regarded as the attitude of the target group towards the stress lab. According to Kazdin (1977), high levels of acceptance can have a positive impact on outcomes, compliance and maintenance of an intervention and are, therefore, of interest before an intervention is to be implemented. In addition, Kazdin (1977) reported that an intervention is more likely to be accepted by participants if its components have been judged as appropriate (Kazdin, 1977). In the current study, appropriateness of the videos was measured to ensure that the videos represented stressful situations that allowed the PESs to gain competences by practicing to manage. The stress lab evaluation was conducted through three separate studies. The first study assessed the acceptance levels and level of knowledge of PESs after working through the e-learning unit. The second study tested the appropriateness of the videos used in the practical unit, based on which the third study examined the acceptance and level of competences of the PESs after participating in the practical unit.

Study 1: Acceptance- and outcome-evaluation of the e-learning unit

The specific aim of phase 3 was to teach the competence of transferring what has been learned into one's own life as a future PET. PESs gave feedback in a plenary session and drew conclusions for themselves about the content of the stress lab and their learning process. They discussed the relevance of the content and were asked to generate their individual take-home messages.

Method

Participants. The sample consisted of 25 PESs (bachelor's and master's levels) ranging in age from 22 to 28 years ($M = 24.27$, $SD = 1.79$) from two universities, one in North-Rhine Westphalia and the other in Schleswig-Holstein. PESs were studying PE for teachers and educational science. No specific inclusion or exclusion criteria were applied.

Measures. Acceptance of the e-learning unit was measured according to two methods. First, overall acceptance of the e-learning unit was measured with a single item using a Visual Analogue Scale (Flynn et al., 2004). PESs were asked to draw a cross on a 10 cm line, with endpoints ranging from 0 = very bad to 10 = very good, to indicate their evaluation of the unit as a whole. Second, PESs were asked whether they accepted the tool as appropriate for imparting knowledge. The self-constructed instrument was developed by a group of experts composed of sport pedagogues, PETs, sport scientists and sport psychologists. The instrument consisted of 16 items with four subscales: 'practicability' (e.g., 'understandable'; $\alpha = .79$), 'usefulness' (e.g., 'helpful'; $\alpha = .89$), 'attractiveness' (e.g., 'appealing'; $\alpha = .59$) and 'suitability' (e.g., 'useable'; $\alpha = .91$). The response options ranged from 1 = does not apply at all to 6 = does apply completely.

Level of knowledge was measured with a self-constructed instrument asking the PESs how they perceived their level of knowledge after completing the e-learning unit. The instrument consisted of 18 items with three subscales. Each item represented a statement about knowledge that was taught in the e-learning unit. The three subscales were based on the three sections of the e-learning unit: 'development and effects of stress' (three items; e.g., 'I know how stress arises'; $\alpha = .81$), 'potential sources of stress' (six items; e.g., 'I know what sources of stress can be'; $\alpha = .71$) and 'resources and coping' (five items; e.g., 'I know the function of resources in the development and management of stress'; $\alpha = .78$). PESs were asked to assess the degree to which related statements applied to their level of knowledge at the time they completed the survey using a five-point scale, ranging from 1 = does not apply at all to 5 = does apply completely.

Procedure. After permission from the local ethics commission was obtained, PESs were recruited through various seminars at the universities. The e-learning unit and the online questionnaire were accessible via a link that was transmitted to PESs, who took part voluntarily without receiving any incentive. PESs needed approximately 60 minutes to work through the e-learning unit and five minutes to complete the online questionnaire.

Statistical analysis. Data were analyzed using IBM SPSS Statistics 27. To examine the PESs' acceptance and knowledge levels, descriptive analyses were run. Following Pimentel (2019), the mean values of the results were interpreted by placing them in intervals formed with equal distances considering the underlying scale. In this case, factors assessed were overall acceptance (0–1.99 = very low, 2.00–3.99 = low, 4.00–5.99 = moderate, 6.00–7.99 = high, 8.00–10.00 = very high), aspects of acceptance (1.00–1.82 = very low, 1.83–2.65 = rather low, 2.66–3.48 = low, 3.49–4.31 = slightly high, 4.32–5.14 = high, 5.15–6.00 = very high) and level of knowledge (1.00–1.79 = very low, 1.80–2.59 = low, 2.60–3.39 = medium, 3.40–4.19 = high, 4.20–5.00 = very high; Pimentel, 2019).

Results

Acceptance. PESs' overall acceptance of the e-learning unit was high with a low dispersion around the mean value. Also, PESs evaluated the unit as having a high degree of practicability, usefulness and suitability and slightly high attractiveness as a tool (see Table 1).

Level of knowledge. The PESs reported a high level of knowledge related to all three sections of the e-learning unit with a low dispersion around the mean value (see Table 1). More specifically, the PESs showed the highest level of knowledge in the section on development and effects of stress.

Table 1
Descriptive statistics of the evaluation of the e-learning unit

		<i>n</i>	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Overall accep-						
tance¹		25	7.15	1.71	3.00	10.00
Specific aspects	practicability	25	4.73	.89	2.00	6.00
	usefulness	25	4.73	.94	1.75	6.00
	attractiveness	25	4.23	.60	3.25	6.00
	suitability	25	4.57	.98	2.00	6.00
	total	25	4.57	.70	3.06	6.00
level of	Development &	25	4.00	.68	2.67	5.00
	effects of stress					
	Sources of stress	25	3.92	.54	3.17	5.00
	Resources & coping	25	3.64	.66	2.60	5.00
total	25	3.80	.48	2.94	5.00	

Note. Scale ranging from: ¹0 = very bad to 10 = very good, ²1 = does not apply at all to 6 = does apply completely, ³1 = does not apply at all to 5 = does apply completely.

Discussion

The results showed that the PESs demonstrated a high level of knowledge after participating in the e-learning unit. The assumption can be made that the PESs gained the knowledge through participation. Moreover, the results can still be optimized. The PESs' level of acceptance of the e-learning unit was high, presumably contributing to positive outcomes (Kazdin, 1977). Thus, the conclusion can be drawn that the e-learning unit seems suitable for teaching PESs knowledge about stress. However, the lack of a control group represents a limitation regarding the interpretation of the causality of the findings. This should be considered in future studies.

Study 2: Appropriateness of the videos for the practical unit

In the practical unit, PESs practice handling stress with the use of videos that depict potentially stressful teaching situations. The aim of the second study was to evaluate the videos to verify which of the situations presented in them would be appropriate for use in the practical unit. To uncover this information, PESs, PEPTs and PETs were asked which of the video-based situations represented stressful situations.

Method

Participants. The sample consisted of 83 participants (46 females, 34 males, 3 with missing data) ranging from 20 to 67 years of age (*M* = 28.66, *SD* = 9.65). The participants belonged to one of three cohorts (34 PESs, 22 PEPTs and 27 PETs) from the federal states of North Rhine-Westphalia and Schleswig-Holstein.

Measures. The participants' perceived stress intensity relative to the situations shown in the videos was assessed through a single item using a Visual Analogue Scale (Flynn et al., 2004). The scale included a 10 cm line with endpoints ranging from 0 = not stressful to 10 = very stressful, on which participants were asked to mark the place that indicated how stressful they perceived the situations to be.

The participants' momentary cognitive stress appraisal regarding the situations shown in the videos was measured with the Primary Appraisal Secondary Appraisal (PASA) scale (Gaab et al., 2005). Both primary appraisal (e.g., 'The situation is relevant to me') and secondary appraisal (e.g., 'I know exactly how to handle this situation') were assessed using two items on the PASA scale. In this case, the secondary appraisal responses were recoded so that high values indicated that the available coping resources were low. High values for the

primary appraisal indicated that the situation was deemed potentially stressful. Based on the transactional model (Lazarus & Folkman, 1984), participants were asked to indicate how strongly each statement applied to them on a 6-point scale ranging from 1 = strongly disagree to 6 = strongly agree.

Procedure. After gaining permission from the local ethics committee, PESs were contacted at university seminars, PEPTs were contacted at teacher education seminars or via their schools and PETs were contacted via their schools or during official meetings. Participants received two links, one directing them to an online platform with the videos and another directing them to an online questionnaire. In total, they needed approximately 30 minutes to watch the videos and answer the questions. Participants took part voluntarily and did not receive any incentive for their participation.

The videos consisted of ten short clips showing multiple types of potentially stressful situations. (For a description of the situations, see supplement Table S3) The videos were deposited on an online platform and randomly arranged. To limit participation time, each participant watched five videos showing multiple situations. Participants were asked to view the situations from the teacher's perspective while watching the videos. After they had seen each video, they were asked about the intensity level of their stress and their momentary cognitive stress appraisal.

Statistical analysis. Data were analyzed using IBM SPSS Statistics 27. A descriptive analysis was run for perceived stress intensity and cognitive appraisal to determine whether the videos represented stressful situations for PESs, PEPTs and PETs. As in study 1, the mean values of the results were interpreted by placing them at intervals according to stress intensity (0–1.99 = very low, 2.00–3.99 = low, 4.00–5.99 = moderate, 6.00–7.99 = high, 8.00–10.00 = very high) and cognitive appraisal (ranging from 1.00–1.82 = very low to 5.15–6.00 = very high; see study 1; Pimentel, 2019). To compare the three career stages in terms of perceived stress and cognitive appraisal, ANOVAs with Bonferroni post-hoc tests were run. For two situations ('time delay', 'complaining'), Kruskal-Wallis tests with Mann-Whitney-U tests were run due to low participant numbers.

Results

Perceived stress intensity. The participants reported moderate to low levels of perceived stress intensity for each situation. However, 5 of 10 situations ('failure of game', 'passing time', 'point deduction', 'time delay', 'complaining') were experienced with moderate levels of stress intensity (see Table 2). Differences between career stages were indicated by significant findings for 'passing time' and 'disappointment'. More precisely, for both situations, PEPTs reported perceiving significantly higher levels of stress intensity than PETs (see Table 3).
Momentary cognitive stress appraisal.

The situations were assessed as low to rather low in both the primary and secondary appraisals (see Table 2). When comparing the responses for each situation representing the three career stages, results showed no significant differences for primary appraisal. For secondary appraisal, significant differences were observed for the situations 'point deduction', 'disappointment' and 'complaining'. In more detail, PEPTs demonstrated a significantly higher value in the secondary appraisal than PETs (see Table 3).

Discussion

The results showed that PETs at different career stages perceived each situation as reflecting stress at moderate to low levels of intensity and with low to rather low values in the cognitive appraisals. Nevertheless, six videos were deemed appropriate to be integrated in the practical unit for PESs: 'failure of game', 'leaving class', 'passing time', 'point deduction', 'time delay' and 'complaining'. This decision was based on two steps. In the first step, results were checked for situations in which PESs showed at least moderate values of stress intensity and cognitive appraisal.

Those five situations – 'failure of game', 'leaving class', 'point deduction', 'time delay' and 'complaining' – were selected for the practical unit. In the second step, significant differences in the stress intensity or cognitive appraisal between PESs and PETs or PEPT were verified, as the tool was developed for PESs. At the same time, the lack of significant differences among the PESs for any of the situations was verified. In some situations, PEPTs perceived significantly higher levels of stress intensity ('passing time', 'disappointment') and higher values in secondary appraisal ('point deduction', 'disappointment', 'complaining') than the PETs. The situation 'passing time' was selected as the sixth video for the practical unit because PEPTs perceived this situation with a higher level of stress intensity compared to PETs. However, as a limitation, each participant only watched 5 out of 10 videos, and therefore, the videos could not be compared through a within-subject design.

Study 3: Acceptance- and outcome-evaluation of the practical unit

The practical unit was developed to give PESs the opportunity to practice handling stressful teaching situations. After including the six videos selected in study 2, the aim of the third study was to investigate, first, how PESs evaluated the practical unit to indicate acceptance and, second, representing the immediate outcome, the competence levels of the PESs after participation.

Method

Participants. The sample consisted of 10 PESs (4 males, 6 females) ranging in age from 19 to 29 years ($M = 24.00$, $SD = 3.56$) from the German Sport University Cologne (bachelor's $n = 8$, master's $n = 2$). PESs were studying physical education and educational science. No specific inclusion or exclusion criteria were applied.

Measures. Acceptance was measured according to two approaches (see study 1). First, overall acceptance was measured through a single item (Flynn et al., 2004) asking PESs to evaluate the practical unit as a whole by marking a spot on a 10 cm line, with endpoints ranging from 0 = very bad to 10 = very good, to indicate their assessment. Second, specific aspects of acceptance were measured by asking PESs to evaluate the effectiveness of the practical unit in imparting competences. The self-established instrument consisted of 16 items with four subscales: 'practicability' (e.g., 'understandable'; $\alpha = .49$), 'usefulness' (e.g., 'helpful'; $\alpha = .87$), 'attractiveness' (e.g., 'appealing'; $\alpha = .78$) and 'suitability' (e.g., 'useable'; $\alpha = .89$). The response options ranged from 1 = does not apply at all to 6 = does apply completely.

The PESs' competence levels were measured with a self-constructed instrument asking them to rate their perceived competences after participating in the practical unit. Each item represented a competence that was practiced as part of the practical unit.

The instrument consisted of eight items with three subscales, based on the three phases of the practical unit: phase 1 (two items; e.g., 'I know that a situation can be appraised differently; $\alpha = .81$), phase 2 (five items; e.g., 'I can perceive my own physical stress response; $\alpha = .56$) and phase 3 (one item, 'I understand the relevance of stress management techniques'). PESs were asked to assess the degree to which these competences applied to them at the time they were completing the survey on a five-point scale, ranging from 1 = does not apply at all to 5 = does apply completely.

Table 2
Descriptive statistics of the evaluation of each situation

<i>Situation</i>		'offending each other'			'failure of game'			'leaving class'			'passing time'			'point deduction'												
<i>DV</i>	<i>Effect</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>Mi</i>	<i>Ma</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>Mi</i>	<i>Ma</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>Mi</i>	<i>Ma</i>										
Stress ¹	PET	16	3.4	1.4	1.0	7.0	15	4.4	2.1	1.0	8.0	12	2.9	1.9	1.0	7.0	14	3.3	1.5	1.0	6.0	12	4.0	2.2	1.0	9.0
	PEPT	10	4.8	2.5	1.0	9.0	10	4.1	2.8	1.0	8.0	16	3.8	2.0	1.0	8.0	11	6.0	2.3	2.0	9.0	11	6.0	1.9	2.0	8.0
	PES	18	3.8	2.1	1.0	7.0	18	5.3	2.3	1.0	9.0	14	4.9	2.0	1.0	8.0	16	4.1	2.4	1.0	8.0	16	5.1	2.0	2.0	9.0
	total	44	3.9	2.0	1.0	9.0	43	4.7	2.4	1.0	9.0	40	3.9	2.1	1.0	8.0	41	4.3	2.3	1.0	9.0	39	5.0	2.1	1.0	9.0
	<i>M</i>																									
Primary ²	PET	16	2.5	0.7	1.5	4.0	15	3.1	1.1	1.5	4.5	12	2.2	1.1	1.0	4.5	14	2.5	0.8	1.0	4.0	12	2.9	0.8	2.0	5.0
	PEPT	10	3.4	0.9	2.5	5.5	10	2.8	1.1	1.0	5.5	16	2.8	1.0	1.0	4.5	11	3.5	1.3	1.0	5.5	11	3.4	1.2	1.0	6.0
	PES	18	2.9	0.9	1.0	4.5	18	3.6	0.8	2.5	5.5	14	3.1	0.9	1.0	4.5	16	3.0	1.1	1.0	5.0	16	3.1	0.9	2.0	5.0
	total	44	2.9	0.9	1.0	5.5	43	3.2	1.1	1.0	5.5	40	2.7	1.1	1.0	4.5	41	2.9	1.1	1.0	5.5	39	3.1	0.9	1.0	6.0
	<i>M</i>																									
Secondary ²	PET	16	1.7	0.9	1.0	3.5	15	1.9	0.9	1.0	4.0	12	1.6	0.5	1.0	2.5	14	2.1	1.1	1.0	4.5	12	2.0	0.9	1.0	4.0
	PEPT	10	2.5	1.0	1.0	4.5	10	3.2	1.4	1.0	5.0	16	2.4	1.1	1.0	4.5	11	3.2	1.8	1.0	6.0	11	3.2	1.1	1.0	5.0
	PES	18	2.4	1.2	1.0	6.0	17	2.5	1.3	1.0	6.0	14	2.5	0.8	1.0	4.0	15	2.3	0.9	1.0	4.0	16	2.6	0.8	1.5	5.0
	total	44	2.2	1.1	1.0	6.0	42	2.4	1.3	1.0	6.0	40	2.2	0.9	1.0	4.0	40	2.5	1.3	1.0	6.0	39	2.6	1.0	1.0	4.0
	<i>M</i>																									
Stress ¹	PET	13	3.2	2.3	1.0	7.0	12	2.7	1.7	1.0	6.0	15	4.0	2.2	1.0	8.0	15	5.2	2.1	2.0	8.0	12	3.1	1.6	1.0	7.0
	PEPT	12	3.9	2.2	1.0	8.0	12	5.0	2.5	2.0	9.0	6	5.0	2.6	2.0	8.0	6	6.3	2.7	2.0	9.0	16	4.2	1.9	2.0	8.0
	PES	18	3.8	2.4	1.0	9.0	16	3.6	1.9	1.0	8.0	20	4.8	2.0	1.0	9.0	20	5.0	1.9	2.0	9.0	14	3.7	2.0	1.0	8.0
	total	43	3.6	2.3	1.0	9.0	40	3.8	2.2	1.0	9.0	41	4.5	2.1	1.0	9.0	41	5.2	2.1	2.0	9.0	42	3.7	1.9	1.0	8.0
	<i>M</i>																									
Primary ²	PET	13	2.5	1.1	1.0	4.5	12	2.7	1.0	1.0	5.0	15	2.5	1.0	1.0	4.0	15	3.0	0.7	2.0	4.5	12	2.0	0.9	1.0	3.5
	PEPT	12	2.6	0.5	2.0	4.0	12	3.1	1.2	2.0	5.5	6	3.0	1.7	1.0	5.0	6	3.9	1.0	2.5	5.5	16	2.7	0.8	1.0	4.5
	PES	18	2.7	0.8	1.5	4.5	16	2.8	0.9	1.0	4.0	20	3.0	0.8	2.0	5.0	20	3.0	0.7	2.0	5.0	14	2.8	0.7	1.0	4.0
	total	43	2.6	0.8	1.0	4.5	40	2.9	1.0	1.0	5.5	41	2.8	1.0	1.0	5.0	41	3.1	0.8	2.0	5.5	42	2.6	0.9	1.0	4.5
	<i>M</i>																									
Secondary ²	PET	13	2.0	0.9	1.0	4.0	12	1.7	0.5	1.0	2.5	15	1.9	0.8	1.0	4.0	15	1.8	0.8	1.0	4.0	12	2.0	1.4	1.0	6.0
	PEPT	12	2.6	1.0	1.0	4.0	12	2.8	1.2	1.0	5.0	6	3.0	1.3	1.5	4.5	6	3.2	1.2	1.0	4.5	16	2.4	1.1	1.0	4.5
	PES	18	2.0	1.0	1.0	4.0	16	2.1	0.9	1.0	4.0	19	2.2	0.8	1.0	4.0	20	2.5	1.0	1.0	4.5	14	2.3	1.2	1.0	4.5
	total	43	2.2	1.0	1.0	4.5	40	2.2	1.0	1.0	5.0	40	2.2	1.0	1.0	4.5	41	2.3	1.1	1.0	4.5	42	2.3	1.2	1.0	6.0
	<i>M</i>																									

Note. PET = Physical education (PE) teachers, PEPT = PE pre-service teachers, PES = PE students; Scale ranging from: ¹0 = not stressful to 10 = very stressful, ²1 = strongly disagree to 6 = strongly agree.

Table 3
Summary of ANOVA results for differences between PETs of three career stages

Situation		'offending each other'					'failure of game'					'leaving class'					'passing time'					'point deduction'				
DV	Effect	df 1	df 2	F	p	η^2/d	df 1	df 2	F	p	η^2/d	df 1	df 2	F	p	η^2/d	df 1	df 2	F	p	η^2/d	df 1	df 2	F	p	η^2/d
Stress intensity	Group	2	41	1.41	.257	.06	2	39	1.09	.347	.05	2	39	3.14	.055	.14	2	37	5.34	.009	.22	2	36	2.50	.096	.12
	Post-hoc	PET < PEPT					PET > PEPT					PET < PEPT					PET < PEPT *									
	Post-hoc	PET < PES					PET < PES					PET < PES					PET < PES									
Primary appraisal	Group	2	41	3.04	.059	.13	2	39	1.53	.229	.07	2	39	2.38	.106	.11	2	37	2.18	.127	.11	2	36	.85	.435	.05
	Post-hoc	PET < PEPT					PET > PEPT					PET < PEPT					PET < PEPT									
	Post-hoc	PET < PES					PET < PES					PET < PES					PET < PES									
Secondary appraisal	Group	2	41	2.00	.148	.09	2	39	3.21	.051	.14	2	39	3.52	.039	.15	2	37	2.53	.094	.12	2	36	4.11	.025	.19
	Post-hoc	PET < PEPT					PET < PEPT					PET < PEPT					PET < PEPT *									
	Post-hoc	PET < PES					PET < PES					PET < PES					PET < PES									

Situation		'lack of attention'					'disappointment'					'time delay'				'complaining'				'criticizing'				
DV	Effect	df 1	df 2	F	p	η^2/d	df 1	df 2	F	p	η^2/d	df	χ^2	p	r	df	χ^2	p	r	df 1	df 2	F	p	η^2/d
Stress intensity	Group	2	40	.33	.719	.02	2	37	3.77	.032	.17	2	1.37	.515	.21	2	1.86	.407	.29	2	39	1.11	.339	.05
	Post-hoc	PET < PEPT					PET < PEPT *					PET < PEPT				PET < PEPT				PET < PEPT				
	Post-hoc	PET < PES					PET < PES					PET < PES				PET > PES				PET < PES				
Primary appraisal	Group	2	40	.15	.865	.01	2	37	.56	.574	.03	2	1.39	.509	.22	2	4.70	.094	.73	2	39	3.17	.053	.14
	Post-hoc	PET < PEPT					PET < PEPT					PET < PEPT				PET < PEPT				PET < PEPT				
	Post-hoc	PET < PES					PEPT > PES					PEPT > PES				PEPT > PES				PEPT > PES				
Secondary appraisal	Group	2	40	.15	.225	.07	2	37	3.96	.028	.18	2	4.07	.130	.64	2	7.83	.016	1.22	2	39	.35	.706	.02
	Post-hoc	PET < PEPT					PET < PEPT *					PET < PEPT				PET < PEPT *				PET < PEPT				
	Post-hoc	PET > PES					PET < PES					PET < PES				PET < PES				PET < PES				

Note. PET = Physical education (PE) teachers, PEPT = PE pre-service teachers, PES = PE students; * indicates $p < .05$. ** indicates $p < .01$. *** indicates $p < .001$.

Procedure. After obtaining permission from the ethics commission, PESs were recruited through university classes; the PESs participated voluntarily without receiving any incentive for their participation. An investigator conducted the practical unit, which lasted about 90 minutes, during which PESs were assigned to two groups of five. Afterwards, the PESs were asked to complete a questionnaire.

Statistical analysis. Data were analyzed using IBM SPSS Statistics 27. To examine PESs' acceptance and competence levels, descriptive analyses were run. As in studies 1 and 2, the mean values of the results were interpreted by placing them at intervals for overall acceptance (ranging from 0–1.99 = very low to 8.00–10.00 = very high; see study 1), aspects of acceptance (ranging from 1.00–1.82 = very low to 5.15–6.00 = very high) and competence levels (ranging from 1.00–1.79 = very low to 4.20–5.00 = very high; Pimentel, 2019).

Results

Acceptance. The overall acceptance of the practical unit was high among PESs with a low dispersion around the mean value. A descriptive analysis for specific aspects of acceptance showed high scores for practicability, usefulness, attractiveness and suitability (see Table 4).

Level of competences. The PESs reported very high competence levels after participating in phases 1 and 3 and high levels after participating in phase 2 with a low dispersion around each of the mean values (see Table 4).

Table 4
Descriptive statistics of the evaluation of the practical unit

		n	M	SD	Min	Max
Overall acceptance¹		10	7.80	1.32	5.00	9.00
Specific aspects of acceptance²	practicability	10	4.95	.71	4.00	6.00
	usefulness	10	4.65	.85	3.50	6.00
	attractiveness	10	4.53	.91	3.25	6.00
	suitability	10	4.65	.85	3.50	6.00
	total	10	4.69	.67	3.75	6.00
level of competence³	Phase 1	10	4.80	.26	4.50	5.00
	Phase 2	10	4.08	.45	3.60	5.00
	Phase 3	10	4.60	.84	3.00	5.00
	total	10	4.33	.37	3.75	5.00

Note. Scale ranging from: ¹0 = very bad to 10 = very good, ²1 = does not apply at all to 6 = does apply completely, ³1 = does not apply at all to 5 = does apply completely.

Discussion

Results showed that the practical unit seemed to promote positive immediate outcomes for PESs, indicating that the students had gained competences by participating. The very high competence levels could be attributed to the PESs' high levels of acceptance of the practical unit. The reaction of the PESs, especially to the first part of the stress lab, was very positive, indicating that the PESs worked well with the tasks. Additionally, the tasks seemed to provide appropriate practice for dealing with stressful situations, thereby enabling competences to be gained. However, a limitation existed regarding the interpretation of the results due to the lack of a control group. This should be considered in future investigations.

General discussion

This paper introduces and evaluates the stress lab as the first tool for PES that prepares them to handle stress and potentially stressful situations and which is both knowledge-based and application-based. The overall aim of this paper was to introduce and evaluate the stress lab as an interactive tool for PESs. The two parts of the stress lab were developed to teach PESs knowledge (e-learning unit) and to give them the opportunity to practice how to handle stress and stressful teaching situations (practical unit). The stress lab was evaluated through three separate studies to verify whether PESs accepted the units and to evaluate their level of knowledge and competence levels after participation. Results of the evaluation of the e-learning unit showed that acceptance and knowledge levels were high for PESs after participating, but decreased after each section. The evaluation of the videos revealed that six videos represented potentially stressful situations for PESs and were, therefore, appropriate for the practical unit. After including these videos, results of the evaluation of the practical unit showed that PESs' acceptance was high, and predominantly in the first phase, they reported very high levels of competence after participating.

Interpretation of the evaluation of the e-learning unit

Results of the evaluation study showed that the e-learning unit seemed to be suitable for conveying comprehensive basic knowledge of the stress development process for reasons of content and didactics. In terms of content, this can be attributed to the fact that the e-learning unit was systematically structured by being oriented to the stress process (Lazarus & Folkman, 1984). In three sections, PESs learned complex content about the effects of stress, sources of stress and coping strategies. From a didactic point of view, the results can be attributed to the broad acceptance of the e-learning unit. However, knowledge acquisition based on the e-learning unit can still be improved. Results of the evaluation of the e-learning unit showed that the knowledge levels of the PESs were high but then decreased with each section. This can be explained in terms of content and didactics. Regarding the content, the assumption can be made that the complex topics of the e-learning unit were well chosen but also had the potential to overtax the PESs. Possibly, the abundance of information cannot be sufficiently conveyed in one e-learning unit. Consequently, PESs may lose interest while working through the sections. Also, in terms of content, the decreasing knowledge levels could be related to the fact that the content was partly described either very specifically (e.g., physiological effects of stress) or very generally (e.g., coping strategies). Both types of content could profit from further PET-specific references and examples for application to help PESs to absorb the knowledge.

Regarding the didactics, the decreasing levels of knowledge of the PESs can be explained by the fact that the knowledge was partly conveyed in long sections of text, and the PESs, therefore, omitted parts or finished the unit early. Also, in terms of didactics, the decreasing level of knowledge could be related to the lack of social contact and interaction with others while working through the unit. Davies and Graff (2005) found that the more students have the opportunity to interact in an online learning platform, the higher their performance (Davies & Graff, 2005). Because the e-learning unit lacked interaction, PESs may not have engaged with the content as attentively. This is also reflected in the slightly high results for attractiveness of the e-learning unit.

Interpretation of the evaluation of the practical unit

Results of the evaluation of the practical unit showed that competence levels after participating in the practical unit were predominantly very high. PESs' acceptance levels were high as well, meaning they reacted positively to the content. This is a useful prerequisite for learning new competences. The very high competence levels in PESs after participating could be attributable to the systematic structure of the practical unit, including the cumulative acquisition of competences, and the use of real-life videos. According to the psychology of learning, this systematic structure makes linking multiple items of learning content possible and, thus, the acquisition of consolidated competences (Bloom et al., 1956). Pertaining to the real-life videos, various studies have demonstrated that videos can make learning more interactive and engaging (Gaudin & Chaliès, 2015). With the help of the real-life videos, complex situations can be presented, and the PES have the opportunity to practice handling them. All six video-based situations chosen for the practical unit corresponded to sources of stress for PESs, as most of the situations involved pupils with discipline problems, pupils who lacked motivation and organizational problems (Pels et al., 2022). Therefore, the six videos fit the specific aim of the stress lab and seemed to be appropriate for gaining competences in the practical unit.

However, results of the evaluation of the practical unit revealed that the PESs' competence levels were very high, especially in the first phase where the focus was on reflecting and perceiving stress reactions,

compared to the following two phases that focused on handling video-based teaching situations (phase 2) and reflecting on the relevance of the topic (phase 3). The reasons for this can be considered from a learning psychology point of view and from a didactic point of view. From the perspective of learning psychology, the higher level of competences in phase 1 can be explained by the cumulative acquisition of competences. According to Bloom's taxonomy, basic competences were acquired in phase 1, which were then built upon in the subsequent phases (Bloom et al., 1956). From the perspective of learning psychology, acquiring the competences of phase 1, therefore, was easiest. Also, the competences gained in phase 1 were the most repeated ones since they appeared again in each subsequent phase. This can explain the very high competence levels reported in phase 1.

In terms of didactics, the videos also may be a reason that the PESs' competence levels were very high in phase 1. The evaluation of the videos found that both situations represented in phase 1 of the practical unit ('point deduction', 'complaining') were perceived as moderately stressful by PESs. Therefore, PESs may have been able to work particularly well with those videos. If the situations were appraised as stressful, the PESs may have been able to put themselves in the situations and reflect on their own stress reactions more easily. Consequently, PESs were able to complete the tasks and gain new competences. In contrast, the situations in the videos represented in phase 2 were rated as less stressful by the PESs, so they may have more difficulty performing the tasks and work with these videos because they had difficulty putting themselves in the role of the teacher. While videos in general offer many advantages for teacher education (Gaudin & Chaliès, 2015), they also offer the viewer the opportunity to build up a certain distance to the situation represented. Unlike in real situations, in which the teacher must always react immediately, PESs can take more distance from the video-based situations and are, therefore, less likely to assess them as stressful. As a result, they may not be able to adequately complete the tasks to assess and cope with the situations and, therefore, do not build new competences. Thus, the conclusion can be drawn that whether the PESs perceive the situation in a video as stressful and whether they can put themselves in the role of the teacher in the situation can have an impact on their acquisition of competences. Another didactic reason that competence levels were highest in phase 1 may be the type of task that was set for the videos. According to the cumulative acquisition of competences, the tasks in phase 1 were kept rather simple (e.g., 'Explain how you would feel in this situation'). In contrast, the tasks in phase 2 were more demanding because knowledge about coping strategies was presupposed (e.g., 'Which coping strategy will you use?'). However, if the PESs did not yet have the knowledge about coping strategies, they would not have been able to apply suitable strategies.

Limitations and future research

Limitations can be found in the sample, design and measures in this study. In terms of sample, the numbers of participants in study 1 and in study 3 were very low, largely due to the time taken by both parts and the effort involved in preparing the practical unit. Another limitation regarding the sample was that people participated voluntarily and may, therefore, be more motivated and value the units more positively than would people who are required to participate. In future studies, the stress lab can, thus, be conducted in a mandatory seminar. Regarding design, control groups were not included in the three studies. Hence, future studies should include a control group. Furthermore, in terms of design, the three studies did not follow a standard intervention design. No pre-post design was used, so we could not determine a time course. However, our studies were based on a clear description of the immediate outcomes after participation. Regarding measures, the e-learning unit and the practical unit were evaluated in two separate studies and, as such, the results could only be analyzed separately. Since the stress lab was supposed to consist of both parts, future studies should evaluate the whole stress lab. Additionally, the measuring instruments (e.g., specific aspects of acceptance) were self-constructed and partly adapted to the content of the stress lab. Therefore, a limited reliability but a high face validity can be determined because the instrument was developed by a group of experts. Future studies should include general measurement instruments in addition to specific instruments.

Conclusion

From this, various implications for the stress lab can be deduced. Implications for the e-learning unit can be considered at the content and didactic level. In terms of content, the most detailed section (development of stress) should be reduced, and the relevant topics described in more detail (coping). More PET-specific examples could make the content more application-oriented. In future studies, whether PESs work through the individual sections of the e-learning unit and the amount of time they spend on them should be ensured to be able to make clear statements about the acceptance of the content. In terms of didactics, the use of variable digital media, such as videos or interactive tools, could increase the attractiveness of the e-learning unit. Implications for the practical unit can be considered from the points of view of learning psychology and of didactics. In terms of learning psychology, the structure of the cumulative acquisition of competences should be reviewed. The individual phases of the practical unit should be structured in a way that PESs are able to gain competences in each phase. Therefore, the conclusion can be drawn that gaining topic-related knowledge before participating in the practical unit could help PESs to acquire competences (e.g., knowledge about coping strategies). From a didactic point of view, further studies should examine whether situations rated as very

stressful were actually related to an acquisition of competences in PESs. Based on the results of the evaluation studies, the conclusion can be made that PESs profited from gaining knowledge about stress and practicing how to handle stressful teaching situations. It not only raises students' awareness about stress in physical education, it also encourages the PESs to communicate with each other about stress, and to learn and practice with each other in order to possibly prevent burnout in later professional life. Therefore, the stress lab should be used by teacher educators in university settings.

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Appendix A. Supplementary material

Table S1

Schedule of the content of the e-learning unit

sections	(1) Development & effects of stress			(2) Sources of stress in PE		(3) Resources and coping strategies			
Parts	Part 1a	Part 1b	Quiz	Part 2	Quiz	Part 3a	Part 3b	Part 3c	Quiz
Content	Transactional theory of stress	Psychological & physiological stress reactions	Query of learning content of the section	Sources of stress that can occur while teaching PE	Query of learning content of the section	Function of resources	Acute coping strategies	Long term coping strategies	Query of learning content of the section

Table S2

Schedule of the practical unit of the stress lab (90 minutes)

Title	Competences to be learned	Cumulative acquisition of competence	Time	Content	Tasks	Materials	Procedure/ Organisation
Organisation			3 min.		tasks of the lecturer		
				- repairing room and material	- scripts	- hand out	Lecturer prepares
					- materials (tablets, pulse watches, headphones with extension cords)	- set up	aptop & projector
					- Moodle and open folder to get to videos	- log in to	aterials
					- tables for groups of 5	- set up group	
Introduction			5 min.		tasks of the lecturer		
	ntroduction of the topic	Reactivating the contents of the e-learning unit		- elcoming all	- topic with the help of the Power-Point presentation (Stresslabor_Presentation_Lehrende) (slides 1-7).	-	Overall group
				- hort review of e-learning unit		-	Lecturer prepares
				- ntroducing topic		-	P presentation
				- erview of the agenda		- cripts	

Phase 1		15 min.	Lecturer moderates					
Phase 1a		8 min.						
reflecting and perceiving one's own and others' stress reactions and cognitive appraisal processes	Recalling knowledge and competences on stress development/reactions		appraisal of stress	phase 1a with the PP presentation (slide 8, 9) via projector, showing video 1, embedded in Moodle	introducing (slide 8, 9) via projector, whole group	apopt & Projector		Overall group
			stress reaction	watches the video together	students work	P Presentation		Lecturer moderates
				with script	students	ideo(Moodle)		
				answer questions for themselves	time for	cript		
				discussion				
Phase 1b		7 min.						
reflecting and perceiving one's own and others' use of coping strategies and resources	Recalling knowledge and competences on stress development/reactions		oping strategies	phase 1b with the PP presentation (slide 9) via projector, show video 2, embedded in Moodle	introducing (slide 9) via projector, whole group	apopt & Projector		Overall group
			esources	watches the video	students work	P Presentation		Lecturer moderates
				with script	students	ideo(Moodle)		
				answer questions for themselves	time for	cript		
				discussion				
Organi-sation		5 min.	Preparations of the lecturer and the students					
			reparing room and material	phase 2 with PP presentation (slide 10 -12) groups of 5	introducing (slide 10 -12) forming	Per group: 1 heart rate monitor, 1 tablet, 1 multiple plug, 5 headphones		Overall group
				devices: per group of 5: 1 tablet, 1 heart rate monitor, 1 multiple plug, 5 headphones	handing out			
				via Link on tablets desktop	open Moodle			
Phase 2		45 min.	Students work with the script, passive role of lecturer (time keeper)					
Phase 2a		8 min.						
receiving own stress reaction in potential stressful situations	Recalling knowledge and competences on stress development/reactions		Video 2a Perceiving stress reaction (on physiological, emotional and cognitive level)	Active teaching person (A) (P1) Tasks: perceive own physiological, emotional, cognitive stress reaction (e.g., "Please assess how you feel right now.")	Student A gets the heart rate monitor Observer s (B) Watching Video 2a Observing and perceivin g psycho-somatic reactions P1	Passive teaching person (C) - aptopt & Projector - P presentation (slide 13,14) - ideo (Moodle)		Groups of 5 Passive role of lecturer
				Task: choose coping strategies to handle stress reaction (e.g., "Think briefly about how you will handle your reaction to the situation.")	Observing and perceivin g psycho-somatic reactions P1	Working on same tasks as P1 but in the script		uestions are integrated into the video
	handling stress reaction (emotion-oriented coping)		Selecting coping strategies			cript		Sc
			Justifying coping strategies Discussion	Task: Justify the choice of coping strategies	Listening to P1			
	becoming aware of the goals of chosen coping strategies				Giving feedback			
Phase 2b		10 min.	Change of person performing the test: handover of the pulse watch					
being able to assess potential stressful situations	Recalling knowledge and competences on didactic contents		Video 2b Answering same tasks from 2a	Active teaching person (A) (P2) Task: 2a (see above)	Observer s (B) Watching Video 2b Observing and perceivin g psycho-somatic reactions P2	Passive teaching person (C) - aptopt & projector - P presentation (slide 15,16) - ideos (Moodle)		Groups of 5 Passive role of lecturer
			Assessing stressful situations	Task: assess the situation (e.g., "Explain what the situation means for you and the rest of the PE lesson?")	Listening to P2	Working on same tasks as P1 but in the script		uestions are integrated into the video
			Discussion		Giving feedback	cript		
Phase 2c		12 min.	Change of person performing the test: handover of the pulse watch					
being able to create and represent appropriate solutions to handle situation (problem-oriented coping)	Recalling knowledge and competences on didactic contents		Videos 2c Answering same tasks from 2a and 2b	Active teaching person (A) (P3) Task: 2a and 2b (see above)	Observer s (B) Watching Video 2c Observing and perceivin g psycho-somatic reactions P3	Passive teaching person (C) - aptopt & Projector - P presentation (slide 17,18) - ideos (Moodle)		Groups of 5 Passive role of lecturer

Phase	Duration	Activity	Task	Observation	Feedback	Integration	Notes
Phase 2d	15 min.	Practicing to handle a potential stressful situation	Weighing up possible courses of action and justifying solutions Discussion Video 2d Answering same tasks from 2a – 2c Discussion	Task: create appropriate solutions (e.g., "Describe how you would act in this situation. Are there different options?") Watching video 2d Task: 2a – 2c under public observation on laptop and beamer	Listening to P3 Giving feedback Observing and perceiving psychosomatic reactions of P4 Giving feedback	Questions are integrated into the video - ript Sc aptop & projector P presentation (slide 19,20) ideas (Moodle) uestions integrated in the video - Script	Moderating role of the lecturer Drawing of the active performing person P4 Active teaching person (A) Observers (B) Overall group Moderation of lecturer Random selection of one person
Phase 3	15 min.	Being able to recognize and understand the practical relevance of the contents	Transfer of what has been learned to the practical usage and giving feedback about what has been learned	Phase 3 with PP presentation (slide 21 -13). Lecturer asks whole group what messages students take home Lecturer invites students to give feedback to the unit	introducing Lecturer asks Lecturer	aptop & Projector P presentation ript	Lecturer moderation Overall group
Fare well	2 min.			making reference to the reflection guide at the end of the script			Moderation of Lecturer Overall group

Table S3
Name of the videos and short description of the situations shown in the videos

Video	name	potential stressful situation
Video 1	'offending each other'	While the teacher speaks to the pupils some pupils start offending each other.
Video 2	'failure of game'	The teacher conducts a game with the pupils and meanwhile notices that it does not work in practice as it was planned in theory.
Video 3	'leaving class'	Pupils are conducting a relay race while the teacher notices one pupil leaving the hall without being asked.
Video 4	'passing time'	The teacher is waiting for the pupils to arrive in the sport hall while a lot of time passes.
Video 5	'point deduction'	The teacher gives points for the last game and one team is complaining because they got a point deduction.
Video 6	'lack of attention'	The teacher speaks to the pupils while some of them lack of attention.
Video 7	'disappointment'	A Pupil reacts disappointed to the teachers comment that no match can take place at the end of the lesson.
Video 8	'time delay'	The teacher wants to start a game but is waiting for one pupil who needs a lot of time to cross the sport hall.
Video 9	'complaining'	Pupils complain about the decisions of the teacher as a referee in a relay race.
Video 10	'criticizing'	The pupils are playing volleyball while the teacher earns critic for the ease of the tasks by one pupil.