

# Optimizing Learning Environments and Resident Well-Being in Postgraduate Medical Education

**Stefan van Vendeloo**





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and Resident Well-Being  
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# Optimizing Learning Environments and Resident Well-Being in Postgraduate Medical Education

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Seremos nós neste mundo apenas canetas com tinta  
Com que alguém escreve a valer o que nós aqui traçamos?...

*Álvaro de Campos [Fernando Pessoa] - Às vezes...*

Voor mijn ouders  
en Marleen

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# Part I

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Introduction

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# Chapter 1

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General introduction and outline

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## **Introduction**

When I reflect on my own career, I remember my internship at the orthopaedic department as an incredibly interesting clinical experience. The one thing that inspired me most – besides standing in the spotlights of the operating theatre, helping patients regain their mobility, and the excitement of being part of a trauma team – was the enthusiasm of my supervisors. Those supervisors were role models for me, because they genuinely loved their job, were highly engaged teachers and were truly satisfied about their work-life balance. My supervisors' enthusiasm back then was probably the most influential factor that eventually led to my choice of becoming an orthopaedic surgeon myself.

At the start of my residency training, my expectations were simple. I hoped to be trained by truly engaged supervisors who considered teaching an integral part of their job and who would support my learning process of becoming a good orthopaedic surgeon myself. I soon experienced the complexity of putting the theory of medical training into practice. I noticed the struggle of some of my supervisors in combining their clinical tasks with clinical teaching and I also realized the importance of other factors on the quality of training: collaboration with peers, input from nurses and other health care professionals, the atmosphere at the department and the number of opportunities to learn new skills. In other words, I experienced how important a good and safe clinical learning environment was to support my learning process. In the same period, I noticed that several of my fellow residents had difficulties coping with the high job and educational demands of residency training, with some of them developing symptoms of burnout. At first, I thought that personality traits predicted the risk of becoming burned out, but later I witnessed how residents flourished in healthy learning environments whilst developing burnout when the learning environment was not supportive.

As my training progressed, I witnessed major changes both in the content of the residency program and in the way the learning process itself was approached.

Concerning the content of the program, the former more broadly oriented training in general orthopaedics, including two years of basic training in general surgery, gave way to a program that gave residents the opportunity to develop their skills in an orthopaedic subspecialty in the final years of their training. In addition, new tools for appraisal and assessment were introduced, we started using a digital portfolio for both assessment and encouraging our professional growth, supervisors received systematic and structured education on the principles of clinical teaching, and there was a growing awareness of the importance of a healthy learning environment. I felt that these educational changes created a collaborative and more engaged learning atmosphere, giving both residents and supervisors clear responsibilities. This modernization process and the unexpected complexity of clinical orthopaedic training inspired the studies in this thesis.

## **Competency-based medical education**

### **CanMeds**

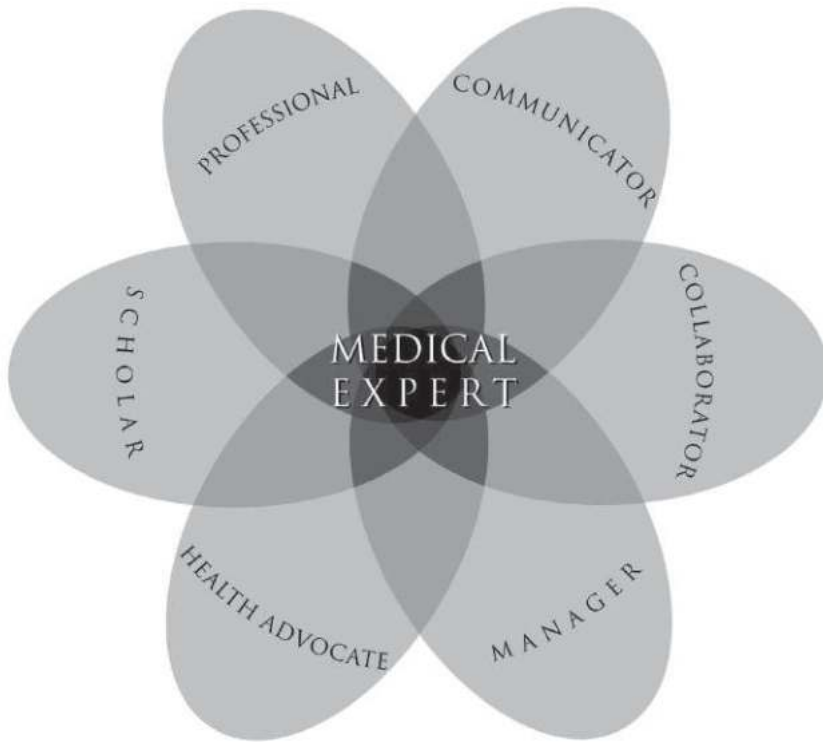
The primary goal of postgraduate medical education (PGME) (or: residency training) is to prepare young doctors for independent practice, creating a medical specialist workforce which is able to meet the needs of patients, populations and the societies it serves.<sup>1,2</sup> During the late 20th century there was a growing recognition that graduates of residency training programs were insufficiently prepared for practice.<sup>1</sup> Until then, educational programs were time-based, focusing on exposure to clinical experiences over a certain predetermined time. These time-based models also relied highly on the content and structure of the curriculum and focused mostly on the latest aspects of medical diagnosis and treatment. These training programs had produced skilled physicians for decades and enjoyed many successes over the years. Nevertheless, increasing rates of errors in diagnosis and treatment, poor communication between physicians and other medical personnel, dysfunctional collaborations between members of medical teams and poor care coordination were some of the serious issues that led to the conclusion that these time base training programs were unable to adequately prepare physicians for 21<sup>st</sup> century practice.<sup>3</sup>

A doctor strike in Canada in 1986 initiated a public debate about what patients and the society should expect from their physicians.<sup>3</sup> This ultimately led to the description, by the college of Physicians and Surgeons of Canada, of key competencies all physicians should obtain to meet the needs of patients, societies and populations.<sup>2</sup> These competencies are organized around seven roles which became known as the Canadian Medical Educational Directives for Specialists (CanMeds) roles (Figure 1). At the heart of CanMeds lies the role of *medical expert*. To become an excellent (or competent) physician, however, competence also has to be achieved in six other, more generic roles: communicator, collaborator, (medical) leader, health advocate, scholar and professional.<sup>2</sup> The Dutch College of Medical Specialties recognized similar needs and challenges and adopted the CanMeds roles as the underpinning of their educational frameworks.<sup>4</sup>

The introduction of CanMeds at the turn of the century catalysed the modernization of postgraduate medical educational programs around the globe. These modern programs are referred to as competency-based medical educational programs, because they are based on achieving competence instead of spending a predetermined amount of time in a training program. Competency-based medical education (CBME) is therefore defined as an outcome-based approach to the design, implementation, assessment, and evaluation of medical education programs, using an organizing framework of competencies.<sup>5</sup> CBME shifts the focus from what is taught to what is learnt. In other words, CBME is a learner-centred approach to postgraduate medical education, focusing on the outcomes, or competencies, that need to be acquired by a resident in order to become an autonomously functioning medical specialist. Fundamental characteristics of CBME are: clearly defined outcome abilities in the form of predefined desired competencies, competencies that are derived from the needs of patients and learners, learning being tailored to each learner's progression, time being used as a resource and not as a proxy for competence, sequencing of learning experiences facilitating the progression of ability in stages, formative and focused feedback from multiple sources, and planned and integrative assessment.<sup>3,6</sup>



**Figure 1.** the CanMeds framework.



© 2015 The Royal College of Physicians and Surgeons of Canada.

### **Criticism and concerns of CBME**

Although there is strong support for CBME in the literature<sup>7,8</sup> and CBME has been embraced as the leading model for postgraduate medical education in most countries in the developed world, it has also been criticised. There are concerns about the lack of evidence supporting CBME.<sup>9</sup> This lack of evidence can partly be explained by the complexity and diversity of CBME programs and by the absence of feasible instruments evaluating the expected improvement in quality of such programs, limiting the possibility to determine whether these programs ultimately produce better doctors.<sup>3,10</sup> Another point made by critics is that the reductionist way CBME is put into practice underappreciates the complexity of clinical teaching and encourages

mediocrity instead of excellence.<sup>11</sup> The increased tendency towards accountability of teaching faculty and CBME programs has prompted the implementation of large numbers of checklists and online assessments which contribute to demoralizing supervisors and residents. Some authors state that merely checking off competencies on checklists is not sufficient in producing a complete and competent physician.<sup>12</sup> These criticisms have had only a negligible effect on the widespread support for CBME as the preferred model for postgraduate medical education among residents, supervisors, program directors, and administrative and regulatory authorities.<sup>3,7</sup>

### **Competence versus competency**

Competence can be defined as the array of abilities (knowledge, skills, and professional attitudes) across multiple domains of performance in certain real-life settings whereas competency is an ability, integrating knowledge, skills, values and attitudes.<sup>6</sup> Competencies can thus be viewed as ingredients or building blocks of competence.

### **Assessment and appraisal in CBME**

The greatest impetus for introducing CBME programs is to ensure that a resident completing training has been verified as being competent,<sup>3</sup> answering to the public and societal calls for greater accountability of the medical profession.<sup>2</sup> This process of verification consists of a thorough evaluation of the resident's professional performance during training. This is easier said than done, however. It turned out to be a major challenge in CBME to assess a resident's competence in each of the CanMeds roles.<sup>5</sup> Based on the educational theory that competent performance of specific clinical tasks is easier to assess and quantify than assessing competence in CanMeds roles,<sup>13,14</sup> the concept of Entrustable Professional Activity (EPA) was developed to operationalize competency-based programs.<sup>15</sup> An EPA can be defined as a unit of professional practice that can be fully entrusted to a resident, as soon

as he or she has demonstrated the necessary competence to execute this activity unsupervised.<sup>16</sup> Workplace-based assessments, i.e. determining with some degree of confidence that residents have completed sufficient learning to be competent in performing the tasks and activities appropriate for their stage of professional development (assessment of learning, summative assessment), is a prerequisite for CBME. Similarly, CBME puts a great emphasis on feedback, which is meant to facilitate the residents' progress (assessment for learning, formative assessment).<sup>17</sup> Examples of feedback instruments are the Mini-Clinical Evaluation Exercise (mini-CEX) and Direct Observation of Procedural Skills (DOPS).

The summative assessments and the formative feedback, combined with reports on the work done, progress made and future goals and plans of the resident, are collected in a portfolio.<sup>18</sup> Since the introduction of CBME programs, portfolios are increasingly used as both a coaching and assessment instrument to support and evaluate the performance of residents. Although considered an important tool in assessing a resident's progress, it remains questionable whether portfolios are able to assess whether competence is being achieved. At least two conditions have to be met before a portfolio can be used reliably in competence assessment. First, the portfolio needs to contain a sufficient amount of information. Second, the evaluations need to be performed by trained and multiple assessors.<sup>19</sup> The feasibility of portfolios as a tool used both for assessment and formative feedback is matter of debate.<sup>17</sup> Moreover, it is unknown whether the digital portfolios used in the Dutch CBME programs contain sufficient information to allow for effective competence improvement, more specifically for effective use of feedback. Moreover, sufficient information is needed to allow for valid judgments (pass-fail) concerning the professional performance of the resident. Although the format and content may differ between portfolios used in other countries, they generally share the same purpose and what they also share is the need for sufficient data: to enhance the residents' professional growth and also to facilitate the decision-making process.

## Portfolio

Portfolios used in medical postgraduate education contain evidence of how residents fulfil tasks and how their competence is progressing. Although the content and the format may differ between portfolios, they basically report on the work done, feedback received and the progress made. A portfolio is a multipurpose instrument, intended to be used both for assessment, and for reflection and professional development.<sup>18</sup>

## Evaluating the quality of the residency training program

The global introduction of CBME programs is accompanied by high costs and requires considerable efforts and time from residents, supervisors and educators. This gives rise to the question whether CBME improves the quality of the training programs. The four-level model, designed by Kirkpatrick, is commonly used to evaluate the quality of a training program in terms of outcomes and thus in effectiveness.<sup>20</sup> The model describes a sequence of four levels to evaluate a training program: *reaction* (residents' satisfaction with the training program), *learning* (changes in knowledge, skills and attitudes), *behaviour* (the application of learned knowledge and skills into clinical practice) and *results* (the improvement of the care delivered by the resident and of health care in general).<sup>20</sup>

Ideally, we would want to evaluate the highest level of the model (*results*), thus assessing whether the quality of health care improves after introducing CBME. The higher the level in this model, however the more difficult, complex and more time consuming the evaluation process becomes. Measuring the effectiveness of CBME programs in terms of improved patient outcomes (*results*: fourth level) is extremely complex, which probably explains that only sparse literature about the effect of CBME on the quality of health care is available.<sup>21,22</sup> Two studies examining the effect of the learning environment on patient outcomes found no association between the overall quality of the learning environment and global department ratings of inpatient

care experience<sup>22</sup> but there was an association between the learning environment and perinatal adverse events in a study conducted among gynaecology residents.<sup>21</sup> When we look at the other levels of the model, only very little is known about the impact of CBME. Concerning the *behaviour* level, one could assess the effect of CBME on professional performance of residents in daily clinical practice, on which no data exists. At the *learning* level of the model, we could assess the degree to which residents feel that their training prepared them sufficiently for independent practice. Literature concerning this level is scarce. A study conducted among young medical specialists who had just finished their CBME training found a positive association between attention to competencies during feedback and preparedness for practice.<sup>23</sup> At the lowest level, one evaluates the educational experience of the resident, which is by far the most feasible level to assess. Hence, when evaluating the quality of a medical training program, the focus in the literature is mostly on this level. Throughout the introduction of CBME programs, extensive research was undertaken to develop feasible and validated instruments that assess the quality of the training program at this level. Most of these instruments focus on the context residents participate in during their day-to-day work as a doctor, i.e. the learning environment.<sup>24</sup>

## Learning environment

The process of residents learning from everyday engagement in clinical tasks and activities takes place in the complex context of the clinical workplace. This context includes formal and informal aspects of the learning process and is called the learning environment.<sup>25</sup> The way supervisors and other personnel in a particular medical department approach the residents and the process of teaching is considered a reflection of the learning environment.<sup>24</sup> The following definition has recently been proposed: *‘Learning environment refers to the social interactions, organizational culture and structures, and physical and virtual spaces that surround and shape the learners’ experiences, perceptions, and learning.’*<sup>26</sup> Due to the complexity of the learning environment, measuring its quality is challenging and there is no gold

standard test available to reliably and validly assess the quality of the learning environment. The systematic evaluation of the learning environment by the residents themselves is considered the single most important quality indicator of the learning environment specific for postgraduate medical education.<sup>27</sup>

### **Evaluating the learning environment**

During the introduction of CBME programs, governments and educational boards have put a greater emphasis on quality assurance and quality control. The Dutch Ministry of Health, Welfare and Sports appointed a committee in 2008 to assess the available quality indicators. The report of the committee, which was updated in 2016, describes the implementation of internal quality assurance by using a plan-do-check-act (PDCA) cycle.<sup>28</sup> Successful use of the PDCA cycle is dependent on formative feedback tools. The report therefore listed several validated feedback tools that assess a variety of aspects related to the quality of the training program. The learning environment is considered the single most important aspect of the quality of a training program.<sup>27</sup> Although the evaluation of the learning environment as perceived by the residents is the lowest level of quality assessment in the aforementioned four-level model of Kirkpatrick, the World Federation for Medical Education (WFME), the Dutch College for Medical Specialties<sup>28</sup> and the General Medical Council<sup>29</sup> all stress the importance of assessing the residents' perceptions of the learning environment when evaluating the quality of a training program. Despite these standards and reports, knowledge about the impact of the introduction of CBME programs on the learning environment is lacking.

The learning environment is a multifaceted construct which is difficult to evaluate due to its complexity. A theoretical framework defining the essential concepts of learning environment measures<sup>30</sup> characterizes the learning environments in terms of three broad domains or sets of dimensions: goal orientation, relationships and organization/regulation. *Goal orientation* refers to the *content* of the training program, the dimension *relationships* refers to the interpersonal aspects and *atmosphere* of

the program and *organization/regulation* covers the structure and the *organization* of the program. A previous content analysis of instruments that evaluate the learning environment has shown that the vast majority of the items of these instruments relate to this theoretical framework.<sup>30</sup>

Several instruments that assess the learning environment as perceived by the resident have been developed and validated. The most widely used questionnaire in the Dutch language area is the Dutch Residency Educational Climate Test (D-RECT), consisting of 50 items that are scored on a 5-point Likert scale, ranging from totally agree to totally disagree. In an update of the instrument in 2016, the number of items was reduced to 35.<sup>31</sup> Although the D-RECT is well studied and validated it lacks a sound theoretical framework.<sup>32</sup> In addition, the D-RECT is relatively long, consisting of 35 items. The Scan of Postgraduate Educational Environment Domains (SPEED) has been developed to overcome these limitations. This instrument is based on the aforementioned theoretical framework defining the *content*, *organization* and *atmosphere* of the program as the three key dimensions of the learning environment. Besides, the SPEED consists of only 15 items and three overall ratings for every key dimension (content, organization and atmosphere).<sup>32</sup>

### **Importance of a healthy learning environment**

The learning environment is considered to be of paramount importance for the effectiveness of training programs<sup>33</sup> and plays a key role in determining the degree to which competency-based residency training programs prepare residents for independent practice.<sup>23</sup> Furthermore, it has been postulated that there is an association between the development of resident burnout and an unhealthy or unsafe learning environment.<sup>34</sup> On the other hand, when residents perceive the learning environment as supportive, it is associated with improved resident well-being.<sup>35</sup> The exact mechanism that underlies the association between learning environment and resident mental well-being is relatively unknown.

## **Resident well-being**

It is against the challenging backdrop of the aforementioned major educational changes that the well-being of residents is under pressure.<sup>34,36-38</sup> The modernized residency programs have put an emphasis on learner-centeredness, focussing on coaching of residents, giving frequent and structured feedback and paying attention to improving didactic skills of supervisors. It is likely that these changes have a positive effect on the quality of the learning environment, but this has yet to be confirmed by research. Moreover, it seems probable that creating an optimal learning environment might improve resident well-being by reducing symptoms of burnout and stimulating resident engagement. I will further describe the background of this hypothesis in the following paragraphs.

### **Burnout**

Optimal resident well-being is widely considered a condition for delivering high-quality and safe patient care.<sup>39,40</sup> The interest in resident well-being focuses mainly on the psychological syndrome of burnout, which is defined by three dimensions: emotional exhaustion, depersonalization, and reduced personal accomplishment.<sup>41</sup> Emotional exhaustion refers to feelings of being depleted of emotional resources. Depersonalization is characterized by a negative, cynical or detached response to others. Reduced personal accomplishment is the perception of being incompetent to perform tasks requiring responsibility. The syndrome is considered a prolonged response to chronic emotional and interpersonal stressors on the job.<sup>41</sup> Burnout among residents is a major concern for several reasons. Probably the most important reason why resident burnout deserves our attention is the significant professional consequences it has. Most importantly, residents who suffer from burnout commit more medical errors and deliver lower quality of patient care.<sup>42,43</sup> Moreover, residents who suffer from burnout have an increased risk of substance abuse, suicidal ideation, and an increased suicide risk.<sup>44</sup> Finally, the prevalence of burnout among residents is high. In the Netherlands the rate of burnout among residents was found to be 21%,<sup>36</sup> but international research shows rates between 25% and 60% among residents from a wide spectrum of different medical specialties.<sup>45</sup>



These wide ranges can be attributed to the use of different definitions, instruments and study designs,<sup>46</sup> but other factors could also play a role. These factors could be environmental (learning environment when it concerns residents), cultural (burnout rated differ between countries) and individual (some personality traits might predispose to burnout). The cause of burnout is multifactorial and it is still unclear how the complex interplay of environmental, cultural and individual factors eventually can lead to burnout in a resident. Although burnout in residents has become a hotly debated topic recently,<sup>34</sup> we know surprisingly little about its causes.

### **Engagement**

While burnout is the negative side of well-being, the positive side of well-being is work engagement. Work engagement is defined as a positive, fulfilling, work-related state of mind that is characterized by vigour, dedication and absorption.<sup>47</sup> Work engaged residents report fewer medical errors and better professional performance.<sup>48,49</sup> Furthermore, it is likely that work engagement has a positive effect on the learning environment. Research has shown that highly engaged employees are more likely to fulfil their goals,<sup>50</sup> and such goal fulfilment will generate positive feedback, increase rewards and thereby improve the working environment.

#### **Burnout versus depression**

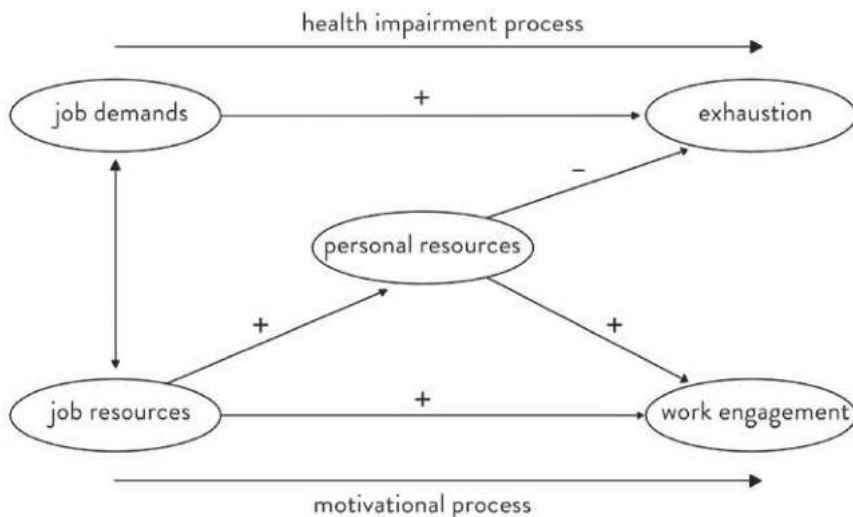
Depression is a mental illness characterized by low mood. People who are depressed have a loss of interest in activities that they normally find enjoyable. Burnout on the other hand is not a mental illness but a work-related syndrome, characterized by a loss of mental energy. People who suffer from burnout don't lose their interest in activities, they lack the energy.

### **Job Demands-Resources Model**

The most widely used model to understand burnout and work engagement is the Job Demands-Resources (JD-R) model (Figure 2), which has matured more recently

into a theory (Job Demands-Resources theory).<sup>50</sup> At the heart of this model lies the assumption that an imbalance between job resources and job demands can lead to burnout.<sup>51</sup> Job resources refer to physical, social or organizational aspects of the job (e.g. peer and supervisory support, coaching, feedback, autonomy and role clarity) that may assist functioning towards achieving goals, may reduce job demands, and may stimulate personal growth and development. Job demands refer to aspects of the job (such as high workload and emotionally demanding interactions with patients) that require sustained physical or mental effort and are therefore associated with certain physiological costs, including exhaustion. Job demands do not necessarily have a negative influence on the well-being of employees, but they can become job stressors when meeting those demands requires high effort and the employee is not given the opportunity to restore adequately.<sup>52</sup> The JD-R model proposes two independent processes to describe employee well-being (Figure 2). Job demands and job resources are the triggers of these two independent processes: the health impairment process (job demands consuming energy) and the motivational process (job resources fulfilling psychological needs, e.g. development of competence).

**Figure 2.** The Job Demands-Resources Model.



*Adapted from Mastenbroek et al.*

## **Resident burnout: role of the learning environment**

During my own training, I experienced that creating a healthy learning environment is highly dependent of supervisors showing proactive behaviour in teaching and acting as positive role models. This became even more apparent during a fellowship that I started abroad, in Belgium, after finishing my residency training in the Netherlands. The training program in the Belgian hospital where I worked was not yet competency-based. Supervisors were highly qualified surgeons and when I asked them about how they interpreted their role as a medical teacher they told me they felt responsible for the next generation of medical specialists, but most of them didn't consider the teaching process itself as part of their job. Furthermore, structured feedback was only rarely given, residents were hardly given the opportunity to learn new skills, and working hours were exceptionally long. In relation to the training experiences in my own country, where teaching has become a top priority in residency training, the differences were striking. During this fellowship abroad, I also noticed the difficulties residents had coping with the poor learning environment, increasing their job-related stress considerably. It came as no surprise to me that many residents complained of symptoms of burnout. These personal experiences raised the question: what is the role of the learning environment in the development of burnout?

### **Increased risk of burnout in residents**

Residents engage in complex social interactions with patients, hospital staff and colleagues on a daily basis and they have to collaborate in large and complex hospital organizations. Before the implementation of CBME programs, the focus of residency training was mostly on acquiring medical knowledge and technical skills, leaving residents with few tools to comprehend and navigate these complex social interactions and with few skills to take the leadership role that is expected of them. Managing stressful situations while being unprepared to do so can be extremely stressful for the residents themselves.<sup>53</sup>

Residents are more at risk of developing burnout than medical specialists due to several reasons. Reports suggest that young age is related to burnout which implies that burnout is more likely to appear early in a person's career.<sup>41</sup> In addition, compared to specialists, residents have higher educational demands, lower levels of control, less autonomy, a higher level of work-home interference and less reciprocity in relationships at work.<sup>54,55</sup> In addition, research has shown that residents who lack social support from their supervisors were found to have higher levels of emotional exhaustion and depersonalization.<sup>54</sup> These results confirm my own experience, that supervisors seem to play a vital role in creating a learning environment in which residents flourish instead of burnout.

### **Resident well-being: environment versus personality**

Recent literature supports the hypothesis that burnout among physicians is rooted in issues that are related to the working environment and organizational culture.<sup>56,57</sup> A meta-analysis demonstrated that organization-directed approaches are more effective in reducing burnout than individual interventions.<sup>58</sup> Many dimensions of physicians' work environment resemble the dimensions of the residents' learning environment discussed above.<sup>24</sup> Although the evidence on the negative impact of burnout on the personal lives of residents and patient care is overwhelming,<sup>34,43,48,59-61</sup> it is striking how little we know about the influence of the learning environment on the well-being of residents and the development of resident burnout.<sup>57</sup> Concurrent with the association between the working environment and burnout in physicians, I think it is probable that there is an important association between the learning environment and resident burnout.

The learning environment is a very broad construct, incorporating a wide variety of aspects concerning the content, the organization and the atmosphere of residency training.<sup>30</sup> If an association exists between the quality of the learning environment and resident burnout, it seems likely that some of the domains of the learning environment act more strongly as a job resource (or job demand when the specific

domain is rated low). I already stressed the importance of the role of supervisors in improving resident well-being and thus hypothesize that aspects concerning supervisory support, including coaching and feedback, have a greater impact on resident well-being and thus on the development of burnout than other aspects (e.g. organizational aspects and working hours).

In addition to job demands and resources, which act on the organizational or environmental level of the JD-R model, personal resources have been introduced in the model and act on the individual level of the model.<sup>52</sup> Personal resources are linked to someone's resilience and refer to someone's sense regarding how much control they have over their working environment.<sup>50</sup> Personal resources are able to buffer the unfavourable effects of job demands, examples are: emotional stability, extraversion, self-efficacy and optimism. In contrast to personal resources, personal demands refer to someone's dysfunctional cognitions about one's self, and include personality traits like perfectionism and emotional instability.<sup>52</sup> The specific role of personal resources and demands in the development of resident burnout is unknown. Although the learning environment is thought to play a key role in the development of resident burnout, individual aspects like personality traits could also contribute to the syndrome. The JD-R-model is displayed in figure 2.<sup>62</sup>

### **Resident well-being in times of crisis: impact COVID-19 pandemic**

Besides environmental factors and personality traits, the well-being of residents could also be seriously affected by health crises, such as the recent worldwide pandemic caused by the coronavirus disease 2019 (COVID-19). This pandemic has had a tremendous impact on both health care systems and on the workload of residents involved in caring for COVID-19 patients.<sup>63</sup> The dramatic alterations in workflows, workload and clinical tasks of residents involved in treating COVID-19-patients has placed an enormous strain on the well-being of these residents.<sup>63,64</sup> Residents caring for COVID-19 patients are confronted with seriously ill and dying patients with an unpredictable disease with only few treatment options.<sup>63,65</sup> Besides,

these residents are likely to have anxiety of getting infected themselves.<sup>63,65</sup> The COVID-19-pandemic is an unprecedented event and unlikely to resolve in the short term. Knowledge about its effects on resident well-being is therefore desirable.

## **Overall aim & outline**

### **Aims of this thesis**

Addressing the gaps in knowledge described in this introduction, this thesis aims to evaluate the impact of the introduction of core components of CBME in residency training on the learning environment. Core components include the use of structured formative feedback, improved supervisory support and the introduction of a digital portfolio. Furthermore, it aims to determine how the perceived quality of the learning environment is associated with resident well-being, both in Dutch and Belgian residents. It also aims to examine which aspects of the learning environment are responsible for the association between learning environment and symptoms of resident burnout. As both environmental and individual factors could influence resident well-being, this thesis also aims to examine the association between residents' personality traits and burnout. Moreover, it aims to further clarify the association between the learning environment and resident well-being by determining why Belgian residents rate the learning environment lower and have a higher risk of burnout than Dutch residents. Finally, it aims to assess the impact of caring for COVID-19-patients during the COVID-19-pandemic on resident burnout risk, their quality of life and fear of getting infected.

## **Outline of this thesis**

### **Competency based medical education in Dutch orthopaedic residency training**

In **chapter 2** we describe how a national cohort of orthopaedic residents perceive the quality of the learning environment from before to after the introduction of several core components of CBME into a modernized orthopaedic residency curriculum. The results of a national study evaluating orthopaedic surgery residents'

compliance with recording the required number of competency assessments in their digital portfolios are presented in **chapter 3**.

### **Resident well-being: Role of the learning environment**

In **chapter 4** we describe the cross-sectional association between the perceived quality of the learning environment and quality of life and symptoms of burnout among orthopaedic residents. In a national Dutch study of residents from 33 different specialties we describe whether the association between the learning environment and resident burnout can also be found among residents from different specialties (**chapter 5**), and we determine the role of personality traits of residents in the development of resident burnout (**chapter 6**). In **chapter 7** we evaluate whether the association we found between the learning environment and resident burnout in Dutch residents can also be found in Belgian residents and in **chapter 8** we describe which aspects of the learning environment are responsible for this association. **Chapter 9** provides the results of a qualitative study evaluating differences in the perceived quality of the learning environment, job resources and job demands between Dutch and Belgian residency programs. In **chapter 10** we discuss the results of a survey study that evaluated the impact of the COVID-19 pandemic on resident well-being in Dutch residents who cared for COVID-19 patients.

In **chapter 11** we provide a general discussion of the studies described in this thesis. A summary of the results and conclusions of this thesis is given in **chapter 12**.

## Glossary

**Residents** (sometimes referred to as trainees) take a central role in the learning process. They are the junior doctors that have finished undergraduate training and are taking part in a postgraduate training program.

Teaching in postgraduate medical education is provided by medical specialists that take the role of **clinical teacher**. These clinical teachers are often called (**clinical supervisors**, faculty or attending physicians.

**Postgraduate medical education (PGME)** is the training junior doctors (often called residents) follow after finishing medical school. After finishing postgraduate medical education, a resident becomes a medical specialist.

**Competency-based medical education (CBME)** is “an approach to preparing physicians for practice that is fundamentally oriented to graduate outcome abilities and organized around competencies derived from an analysis of societal and patient needs. It de-emphasizes time-based training and promises greater accountability, flexibility, and learner-centeredness.”<sup>6</sup>

The **learning environment** is a broad construct that consists of residents shared perceptions of formal and informal aspects of education,<sup>66</sup> including perceptions of the content, organization of the training program<sup>30</sup> and the overall atmosphere within the teaching hospital.<sup>33</sup> In some literature the term **learning climate** is used instead of learning environment.<sup>24</sup> Some authors differentiate between the two terms, while we use both terms interchangeably in this thesis.

**Burnout** is a psychological syndrome a work-related syndrome that is defined by three dimensions: emotional exhaustion depersonalization and reduced personal accomplishment. Emotional exhaustion refers to feelings of being depleted of emotional resources. Depersonalization is characterized by a negative, cynical or



detached response to others. Reduced personal accomplishment is the perception of being incompetent to perform tasks accepting responsibility.<sup>41</sup>

**Work engagement** is a positive, fulfilling, work related state of mind that is characterized by vigour, dedication and absorption.<sup>47</sup>

The **Job Demands-Resources (JD-R) model** is an occupational stress model that is used to predict burnout and engagement by describing the relationship between positive (job resources) and negative work-related factors.<sup>51</sup> This model has more recently evolved in **Job Demands-Resources (JD-R) theory**.<sup>50</sup>

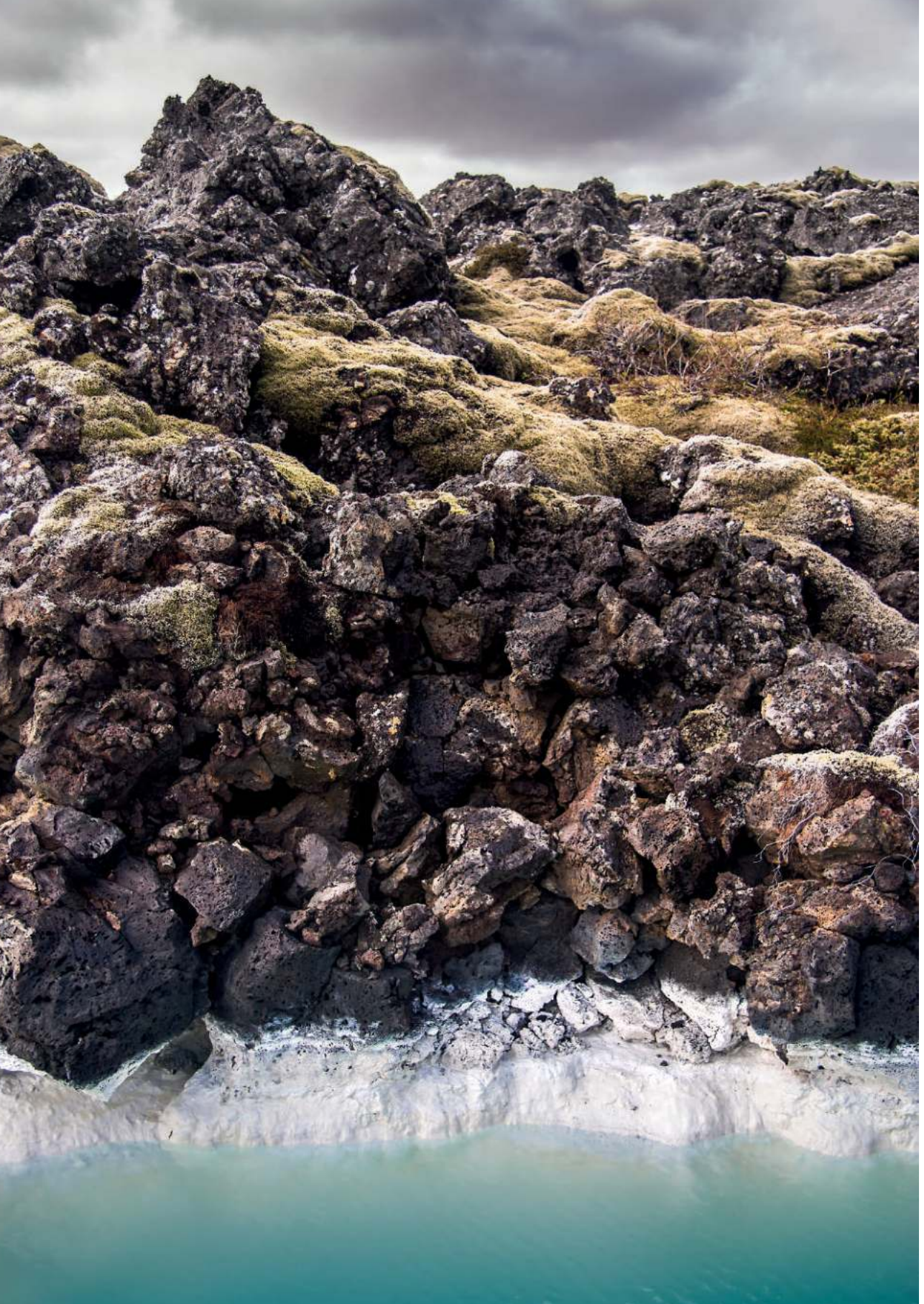
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## Part II

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Competency-based medical  
education in Dutch orthopedic  
residency training

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# Chapter 2

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Changes in perceived supervision quality after introduction of competency-based orthopedic residency training

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CCPM Verheyen

J Surg Educ. 2018;75(6):1624-9

## **Objective**

To evaluate the perceived quality of the learning environment, before and after introduction of competency-based postgraduate orthopedic education (CBPGOE).

## **Design**

From 2009 to 2014, we conducted annual surveys among Dutch orthopedic residents. The validated Dutch Residency Educational Climate Test (D-RECT, 50 items on 11 subscales) was used to assess the quality of the learning environment. Scores range from 1 (poor) to 5 (excellent).

## **Setting**

Dynamic cohort follow-up study.

## **Participants**

All Dutch orthopedic residents were surveyed during annual compulsory courses.

## **Results**

Over the 6-year period, 641 responses were obtained (response rate 92%). Scores for 'supervision' (95% CI for difference 0.06 to 0.28,  $p = 0.002$ ) and 'coaching and assessment' (95% CI 0.11 to 0.35,  $p < 0.001$ ) improved significantly after introduction of competency-based training. There was no significant change in score on the other subscales of the D-RECT.

**Conclusions:** After the introduction of some of the core components of CBPGOE the perceived quality of 'supervision' and 'coaching and assessment' improved significantly.

## Introduction

Over the past years, there has been a shift towards competency-based evaluation of resident performance in postgraduate medical education.<sup>1-3</sup> Policy makers of postgraduate medical educational programs have embraced teaching philosophies based on outcomes instead of time spent in training.<sup>4-6</sup> By putting emphasis on learner performance, these philosophies promote greater learner-centeredness. The greatest impetus for implementation of competency-based education frameworks is to ensure a resident completing training has been verified as being competent on the basis of a thorough evaluation of their performance during training.<sup>2,3</sup> Competency-based frameworks aim to address the deficiencies in the quality and safety of patient care by shifting the focus from solely acquiring medical knowledge to competencies needed by doctors to meet the health care needs of the patients, the communities and the societies they serve.<sup>1-3,5,6</sup> Most competency-based frameworks around the world are based on the CanMEDS roles.<sup>7</sup>

As the educational programs are shifting towards competency-based education, the way residents are being supervised is changing considerably. Core components of the new competency-based programs include new appraisal and work-based assessment tools that evaluate competencies besides medical knowledge, an educational portfolio that residents are required to keep, and the formal use of structured feedback.<sup>8-10</sup> The potential benefits of competency-based frameworks need to be balanced against the costs involved and the considerable efforts and time required from educators, faculty and residents themselves. Concern has also been raised on the extent to which the theoretical framework of generic competencies can be incorporated into the practice of clinical teaching.<sup>11,12</sup> The lack of evidence supporting better outcome of competency-based postgraduate education programs<sup>3,13</sup> has been raised by some experts as an argument against implementing such programs.<sup>12-14</sup> The lack of evidence is partly explained by the complexity of the construct and the associated absence of feasible assessment tools to evaluate the expected improvement in quality of educational programs.<sup>3</sup> Validated

instruments have been developed, however, to assess the learning environment,<sup>15,16</sup> a broad construct that reflects the content, organization and atmosphere of a training program.<sup>16</sup> The learning environment incorporates aspects of supervisory support, assessment and appraisal, peer support and feedback.<sup>15</sup> Assessment of the learning environment allows for evaluation of the core components of a competency-based education program.

The aim of this study is to evaluate the perceived quality of the learning environment during the process of introducing core components of a competency-based postgraduate orthopedic education (CBPGOE) program.

## **Material and methods**

### **Participants**

In the third, fourth and fifth year of their 6-year orthopedic training program, all Dutch orthopedic residents follow a compulsory course covering the basics of orthopedic surgery. This course consists of three separate sessions each year. From 2009 onwards, all orthopedic residents taking part in these courses were asked to participate in our study. During our study period, residents left the cohort upon completion of their training whilst new residents entered at the start of their third year, thus creating a national dynamic cohort of orthopedic residents. As competency-based training for Orthopedic Surgery became compulsory in the Netherlands in 2011, the first two surveys (2009 and 2010) were conducted before the introduction of the program, the surveys of 2011 and 2012 were considered as conducted during the transition years and the final two surveys (2013 and 2014) were conducted after all orthopedic training departments had completed the transition to a competency-based curriculum. The competency-based educational components that were introduced included: formal structured feedback concerning surgical skills (Objective Structured Assessment of Technical Skills [OSATS]), evaluation of generic skills (mini-CEX) and the systematic use of a digital portfolio. In addition, a list with basic orthopedic treatments was introduced covering the field of orthopedic surgery,

giving residents the opportunity to be assessed on different levels of supervision, facilitating their progression towards independent practice. The structure of this assessment tool is based on the Entrustable Professional Activity (EPA).<sup>17</sup>

### **Survey**

At the final course of each year, all participants were asked to complete the Dutch Residency Educational Climate Test (D-RECT), a validated instrument to assess the learning environment as perceived by residents.<sup>15</sup> The D-RECT consists of 50 items on 11 subscales (e.g. feedback, coaching and assessment, supervision, patient handover and professional relations between consultants). Assessment of D-RECT subscales provides insight in the perceived quality of the core components of the competency-based program (e.g. structured feedback, use of assessment and appraisal tools, aspects of supervisory support). Respondents indicate their agreement with each item on a 5-point Likert scale ranging from totally agree (5) to totally disagree (1). High scores (4 or 5) indicate agreement with the item and a positive attitude towards the assessed subscale. Scores 3 or lower are considered a cause for concern.<sup>18</sup>

### **Data analysis**

Statistical analysis was performed using Statistical Package for the Social Sciences v17.0 (SPSS Inc., Chicago, Illinois). Paired Student *t* tests were used to compare mean D-RECT subscale scores pre- (2009-2010) and post-introduction of CBPGOE (2013-2014). All tests were two-tailed and *p*-values < 0.05 were considered significant. A Bonferroni correction was used to adjust for multiple comparisons.

### **Ethical approval**

The Dutch Orthopedic Society approved the study. Because no patients were involved, the study was exempt from ethical board review under Dutch law. Following the Netherlands Association of Medical Education guidelines for educational research, anonymity was guaranteed, participation was voluntary, and informed consent was obtained.

## Results

A total of 641 responses were obtained from orthopedic residents between 2009 and 2014 (response rate 92%). Demographics are shown in Table 1. The mean (SD) overall D-RECT score was 3.77 (0.48). In 0.7% of the individual item scores, residents selected the ‘not applicable’ option or item scores were missing.

Regarding our primary aim, concerning the perceived quality of core components of competency-based training, we found significant increases in scores for the subscales ‘supervision’ and ‘coaching and assessment’ from the pre- to the post-introduction period (Table 2). The items responsible for the significant improvements in these subscale scores over time are presented in Table 3. There was no significant change in overall D-RECT scores from before to after introduction (Table 2).

**Table 1.** Characteristics of responding residents. Values are number (%) unless otherwise stated.

	<b>Total n = 641</b>	<b>2009 n = 100</b>	<b>2010 n = 103</b>	<b>2011 n = 105</b>	<b>2012 n = 107</b>	<b>2013 n = 106</b>	<b>2014 n = 120</b>
Gender							
Male	491 (76.6)	80 (80)	84 (81.6)	83 (79)	79 (73.8)	80 (75.5)	85 (70.8)
Female	148 (23.1)	20 (20)	19 (18.4)	22 (21)	28 (26.2)	26 (24.5)	33 (27.5)
missing	2 (0.3)						2 (1.7)
Year of training							
1	246 (38.4)	36 (36)	44 (42.7)	37 (35.2)	47 (43.9)	44 (41.5)	38 (31.7)
2	258 (40.2)	44 (44)	37 (35.9)	43 (41.0)	36 (33.6)	50 (47.2)	48 (40)
3 or 4	136 (21.4)	20 (20)	22 (21.4)	25 (23.8)	24 (22.4)	12 (11.3)	33 (27.5)
Program							
Academic	240 (37.4)	35 (35)	39 (37.9)	38 (36.2)	41 (38.3)	39 (36.8)	48 (40)
Affiliated	400 (62.4)	65 (65)	64 (62.1)	66 (62.9)	66 (61.7)	67 (63.2)	72 (60)
missing	1 (0.2)			1 (0.9)			
Age, years; median (range)	31 (26 – 39)	31 (28 – 39)	32 (28 – 37)	32 (26 – 36)	32 (27 – 36)	31 (27 – 36)	31 (27 – 37)

**Table 2.** Mean scores on each subscale of the D-RECT and mean overall D-RECT score (learning environment) from before to after introduction of the competency-based orthopaedic program.

	<b>Pre- introduction (SD)</b>	<b>Post- introduction (SD)</b>	<b>Score difference</b>	<b>95% CI</b>	<b>p</b>
	<b>2009 and 2010 (n = 203)</b>	<b>2013 and 2014 (n = 226)</b>			
<b>Mean score per subscale</b>					
Supervision	3.85 (0.60)	4.02 (0.60)	0.18	0.06 – 0.29	0.002
Coaching and assessment	3.19 (0.63)	3.42 (0.62)	0.23	0.11 – 0.35	<0.001
Observation forms	3.10 (1.18)	3.08 (1.20)	-0.02	-0.25 – 0.21	0.87
Teamwork	3.48 (0.77)	3.56 (0.68)	0.08	-0.06 – 0.22	0.25
Peer collaboration	4.40 (0.64)	4.35 (0.61)	-0.06	-0.18 – 0.06	0.30
Professional relations between consultants	4.00 (0.78)	3.88 (0.83)	0.13	-0.28 – 0.03	0.11
Work is adapted to trainee's competence	3.69 (0.68)	3.69 (0.72)	0	-0.13 – 0.13	0.99
Consultants' role	3.84 (0.63)	3.77 (0.68)	-0.07	-0.20 – 0.05	0.25
Formal education	3.68 (0.67)	3.77 (0.74)	0.08	-0.05 – 0.22	0.24
Role of specialty tutor	4.00 (0.60)	3.93 (0.75)	-0.07	-0.20 – 0.06	0.29
Patient sign out	4.10 (0.61)	4.00 (0.64)	-0.10	-0.22 – 0.02	0.11
<b>Mean overall score</b>	<b>3.72 (0.45)</b>	<b>3.79 (0.50)</b>	<b>0.07</b>	<b>-0.03 – 0.15</b>	<b>0.19</b>

**Table 3.** Mean D-RECT scores of the individual items responsible for improvement of the subscale scores ‘supervision’ and ‘coaching and assessment’ are displayed. To adjust for multiple comparisons, only p-values < 0.01 were considered statistically significant.

	<b>Pre- modernization (SD)</b>	<b>Post- modernization (SD)</b>	<b>p</b>
	<b>2009 and 2010 (n = 203)</b>	<b>2013 and 2014 (n = 226)</b>	
<b>Subscale: Supervision</b>			
The guidelines clearly outline when to request input from a supervisor	3.29 (1.00)	3.65 (0.94)	< 0.0001
The amount of supervision I receive is appropriate for my level of experience	3.56 (0.96)	3.89 (0.79)	< 0.0001
When I need a consultant, I can always contact one	4.16 (0.77)	4.18 (0.70)	0.61
When I need to consult a consultant, they are readily available	4.36 (0.71)	4.41 (0.63)	0.04
It is clear which attending supervises me	3.88 (0.91)	4.00 (0.89)	0.54
<b>Subscale: Coaching and Assessment</b>			
My consultants take the initiative to evaluate my performance	3.05 (0.96)	3.33 (0.90)	0.002
My consultants take the initiative to evaluate difficult situations I have been involved	2.82 (0.89)	3.17 (0.95)	< 0.0001
My consultants evaluate whether my performance in patient care is commensurate with my level of training	3.13 (0.93)	3.43 (0.91)	0.001
My consultants occasionally observe me taking a history	2.63 (1.30)	3.04 (1.38)	0.001
My consultants give regular feedback on my strengths and weaknesses	3.41 (0.96)	3.64 (0.84)	0.008
I am asked on a regular basis to provide a rationale for my management decisions and actions	3.65 (0.75)	3.72 (0.73)	0.57
My consultants coach me on how to communicate with difficult patients	3.13 (0.98)	3.25 (0.95)	0.83
My consultants take the initiative to explain their actions	3.43 (0.91)	3.62 (0.80)	0.03
My consultants assess not only my medical expertise but also other skills such as teamwork, organization or professional behavior	3.54 (1.03)	3.65 (0.96)	0.26



## Discussion

This study shows that residents perceived a higher quality of supervision and coaching and assessment after introducing the core components of CBPGOE. Their overall assessment of the learning environment did not change.

The preference for a postgraduate training framework promoting an orientation to outcome abilities and employing greater accountability, flexibility and learner centeredness, has been the inspiration for the movement towards a competency-based framework.<sup>1-3</sup> The Dutch College of Medical Specialties recognized the need to modernize its postgraduate training programs to better prepare physicians for twenty-first century practice. The Dutch framework, which was based on the CanMEDS roles,<sup>4-7</sup> was adopted by all medical specialist societies and led to the introduction of specialty specific competency-based training programs.<sup>7</sup> The orthopedic program we evaluated in the current study, can therefore be considered the logical answer to changes in patient, societal and medical needs.

The effectiveness of current competency-based programs in producing better doctors remains elusive. Our results show that residents experience improvement in supervision and coaching and assessment after the change towards CBPGOE. A contributor to the found improvement on the subscale of “coaching and assessment” could be the more explicit and documented assessment that OSATS, mini-CEX and a digital portfolio help to provide. The significant improvement on the subscale of “supervision” implies that residents experience that the degree of supervision appears to be better aligned with their level of competence. With the introduction of competency-based postgraduate education, faculty members were required to attend dedicated multiple-day “teach-the-teacher” courses. Previous studies in several countries have shown that commitment to faculty development improves the application of coaching and assessment tools by faculty,<sup>19-22</sup> and that this is positively associated with residents’ evaluation of faculty supervisor performance.<sup>20,21</sup> Whether the improvement we found resulted from faculty development remains

unclear. Nevertheless, faculty development is believed to be a prerequisite to adequately prepare supervisors for teaching and assessing all competencies required by residents for independent practice.<sup>22</sup>

This study is the first nationwide study to evaluate the process of introducing some of the core components of CBPGOE. A major strength is its nationwide design, including all orthopedic residents enrolled in the program. Residents' perceptions of the learning environment are considered to be of key importance in evaluating training programs because of the resident's central role in the learning process.<sup>23</sup> Another strength is the longitudinal design with a follow-up period of 6 years. We acknowledge the following limitations of this study. First, the absence of a control group precludes causal inference. However, the introduction of a competency-based program was the only major change to the postgraduate orthopedic educational program during our study period. Second, the magnitude of the observed changes was relatively small. This may be related to the relatively short follow-up of each resident in the study (3 to 4 years) which is unlikely to cover the full transition from an "old school" time-based postgraduate education program to fully implemented CBPGOE.<sup>2,3,9,24</sup> Each resident in the study is therefore likely to have only noticed small changes in the curriculum.<sup>25</sup> The relatively high D-RECT scores before introduction of CBPGOE, with mean subscale scores all above the "cause for concern" mark of 3, limited the ability of this study to show improvement (*ceiling effect*).<sup>26</sup> This emphasizes the importance of the improvements we found. Finally, we used the D-RECT to assess perceived improvements in the training program, whilst the instrument was created and validated for evaluating the learning environment.<sup>15</sup>

Previous research has shown that postgraduate residents in other training programs in the Netherlands appreciate the introduction of more structured and formal appraisal and assessment as a useful innovation.<sup>27</sup> Because the Dutch health care system relatively strongly depends on residents covering clinical workload, most postgraduate education programs in the Netherlands remain fixed-time. Such

a hybrid training model is comparable to current programs in the United States and Canada,<sup>9,24</sup> and this can be considered a logical step in the transformation process towards full implementation of CBPGOE including flexible training program duration.<sup>3,28</sup> Furthermore, the current program relies heavily on EPAs that assess surgical skills and are related to end-of-training program requirements. Although this approach is appealing to both trainees and faculty, it has been argued that successful implementation of EPAs into effective postgraduate training programs requires quite intensive faculty development and a more flexible and individualized setup of postgraduate training programs in which the entrustment decisions should also be based on generic competencies.<sup>31</sup>

## Conclusions

Competency-based medical education is believed to be the optimal way in preparing the next generation of orthopedic surgeons for twenty-first century practice.<sup>1-3,9,28</sup> Given the tremendous impact this process of modernization postgraduate orthopedic education has on existing systems and the efforts, energy and resources needed to introduce such a program, the serious criticism on CBPGOE is understandable.<sup>3,12,13,29</sup> Our study provides useful insight in the way orthopedic residents perceive and appreciate the introduction of some of the core components of CBPGOE, including improved perceived “supervision” and “coaching and assessment”. Given the importance of supportive supervision and assessment for acquiring clinical competency,<sup>30</sup> this is a reassuring finding.

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An aerial photograph of a wooden boardwalk or bridge crossing a rocky stream. The water is a vibrant blue, and the surrounding rocks are in shades of grey, brown, and tan. The boardwalk is made of light-colored wooden planks. The image is split vertically, with the left side showing the boardwalk and the right side showing a dark, textured background.

# Chapter 3

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Registration of assessments in  
orthopaedic residents' portfolios  
is falling short

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## **Objective**

To evaluate of the number of registered competency assessments in the portfolios of orthopaedic residents in the Netherlands, for whom a competency-based training programme is mandatory.

## **Design**

National cohort study.

## **Method**

We collected data regarding the registered assessments of all orthopaedic residents who finished their training between 2012-2015. We determined the number of registered assessments of 'standard orthopaedic treatments' (evaluating residents' competency in 70 different orthopaedic treatments), objective structured clinical skills evaluations (OSCEs), critically appraised topics (CATs), and 360 degree feedback appraisals. We compared the number of registered assessments in the portfolios with the minimum requirements laid down by the training curriculum.

## **Results**

A total of 196 residents finished their training between 2012 and 2015. These residents finished their training with a mean (i.e., percentage of minimally required number of assessments) of 17.0 (34%) 'standard orthopaedic treatments' (level 4 or 5), 13.6 (34%) OSCEs, 2.6 (33%) CATs and 0.2 (4%) 360 degree feedback.

## **Conclusion**

On average, only one-third of the minimally required number of assessments were registered in the portfolios of orthopaedic residents (OSCEs and standard orthopaedic treatments level 4 or 5). These revelations show that action is needed to improve the way in which the progress of residents is monitored. These findings are going to have an effect on the new curriculum which must be more practical and less complex. Additionally, external quality control will focus more on residents



at the end of their training and on the training region involved. This information may serve as a framework for postgraduate training programmes in other scientific associations which also find themselves in the same process of modernisation.

# **Praktijktoetsen van aiossen onvoldoende geregistreerd**

## **Onderzoek naar toetsregistratie in het portfolio van aiossen orthopedie**

### **Doel**

Onderzoeken in hoeverre het portfolio van aiossen orthopedie, die een gemoderniseerde competentiegerichte opleiding volgen, voldoet aan het aantal geregistreerde toetsen zoals voorgeschreven in het opleidingsplan Orthopedie.

### **Opzet**

Nationaal cohortonderzoek.

### **Methode**

Van alle aiossen orthopedie die in de periode 2012-2015 hun opleiding hadden afgerond verzamelden we uit het portfolio gegevens over geregistreerde toetsen. We registreerden de aantallen orthopedische standaardbehandelingen (OSB's) – waarin de competenties van aiossen voor 70 orthopedische behandelingen worden beoordeeld –, korte praktijkbegeleiding (KPB's), 'critically appraised topics' (CAT's) en 360-graden-feedbackrondes die in het portfolio waren vastgelegd. We vergeleken de geregistreerde aantallen met het verplichte minimumaantal toetsen zoals beschreven in het opleidingsplan.

### **Resultaten**

In de onderzoeksperiode hadden 196 aiossen hun opleiding afgerond. Per aios waren gemiddeld 17,0 OSB's op niveau 4 of 5 geregistreerd (34% van het vereiste aantal), 13,6 KPB's (34%), 2,6 CATs (33%) en 0,2 360-graden-feedbackrondes (4%).

### **Conclusie**

In het portfolio van een aios orthopedie was gemiddeld een derde van de in het opleidingsplan voorgeschreven aantal toetsen (KPB en OSB op niveau 4 of 5)

geregistreerd. Deze constatering zal tot verandering moeten leiden in de wijze van monitoren van de voortgang van aiossen. Onze bevindingen zullen effect hebben op het nieuwe opleidingsplan, dat praktischer en minder complex moet worden. Ook zullen zij invloed hebben op de opleidingsvisite: er komt meer nadruk op de controle van de vertrekkende aiossen en op de betrokken opleidingsregio. Wellicht kan dit onderzoek ook andere wetenschappelijke verenigingen van dienst zijn; zij bevinden zich immers in hetzelfde proces van modernisering.

De medisch-specialistische vervolgoopleidingen zijn de afgelopen jaren gemoderniseerd om beter te kunnen voldoen aan de eisen die patiënten en maatschappij in toenemende mate aan medisch specialisten stellen.<sup>1</sup> Dit heeft ingrijpende veranderingen gebracht voor zowel artsen in opleiding tot specialist (aios) als opleiders.<sup>2</sup> Centraal in het moderne opleiden staat het verwerven van competenties die gerubriceerd zijn volgens het CanMeds-model ('CanMeds' staat voor 'Canadian medical education directives for specialists').<sup>3</sup> Daarnaast is de moderne opleiding 'uitkomst-georiënteerd' in plaats van 'tijd-georiënteerd'. Het opleidingsmodel gaat ervan uit dat iedereen in een ander tempo leert en dat de uitkomst van het leerproces, het behaalde niveau van de verschillende competenties, de maatstaf moet zijn.<sup>1</sup> Om de ontwikkeling van competentie goed te kunnen volgen zijn betrouwbare toetsinstrumenten nodig en een zorgvuldige registratie van de resultaten van deze toetsen in een portfolio.<sup>4</sup>

De meeste toetsinstrumenten, zoals de korte praktijkbeoordeling (KPB), het 'critically appraised topic' (CAT), de 360-graden-feedback en de 'objective structured assessment of technical skills' (OSATS) worden gebruikt bij een breed spectrum van specialismen. Een voorbeeld van een vakspecifiek instrument is de 'orthopedische standaardbehandeling' (OSB). Dit is een instrument dat de gehele cyclus van een orthopedisch probleem toetst: de poliklinische en operatieve fase en de wetenschappelijke onderbouwing.<sup>5</sup> De competentie die de aios laat zien voor een OSB wordt op 5 niveaus ingedeeld, variërend van het herkennen van de aandoening of assisteren van een operatie (niveau 1) tot het zelfstandig diagnosticeren, behandelen en opereren (niveau 4) en het superviseren van een jongere aios die de ingreep uitvoert (niveau 5).<sup>6,7</sup> Het opleidingsplan Orthopedie schrijft een minimum van 50 OSB's op niveau 4 of 5 voor (70% van de totale lijst OSB's die de aios heeft uitgevoerd) bij het afronden van de opleiding.<sup>5</sup>

Een portfolio wordt beschouwd als een uitstekend instrument om de professionele groei van de aios te volgen.<sup>4</sup> Een portfolio heeft 3 functies: monitoring en planning,

coaching en reflectie, en beoordeling.<sup>8,9</sup> In snijdende specialismen heeft het bijhouden van de operatieve verrichtingen (monitoring en planning) door de aios een lange traditie; het gebruik van het portfolio voor coaching, reflectie en beoordeling is pas begonnen met de modernisering van de opleiding.<sup>9</sup> Om tot een betrouwbaar oordeel te komen moet het portfolio minimaal aantallen toetsen en beoordelingen bevatten.<sup>4</sup> Deze minimaal aantallen zijn vastgelegd in het opleidingsplan. Wij onderzochten in hoeverre de portfolio's van aiossen bij het afronden van de opleiding voldeden aan deze minimaal aantallen, sinds de start van de gemoderniseerde opleiding orthopedie.

## Methodie

Sinds de start van de gemoderniseerde opleiding orthopedie maken alle aiossen gebruik van hetzelfde digitale portfolio (bron: [www.vrest.com](http://www.vrest.com)). Om het gebruik van het portfolio te kunnen volgen worden centraal gegevens verzameld over aantallen geregistreerde toetsen. Deze gegevens zijn geanonimiseerd en daarom niet te herleiden op individuele aiossen of op klinieken. Voor dit onderzoek verzamelden wij aantallen geregistreerde toetsen (KPB's, CATs, 360-graden-feedback en OSB's) uit het portfolio van alle aiossen die in de periode 2012-2015 in Nederland hun opleiding orthopedie afronden.

Tijdens het onderzoek bestond de opleiding orthopedie voor alle aiossen uit 2 jaar vooropleiding algemene heilkunde en 4 jaar orthopedie. De vereiste aantallen toetsen zoals vastgelegd in het opleidingsplan Orthopedie gaan uit van deze verhouding.<sup>5</sup> Verder waren aiossen die in 2012 de opleiding afronden niet verplicht te voldoen aan het minimale aantal toetsen; dit was een overgangsregeling voor 5e- en 6e-jaars aiossen.<sup>5</sup>

Van de geregisterde aantallen werden de gemiddelden en standaarddeviaties (SD) bepaald; deze vergeleken wij met de minimaal vereiste aantallen. We berekenden deze gemiddelden zowel over de gehele studieperiode (2012-2015) als over de

periode waarin alle aiossen verplicht waren tot registratie van de minimaal aantallen toetsen in het portfolio (2013-2015).

## Resultaten

Van 2012-2015 rondde in totaal 196 aiossen orthopedie hun opleiding af. De aantallen in het portfolio geregistreerde toetsen en de minimumeisen staan weergegeven in tabel 1. De aantallen aiossen, OSB's op niveau 4 of 5 en KPB's per regionale opleidingsgroep orthopedie staan weergegeven in tabel 2. We zagen een grote spreiding tussen de verschillende regionale opleidingsgroepen in het aantal KPB's en het aantal OSB's dat bij afronding van de opleiding was afgelegd op niveau 4 of 5.

**Tabel 1.** Aantal toetsen per aios bij afronding van de opleiding orthopedie, gemeten over de jaren 2012-2015 (in totaal 196 aiossen).

Toets	Gemiddeld aantal per aios per jaar				Gemiddelde (SD)	Voorgeschreven aantal toetsen	%†
	2012*	2013	2014	2015			
Aantal aiossen	49	50	49	48			
KPB	7,6	12,4	17,4	17,0	13,6 (4,6)	40	34
CAT	1,2	2,6	3,7	3,0	2,6 (1,1)	8	33
360 gr feedback	0	0	0,3	0,6	0,2 (0,3)	5	4
OSB's totaal	25,0	35,7	40,2	36,9	34,5 (6,6)	-	
OSB's niveau 4-5‡	15,0	18,8	17,1	17,1	17,0 (1,6)	50	34

KPB = korte praktijkbeoordeling; CAT = 'critically appraised topic'; OSB = orthopedische standaard behandeling.

\* Voor de aiossen die in 2012 de opleiding orthopedie afronden bestond een overgangsregeling; zij werden niet verplicht te voldoen aan het minimaal vereiste aantal toetsen.

† Dit percentage is het percentage van het voorgeschreven aantal toetsen dat bij afronding van de opleiding was afgelegd.

‡ Bij het afronden van de opleiding is het aantal OSB's op niveau 4 en 5 (aios handelt zelfstandig of superviseert) relevant, omdat alleen dit aantal meetelt in de bekwaamheidsbeoordeling.

**Tabel 2.** Gemiddeld aantal toetsen per aios bij afronding van de opleiding orthopedie, gemeten over de jaren 2012-2015 (in totaal 196 aiossen) en uitgesplitst naar regionale opleidingsgroep orthopedie

Toets	ROGO*								Gemiddelde (SD*)
	I	II	III	IV	V	VI	VII	VIII	
Aantal aiossen	30	20	29	18	25	22	24	28	
OSB's niveau 4-5†; n	23	14	9	10	15	8	34	26	17,0 (9,3)
%‡	46	28	18	20	30	16	68	52	34
KPB's; n	16	15	8	10	12	11	19	18	13,6 (4,0)
%‡	40	38	20	25	30	28	48	45	34

ROGO = regionale opleidingsgroep orthopedie; KPB = korte praktijkbeoordeling; OSB = orthopedische standaard behandeling.

\* Standaarddeviatie

† Bij het afronden van de opleiding telt alleen het aantal OSB's op niveau 4 en 5 (aios handelt zelfstandig of superviseert) mee in de bekwaamheidsbeoordeling.

‡ Dit percentage is het aantal afgelegde toetsen bij afronding uitgedrukt als percentage van het voorgeschreven aantal toetsen.

## Beschouwing

Ons onderzoek toont aan dat in de gemoderniseerde opleiding orthopedie de registratie in het portfolio ruim achterloopt bij het aanvankelijk door de opleiders orthopedie geaccordeerde aantal. Van het minimaal vereiste aantal OSB's werd slechts 34% op het vereiste niveau afgerond, van het vereiste aantal KPB's werd gemiddeld 34% behaald, van de CAT's 33% en van de 360-graden-feedbackrondes slechts 4%.

Hoewel we een grote spreiding vonden tussen de opleidingsregio's, voldeed geen enkele regio aan de minimumeisen. Dit is zorgelijk, omdat onderzoek heeft aangetoond dat een minimaal aantal toetsen nodig is om tot een betrouwbaar oordeel over de competentie van de aios te komen.<sup>4</sup> Dit roept de vraag op of de toetsing van de aios werkelijk tekortschiet, of dat de registratie er van in het portfolio onvoldoende gebeurt. Hoewel we die vraag niet met zekerheid kunnen beantwoorden lijkt het aannemelijk dat het vooral om tekortschietende registratie

gaat, omdat het gebruik van een portfolio door veel aiossen en opleiders als een bureaucratische en enigszins zinloze exercitie wordt beschouwd.<sup>8,10,11</sup>

### **Portfolio als onderdeel van competentiegericht opleiden**

Het portfolio werd geïntroduceerd als onderdeel van het competentiegerichte opleiden en heeft een tweeledig doel: het stimuleren van reflectie en het registreren van vooruitgang.<sup>9</sup> Een belangrijk kenmerk van het competentiegerichte opleiden is een verschuiving van de focus van 'aangenomen bekwaamheid' naar 'aangetoonde bekwaamheid'.<sup>12</sup>

In de voormalige opleiding werd de bekwaamheid van de aios getoetst op basis van het 'onderbuikgevoel' van de opleider.<sup>13</sup> Deze toetsing van bekwaamheid op basis van vertrouwen is niet per se onbetrouwbaar, als deze maar voldoet aan de voorwaarden dat meerdere opleiders de aios beoordelen en dat deze globale beoordeling aangevuld wordt met meerdere instrumenten.<sup>14</sup> Daarom achten wij het onwaarschijnlijk dat de huidige opleiding slechte medisch specialisten opleidt, ondanks de onderregistratie van toetsen in het portfolio. De kracht van het portfolio als summatief toetsinstrument zit in het aantoonbaar maken van de bekwaamheid van de aios door te laten zien wat de huidige competenties zijn en hoe de aios geleidelijk groeit naar zelfstandig functioneren.<sup>15</sup>

Opvallend is de grote spreiding van de aantallen geregistreerde toetsen tussen de verschillende regionale opleidingsgroepen orthopedie (zie tabel 2). In de 3 opleidingsgroepen met het grootste aantal OSB's werden ook de meeste KPB's geregistreerd. Dit suggereert dat, ondanks een uniform nationaal opleidingsplan en een portfolio dat door alle klinieken gebruikt wordt, regionale opleidingsgroepen hieraan verschillend uitvoering geven. Toekomstig onderzoek zou gericht kunnen zijn op het identificeren van de factoren die succesvol portfoliogebruik en compliance met het opleidingsplan bepalen.



## Oorzaken van tekortschietende registratie

Het tekortschieten van de registratie van toetsen en beoordelingen in het portfolio kan verschillende oorzaken hebben.<sup>9</sup> Ten eerste is het formeel gezien de taak van de opleider om het portfolio op volledigheid te controleren en consequenties te verbinden aan onvolledigheid. Ons onderzoek laat zien dat dit onvoldoende gebeurt. Het is evident dat het ontbreken van een formele controle op de volledigheid van het portfolio aanleiding geeft tot minder gebruik van het portfolio bij het volgen van de ontwikkeling van de aios.<sup>16</sup>

Daarnaast is het mogelijk dat de aios te weinig de verantwoordelijkheid neemt voor het bijhouden van het eigen portfolio, waarbij deze de kans laat liggen om te reflecteren op de eigen ontwikkeling. De oorzaak hiervan kan liggen in beperkte controle door opleiders of in beperkte motivatie van de aios om het portfolio als leerinstrument te gebruiken. Om het gebruik van een portfolio succesvol te laten zijn, is het essentieel een opleider toe te wijzen die als mentor het gebruik van het portfolio ondersteunt. Bij chirurgische aiossen nam het gebruik van het portfolio van minder dan 50% toe tot 100% toe na aanwijzing van een mentor die maandelijks feedback gaf op het portfolio.<sup>17</sup> Hoewel het ontbreken van controle op volledigheid van het portfolio aanleiding kan geven tot minder gebruik ervan, moet het ook daadwerkelijk ingezet worden tijdens voortgangsgesprekken met de aios (formatieve feedback).<sup>4,16</sup>

De resultaten van ons onderzoek zullen een direct effect hebben op de opleidingsvisitaties. Er zal een focus zijn op volledigheid van portfolio's van vertrekkende aiossen. Daarnaast kunnen regionale visitaties in de toekomst wellicht een oplossing zijn voor de kwetsbare positie waarin een kliniek die gevisiteerd wordt zich momenteel bevindt. De regio wordt dan in zijn geheel beoordeeld, wat mogelijk tot meer transparantie zal leiden.

Andere factoren die het bijhouden en gebruik van een portfolio kunnen bevorderen zijn: integratie van het portfoliogebruik in de werkstructuur, een gebruiksvriendelijk

platform en een goede introductie van het portfolio voor nieuwe gebruikers.<sup>4,8,9</sup> Daarom adviseren wij een lid van de opleidingsgroep verantwoordelijk te maken voor feedback en controle op het portfolio. Naast een rol als mentor zou deze opleider ook in de opleidingskliniek problemen bij de implementatie van het minimumaantal toetsen moeten bespreken met de aios- en opleidersgroep.

### **De ‘Orthopedische standaardbehandeling’**

Een andere oorzaak voor het tekortschieten van de registratie van toetsen kan gerelateerd zijn aan de inhoud van de toetsen. De OSB vormt de kern van het orthopedisch curriculum en heeft het karakter van een ‘entrustable professional activity’ (EPA).<sup>7,14</sup> Daarom bedoelt men een professionele taak die toevertrouwd wordt aan een voldoende competente aios. EPA’s werden geïntroduceerd om de kloof te overbruggen tussen de theorie van het competentiegericht opleiden en de dagelijkse klinische praktijk;<sup>7,18</sup> zij winnen de laatste jaren aan populariteit.<sup>14,19,20</sup>

Het identificeren en beschrijven van EPA’s voor een opleiding is een complex proces. Zowel het aantal EPA’s (niet te veel, niet te weinig) als de omvang van elke EPA (niet te breed, niet te smal) moet zorgvuldig afgestemd worden op de beroepspraktijk om de aios het vertrouwen te geven dat hij of zij erkend wordt in de toenemende verantwoordelijkheid, passend bij de fase van de opleiding.<sup>21</sup> Het aantal professionele taken dat samen een EPA vormt moet daarom voldoende groot zijn, zodat de toevertrouwde verantwoordelijkheid en vereiste bekwaamheid een voldoende grote stap voor de aios betekenen. Als vuistregel wordt een maximum geadviseerd van 10 beslismomenten per jaar in het kader van een EPA.<sup>14</sup>

Uit deze inzichten over de effectiviteit van de EPA als opleidingsinstrument volgen enkele aanbevelingen over de rol van de OSB’s. Ten eerste is de lijst met 70 OSB’s waarschijnlijk te omvangrijk en de opleidingseis van 50 OSB’s op niveau 4-5 te hoog. Ten tweede is de basislijst OSB’s thematisch opgebouwd met een beperkte

omschrijving van individuele OSB's, waarbij de vraag rijst of bij een omvangrijke lijst (70 OSB's) de individuele OSB's niet te kort omschreven zijn.

Een voorbeeld is de OSB 'heupfractuur' (te vinden als supplement bij dit artikel op [www.ntvg.nl/D630](http://www.ntvg.nl/D630)). Dit is een zeer breed thema dat verschillende behandelingen kent. Om in termen van een EPA te blijven: er kan in deze OSB geen discrete taak toevertrouwd worden aan de aios.<sup>14</sup> Een vernieuwd opleidingsplan zou daarom een beperkter aantal beter omschreven OSB's moeten bevatten en vooraf moeten gaan aan een gestructureerde ontwikkeling van EPA's.<sup>22</sup> De ervaring van andere opleidingen leert dat bij de samenstelling van EPA's inbreng wenselijk is van zowel aiossen, opleiders en bestuursleden van de wetenschappelijke vereniging als onderwijskundigen.<sup>23,24</sup>

### **Sterke en zwakke punten van het onderzoek**

Een sterk punt van ons onderzoek is het gebruik van een nationaal cohort van aiossen die hetzelfde portfolio gebruikten. Daarnaast is dit het eerste onderzoek dat de mate van registratie in het portfolio van aiossen in Nederland onderzocht. De belangrijkste beperking van onze studie is dat we geen gegevens hebben over welke factoren de tekortschietende registratie bepalen. Een ander zwak punt is dat aiossen die gedurende 2012 hun opleiding afronden, niet verplicht waren te voldoen aan de minimumeisen. Ook als de gegevens uit dit jaar niet worden meegeteld, is er echter een duidelijke onderregistratie.

### **Conclusie**

Het portfoliogebruik van aiossen orthopedie schiet tekort. Dit kan de educatieve waarde van het portfolio beperken. Hoewel de registratie tekortschiet, is het waarschijnlijk dat aiossen tijdens hun dagelijkse werk wel getoetst worden door hun opleiders, zoals dat vóór de modernisering van de opleiding ook al gebeurde.

De huidige kwaliteitscontrole, uitgevoerd door de Nederlandse Orthopaedische Vereniging, zal tot verandering in het monitoren van de voortgang van aiossen moeten

leiden. Zo zal het nieuwe opleidingsplan Orthopedie minder complex en praktischer worden. Ook zal tijdens opleidingsvisitaties meer nadruk gelegd worden op controle van vertrekkende aiossen en ook op beoordeling van de opleidingsregio als geheel.

Tot slot zijn diverse maatregelen denkbaar ter verbetering van het portfoliogebruik: de verantwoordelijkheid van de aios voor zijn portfolio kan worden gestimuleerd door het aanwijzen van een mentor, de inhoud van specifieke toetsinstrumenten dient te worden herzien, en het gebruiksgemak van het portfolio kan geoptimaliseerd worden.

Of het tekortschieten van de registratie ook bij andere opleidingen speelt, zal bevestigd moeten worden met verder onderzoek. Wel denken we dat onze informatie voor andere wetenschappelijke verenigingen van belang kan zijn. Zij bevinden zich immers in hetzelfde proces van implementatie van competentiegericht opleiden.

## **Leerpunten**

- Bij de modernisering van de medisch-specialistische opleiding zijn verschillende toetsinstrumenten geïntroduceerd, waarvan de scores worden vastgelegd in een portfolio.
- De registratie van toetsen en bekwaamheidsbeoordelingen in het portfolio maakt de bekwaamheid van aiossen aantoonbaar.
- De registratie van toetsen en bekwaamheidsbeoordelingen in het portfolio is laag.
- Volledigheid van het portfolio is belangrijk om de professionele groei van de aios te kunnen volgen.
- Een mentor kan aiossen stimuleren het portfolio goed bij te houden, maar ook integratie van het portfolio in de dagelijkse werkstructuur kan de toepassing ervan verbeteren.
- Het verdient aanbeveling om ook bij andere opleiding dan die tot orthopedisch chirurg de registratie van toetsen in een portfolio te onderzoeken.

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# Part III

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Resident well-being:  
Role of the learning environment

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An aerial photograph of a river with white water rapids flowing over dark, jagged rocks. The water is a mix of white foam and turquoise-green. The background is a dark, mossy forest. The text is overlaid on the right side of the image.

## Chapter 4

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Burnout and quality of life among orthopaedic trainees in a modern educational programme: importance of the learning climate

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## **Introduction**

We aimed to determine quality of life and burnout among Dutch orthopaedic trainees following a modern orthopaedic curriculum, with strict compliance to a 48-hour working week. We also evaluated the effect of the clinical climate of learning on their emotional wellbeing.

## **Methods**

We assessed burnout, quality of life and the clinical climate of learning in 105 orthopaedic trainees using the Maslach Burnout Inventory, linear analogue scale self-assessments, and Dutch Residency Educational Climate Test (D-RECT), respectively.

## **Results**

A total of 19 trainees (18%) had poor quality of life and 49 (47%) were dissatisfied with the balance between their personal and professional life. Some symptoms of burnout were found in 29 trainees (28%). Higher D-RECT scores (indicating a better climate of learning) were associated with a better quality of life ( $r = 0.31$ ,  $p = 0.001$ ), more work-life balance satisfaction ( $r = 0.31$ ,  $p = 0.002$ ), fewer symptoms of emotional exhaustion ( $r = -0.21$ ,  $p = 0.028$ ) and depersonalisation ( $r = -0.28$ ,  $p = 0.04$ ).

## **Conclusion**

A reduced quality of life with evidence of burnout were still seen in a significant proportion of orthopaedic trainees despite following a modern curriculum with strict compliance to a 48-hour working week. It is vital that further work is undertaken to improve the quality of life and reduce burnout in this cohort.

## Introduction

The challenges of medical training can lead to significant personal distress.<sup>1</sup> Burnout, poor quality of life and job dissatisfaction have been identified among physicians during their postgraduate medical training.<sup>2-4</sup> Poor quality of life has been reported in 14.8% to 18% of trainees in different surveys.<sup>4,5</sup> Using the Maslach Burnout Inventory,<sup>6</sup> symptoms of burnout have been found in 21% of Dutch trainees from different specialties who have a working week which does not exceed 48 hours,<sup>7</sup> and in as many as 56% of orthopaedic trainees in the United States with an 80-hour working week.<sup>8</sup> Although similarly high levels of burnout have been described among general practitioners in the United Kingdom,<sup>9</sup> the rate of emotional distress among British orthopaedic surgeons and trainees has not yet been studied. Because sub-optimal physician wellbeing is associated with negative effects on patient care, preventing stress and burnout of trainees should be a priority in every postgraduate training programme.<sup>2,10,11</sup>

The development of distress and symptoms of burnout can result from a high level of work home interference and high professional and educational demands.<sup>12,13</sup> High workloads, long and irregular working hours<sup>12</sup> and organizational and educational factors such as lack of autonomy, lack of social and supervisory support have also been associated with distress and burnout in trainees.<sup>14</sup> Over the past decade, major changes have been implemented in postgraduate training programmes in several countries, including the United Kingdom and the Netherlands, to address these problems. First, educational training programmes have been gradually modernised from a process-based model focusing on completing the time period of postgraduate training and fulfilling the numerical requirements of surgical procedures to be mastered, to an outcome-based model with increased emphasis on generic competencies in addition to medical knowledge and surgical skills.<sup>15-18</sup> Second, strict compliance with the European Working Time Directive (EWTD) limits the working week of Dutch orthopaedic trainees to 48 hours, compared with that of 80 hours a week for United States trainees. In the United Kingdom, the same EWTD

applies, but trainees can work longer hours by signing an opt-out clause. Although concern has been raised about the negative effects of reducing the working hours of postgraduate doctors on their clinical and surgical competencies, two systematic reviews of practice in the United States suggest that reducing trainees' working hours from over 80 hours a week does not seem to adversely affect postgraduate training and patient care in surgical and nonsurgical disciplines.<sup>19,20</sup> However, the impact of reducing the working week to 48 hours has not yet been sufficiently evaluated.<sup>19</sup> Third, the modernisation of postgraduate training programmes has placed increased emphasis on the importance of stimulating a safe clinical learning environment.<sup>21</sup> Earlier work on Dutch trainees has shown that the risk of burnout increases if trainees perceive little reciprocity in the relationship with their supervisors.<sup>22</sup> Conversely, adequate supervision, room for extra operating, and evaluation of and attention to the individual competence of trainees throughout their traineeship are positively influencing both trainee well-being and patient outcomes.<sup>20</sup>

The aim of this study was to evaluate the emotional wellbeing of orthopaedic trainees in a modern competency-based training programme with strict compliance to a 48-hour working week. We hypothesised that quality of life would be better and the prevalence of burnout symptoms would be lower in trainees enrolled in such programmes than in trainees who followed a more process-based programme with an 80-hour working week, such as the orthopaedic training programme in the United States. In addition, we hypothesised that the emotional well-being of trainees would be positively related to the quality of the learning environment.

## **Methods**

Starting in their third postgraduate year of training, and after completing their two-year general surgery rotation, all orthopaedic trainees in the Netherlands participate in an annual national compulsory course which covers the basics of orthopaedic surgery. Trainees have to participate three times in this course, in their third, fourth and fifth year of postgraduate training. During one of these courses, held in

November 2011, we asked all attending trainees to complete a questionnaire which assessed their quality of life, symptoms of burnout and the quality of the clinical learning climate using validated instruments as described below. Demographic data were also recorded. The Dutch Orthopaedic Society approved this study. Because no patients were included, the study was exempt from formal ethical board review under Dutch law. Following guidelines for educational research issued by the Netherlands Society of Medical Education, anonymity was guaranteed, participation was voluntary, and informed consent was obtained.

Quality of life was evaluated using two single-item linear analogue self-assessments, which are being widely used in quality of life research and have been validated across a broad range of medical conditions.<sup>23,24</sup> Trainees were asked to rate their quality of life on a scale of 1 to 5, with response options ranging from “As bad as it can be” to “As good as it can be. Satisfaction with the balance between personal and professional life was assessed on a similar five-point Likert scale.<sup>25</sup> High quality of life was defined as a response of 5 or 4 to each of these questions. Likewise, poor quality of life was defined as a response of 3, 2 or 1 to each of these questions.

To assess symptoms of burnout, we used the key items of the Maslach Burnout Inventory (MBI),<sup>6</sup> which is considered to be the reference instrument for the evaluation of burnout in the medical literature.<sup>1</sup> Emotional exhaustion and depersonalisation are considered the cornerstone dimensions of burnout.<sup>1,26</sup> Therefore, we focused on items which assessed the dimensions of emotional exhaustion and depersonalisation, drawing on responses to two items from the MBI. In a large sample of more than 10000 trainees and physicians, these two single-item measures correlated strongly with the aforementioned dimensions of burnout.<sup>23</sup> Emotional exhaustion was evaluated by the question, “How often do you feel burned out from your work?” and depersonalisation by the question, “How often do you feel you’ve become more callous towards people since you started working as an orthopaedic trainee?” These questions were answered on a seven-point Likert scale,<sup>6,25</sup> ranging from ‘never’ to

'daily'. Symptoms of high emotional exhaustion were defined by a frequency of at least once a month on the single-item emotional exhaustion measure. Similarly, symptoms of high depersonalisation were defined by a frequency of at least once a month on the single-item depersonalisation measure.

To evaluate the quality and safety of the clinical learning environment we used the Dutch Residency Educational Climate Test (D-RECT).<sup>27</sup> The D-RECT is a validated tool to measure the quality of the learning climate and consists of 50 items on 11 subscales (e.g. feedback, coaching and assessment, supervision, patient handover and professional relations between consultants).<sup>28</sup> Respondents are asked to indicate their agreement with each item using a five-point Likert scale, ranging from totally agree (5) to totally disagree (1), or to rate the item as not applicable. High scores (4 or 5) indicate a 'good' clinical learning climate. Scores 3 or lower are considered a cause for concern. This questionnaire also records data on gender, age, year of training and site of training.

### **Statistical analysis**

This was performed using Statistical Package for the Social Sciences v17.0 (SPSS Inc., Chicago, Illinois). Student t-tests were used to compare means. Categorical variables were compared using Pearson's chi-squared test. Analysis of variance (ANOVA) was used when comparing means in more than two groups. Correlation between variables was determined using Spearman's rank coefficient. P-values < 0.05 (all two-tailed) were considered significant.

### **Results**

Of the 112 orthopaedic trainees attending the training day, 105 (94%) responded. There were 22 (21%) female respondents. Overall, 38 (36%) worked in an academic medical centre, 66 (63%) in an affiliated general hospital, and one trainee did not provide information about their teaching hospital. Of the trainees, 37 (35%) were in their third postgraduate year, 43(41%) in their fourth year, and 25 (24%) in their fifth year.



The mean (standard deviation (SD), range) overall quality of life score was 4.0 (SD 0.7, 2 to 5). Poor quality of life scores (score < 3) were found in 19 trainees (18.1%). Furthermore, 49 trainees (46.7%) were somewhat or very dissatisfied with the balance between their personal and professional life (score < 3). Some symptoms of burnout were seen in 29 trainees (27.6%) and of this total of 29 trainees, 17 (16.2%) reported symptoms of emotional exhaustion, and 12 (11.4%) symptoms of depersonalisation at least once a month. Poor quality of life and symptoms of burnout were equally common in men and women and in different years of postgraduate training (Table 1). Although we did not find a difference in overall quality of life, satisfaction between work-life balance and symptoms of emotional exhaustion between trainees working in affiliated general hospitals and academic medical centres, monthly symptoms of depersonalisation were reported more frequently by trainees from affiliated general hospitals (n = 11, (16.7%)) than by those from university hospitals (n = 1 (2.6%), p = 0.03) (Table 2).

**Table 1.** Demographic characteristics and self-reported poor quality of life (QOL), dissatisfaction with work-life balance, symptoms of emotional exhaustion and depersonalisation in Dutch orthopaedic trainees

Variable	Poor overall QOL		Dissatisfaction work-life balance		Emotional exhaustion		Depersonalization	
	n (%)	p value	n (%)	p value	Score	p value	n (%)	p value
Gender		0.53		0.90		0.72		0.71
Female	5 (22.7)		10 (45.5)		3 (13.6)		3 (13.6)	
Male	14 (16.9)		39 (47.0)		14 (16.9)		9 (10.8)	
Year of training		0.10		0.69		0.12		0.52
PGY-1	4 (10.8)		18 (48.6)		6 (16.2)		6 (16.2)	
PGY-2	7 (16.3)		18 (41.9)		10 (23.3)		4 (9.3)	
PGY-3	8 (32.0)		13 (52.0)		1 (4.0)		2 (8.0)	
Programme		0.58		0.30		0.91		0.03*
Academic	8 (21.1)		15 (39.5)		6 (15.8)		1 (2.6)*	
Affiliated	11 (16.7)		33 (50.0)		11 (16.7)		11 (16.7)*	

\* statistically significant

**Table 2.** Relationship between D-RECT (Dutch residency educational climate test) scores and self-reported poor quality of life, dissatisfaction with work-life balance, symptoms of emotional exhaustion and depersonalisation in Dutch orthopaedic trainees.

Emotional well-being		Mean score D-RECT (SD)	p value
Overall quality of life	Good	3.9 (0.40)*	0.003*
	Poor	3.6 (0.33)*	
Work-life balance	Satisfied	3.9 (0.43)	0.09
	Dissatisfied	3.7 (0.37)	
Emotional exhaustion	Not exhausted	3.8 (0.41)	0.16
	Exhausted	3.7 (0.35)	
Depersonalization	No depersonalization	3.8 (0.41)*	0.049*
	Depersonalization	3.6 (0.33)*	

\* statistically significant

The mean (SD, range) total clinical learning climate score was 3.8 (SD 0.4 (2.6 to 4.6)), indicating an acceptable learning climate. Total scores < 3 (cause for concern) were reported by 18 trainees (17.0%). No differences were found in clinical learning climate scores between males and females ( $p = 0.66$ ), university or general hospitals ( $p = 0.22$ ), or year of training ( $p = 0.06$ ). Higher scores on the D-RECT (indicating a better learning climate) were associated with better quality of life ( $r = 0.31$ ,  $p = 0.001$ ), more work-life balance satisfaction ( $r = 0.31$ ,  $p = 0.002$ ), fewer symptoms of emotional exhaustion ( $r = -0.21$ ,  $p = 0.028$ ) and fewer symptoms of depersonalisation ( $r = -0.28$ ,  $p = 0.04$ ). A total of seven of the 18 trainees (39.0%) rating the learning climate quality as poor (score < 3) reported poor quality of life (score < 3), compared with 12 (14%) of the 87 trainees who gave high ratings (score > 3) to the learning climate quality ( $p = 0.012$ , chi-square test). Similarly, a significantly higher rate of depersonalisation was found in trainees who rated the quality of the learning climate as poor ( $n = 5$ , 28%) compared with trainees who rated the learning climate as good ( $n = 7$ , 8.0%) ( $p = 0.017$ , chi-square test).

The quality of the learning environment was rated significantly higher by trainees with good quality of life than by those with poor quality of life (Fig. 1, Table 2), and by trainees without symptoms of depersonalisation than in those with such symptoms (Fig. 2, Table 2). There were no significant differences in satisfaction with work-life balance ( $p = 0.177$ , Student's t-test) and symptoms of emotional exhaustion ( $p = 0.445$ , Student's t-test) between trainees who rated the quality of the learning climate as 'good' and trainees who rated the quality of the learning climate as 'poor'.

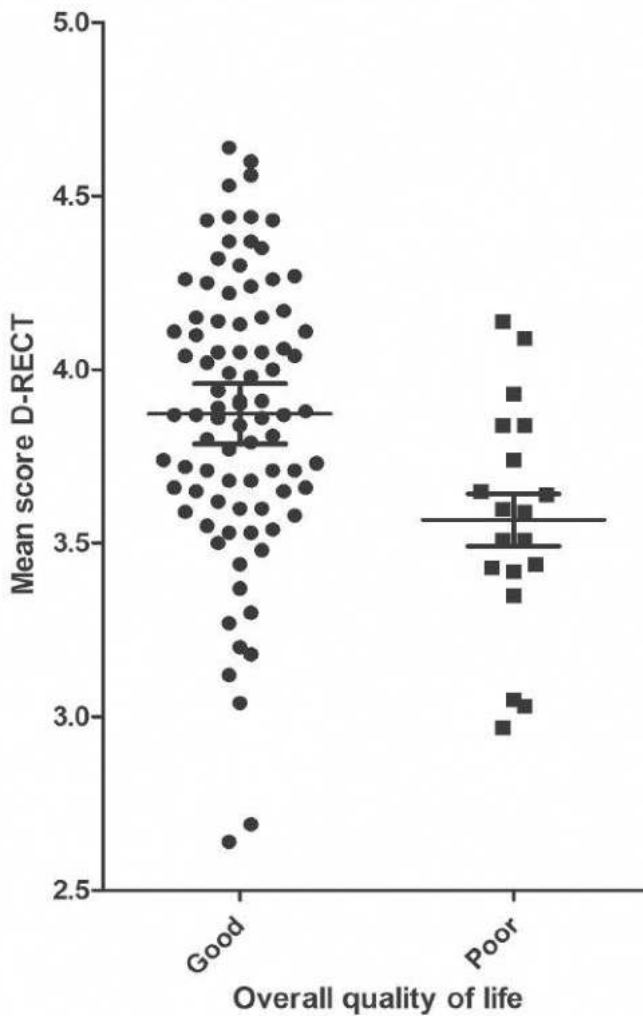
Trainees' overall quality of life and satisfaction with work-life balance was significantly correlated, with work adapted to the trainee's competence and with the role of the supervising consultant (Table 3). Additional learning factors of climate associated with overall quality of life included role of the specialty tutor, who is considered the consultant responsible for the trainees' educational programme and patient sign-out, meaning communication, discussion and making decisions in patient care. The strongest learning climate factor associated with symptoms of burnout was poor peer collaboration (Table 3). It should be noted that some of the correlations in Table 3 are weak, with values  $< 0.4$ .

**Table 3.** Correlations between D-RECT subscales (learning climate) and quality of life (QOL) and burnout in Dutch orthopaedic trainees. To adjust for multiple comparisons, only p values <0.01 were considered statistically significant.

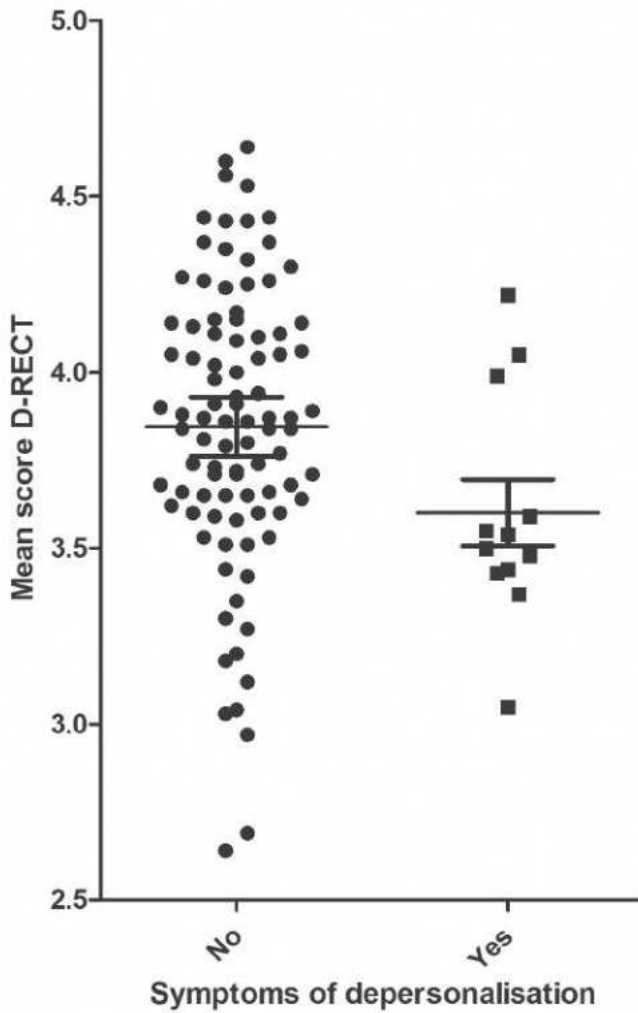
Subscale	Overall QOL		Satisfaction work-life balance		Emotional exhaustion		Depersonalization	
	r	p value	r	p value	r	p value	r	p value
Supervision	0.20	0.05	0.16	0.11	-0.10	0.3	-0.15	0.12
Coaching and assessment	0.19	0.05	0.13	0.19	-0.12	0.3	-0.09	0.37
Observation forms	0.11	0.3	0.03	0.8	-0.10	0.3	-0.07	0.48
Teamwork	0.06	0.6	0.17	0.08	-0.01	0.9	-0.10	0.34
Peer collaboration	0.14	0.14	0.21	0.04	-0.26*	0.007*	-0.40*	< 0.001*
Professional relations between consultants	0.20	0.04	0.26*	0.008*	-0.16	0.1	-0.11	0.25
Work is adapted to trainee's competence	0.31*	0.002*	0.26*	0.008*	-0.33*	0.001*	-0.22	0.23
Consultants' role	0.26*	0.008*	0.29*	0.002*	-0.11	0.3	-0.15	0.14
Formal education	0.10	0.3	0.19	0.05	-0.08	0.4	-0.16	0.1
Role of the specialty tutor	0.28*	0.004*	0.15	0.12	-0.13	0.18	-0.14	0.16
Patient sign out	0.26*	0.007*	0.22	0.03	-0.11	0.27	-0.17	0.08

\* statistically significant

**Figure 1.** Mean Dutch Residency Educational Climate Test (D-RECT) (clinical learning climate) scores of trainees with good and trainees with poor quality of life. Horizontal bars represent mean values (95% confidence interval (CI)). The difference in D-RECT scores between trainees with good and poor quality of life (0.31) is significant ( $p = 0.003$ , 95% CI for difference in D-RECT scores 0.11 to 0.50).



**Figure 2.** Graph showing mean Dutch Residency Educational Climate Test (D-RECT) (clinical learning climate) scores of trainees with and without symptoms of depersonalisation. Horizontal bars represent mean values (95% confidence intervals (CI)). The difference in DRECT (learning climate) scores between trainees with and without depersonalisation (0.24) is of borderline significance ( $p = 0.049$ , 95% CI of difference in D-RECT scores 0.01 to 0.49).



## Discussion

We found a significant number of the Dutch orthopaedic trainees reported poor quality of life and symptoms of burnout in a modern educational programme with strict compliance to a 48-hour working week. Even in a programme with such strictly reduced working hours, dissatisfaction with work-life balance was found. A better quality of the clinical learning climate was associated with better emotional well-being and fewer symptoms of burnout in orthopaedic trainees, suggesting that further improvements in the learning environment should be able to reduce the undesirably high level of burnout and poor quality of life among orthopaedic trainees.

When comparing our results with those reported in recent literature, it should be borne in mind that the prevalence of burnout symptoms varies greatly between studies, ranging from 18% to 82%.<sup>1,12,23,28</sup> This large variation can partly be explained by differences in work conditions, duration of the working week, specialty, culture, and response rate to the questionnaire. These differences in study methods and the large variability of burnout symptoms between studies hamper the comparison of our results to those found in other groups. Sargent et al<sup>8</sup> evaluated the rate of burnout symptoms in orthopaedic trainees in the United States. They found the rate of burnout symptoms to be 56%, which considerably exceeds the 28% seen in our study. Although a range of other factors, as listed above, may also help to explain the difference in burnout symptom rates between Dutch trainees and their colleagues in the United States, the possibility of the striking difference in working hours between the two countries might be a contributory factor. Previous studies have shown a consistent relationship between lengthy working hours and sleep deprivation and low quality of life and burnout.<sup>13,28</sup> International comparative data are needed to further elucidate differences in burnout symptoms between trainees from different countries and with different educational programmes and working hours regulations.

We found a consistent and significant association between the clinical learning climate and the overall well-being of orthopaedic trainees. This clinical climate of learning, which constitutes the specific context in which trainees learn during their

daily activities, represents a major indicator of the educational quality of a medical department that provides clinical training.<sup>27</sup> Our results suggest that improving the quality of the learning environment may contribute to an improvement in the quality of life and a reduction in the risk of burnout for trainees. Improving the climate of learning can be achieved by the appropriate integration of work and training and by tailoring the education to the learning needs of the individual trainee.<sup>29</sup> The quality of the climate of learning is of major importance because the quality of training programmes is related to patient care.<sup>20</sup> The results of our study suggest that improvements in the climate of learning should include both the role of the consultant in the organisation of the learning environment and peer collaboration among trainees, as these factors were significantly associated with overall quality of life, satisfaction with work-life balance, and symptoms of burnout, respectively (Table 3).

We believe this is the first study to investigate the relationship between the clinical climate of learning and trainee well-being in a modern educational programme with strict compliance to a 48-hour working week. A strength of the study is the high response rate (94%), whereas other studies have shown response rates ranging from 27%<sup>28</sup> to 41%.<sup>7</sup> We acknowledge the following limitations. First, the cross-sectional and correlational design of the study precludes inference of causation. We are now following orthopaedic trainees longitudinally to investigate whether the association between the quality of the learning environment and the prevalence of burnout symptoms and quality of life in these individuals is consistent over time, and throughout their training programme. Second, only the most important domains of well-being were assessed, meaning that our results do not provide information about depression, job satisfaction, or other factors which determine the overall well-being of trainees. We deliberately limited our survey for practical reasons, to ensure a higher response rate than have been achieved by previous physician surveys.<sup>30</sup> Further qualitative or in-depth studies are needed to provide more details about the extent and nature of poor quality of life in orthopaedic trainees in modern educational programmes with limited working hours. Thirdly, only selected



demographic variables were evaluated, excluding other personal factors which may have an impact on well-being, such as socioeconomic status, marital status and children, and educational debt. A final limitation is that our study only included Dutch orthopaedic trainees, which limits the generalisation of our results to foreign training systems. Finally, it should be noted that we used only the key items from the MBI, instead of the whole instrument. Although this may have influenced the observed prevalence of burnout in our sample to some degree, it is unlikely to have had a major influence on our results as previous work has shown that responses to these key questions are a good reflection of the responses to the corresponding key dimensions of the MBI.<sup>23</sup> Although we acknowledge that future studies are needed to compare burnout and quality of life in orthopaedic trainees from different countries, we feel that our study provides an important insight into the well-being of trainees enrolled in a modern training programme with a strictly limited 48-hour working week.

## Conclusion

In conclusion, we found a significant proportion of Dutch orthopaedic trainees enrolled in a modern postgraduate educational programme, with strict 48-hour work week regulations, still reported poor quality of life and symptoms of burnout. The rate of burnout found in this study was lower than the rate of burnout found among orthopaedic trainees in the United States but we accept that they pursued a more traditional educational programme as well as being employed for an 80-hour working week. A better clinical climate of learning was associated with a better quality of life of orthopaedic trainees and fewer symptoms of burnout. This suggests that further improvements in the clinical climate of learning may help to improve the well-being of trainees and could, in the end, improve patient care.

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# Chapter 5

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The learning environment and  
resident burnout: a national study

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## **Introduction**

Concerns exist about the negative impact of burnout on the professional and personal lives of residents. It is suggested that the origins of burnout among residents are rooted in the learning environment. We aimed to evaluate the association between the learning environment and burnout in a national sample of Dutch residents.

## **Methods**

We conducted a cross-sectional online survey among all Dutch residents in September 2015. We measured the learning environment using the 3 domain scores on content, organization, and atmosphere from the Scan of Postgraduate Educational Environment Domains (SPEED) and burnout using the Dutch version of the Maslach Burnout Inventory (UBOS-C).

## **Results**

Of 1231 responding residents (33 specialties), 185 (15.0%) met criteria for burnout. After adjusting for demographic (age, gender and marital status) and work-related factors (year of training, type of teaching hospital and type of specialty), we found a consistent inverse association between SPEED scores and the risk of burnout (aOR 0.54, 95% CI 0.46 to 0.62,  $p < 0.001$ ).

## **Discussion**

We found a strong and consistent inverse association between the perceived quality of the learning environment and burnout among residents. This suggests that the learning environment is of key importance in preventing resident burnout.

## Introduction

The virtues of medical residency are offset by high educational demands, long working hours, lack of autonomy, a high level of work-home interference and a lack of reciprocity in professional relationships. These factors may have detrimental effects on the mental health of residents and a substantial proportion of residents experience symptoms of burnout.<sup>1-3</sup> Three dimensions define the multifaceted syndrome of burnout: emotional exhaustion, depersonalization, and reduced personal accomplishment.<sup>4</sup> Burnout has both professional and personal implications. Residents with burnout are more likely to deliver suboptimal patient care and are at greater risk of making medical errors.<sup>5-6</sup> In addition, residents with burnout show increased rates of substance abuse, alcohol consumption and suicidal thoughts.<sup>7-8</sup>

Recently physician burnout is viewed as being rooted in issues related to the working environment and organizational culture, instead of being an individual problem.<sup>9-10</sup> When it concerns resident doctors, this working environment resembles the learning environment,<sup>11</sup> which is a construct that includes formal and informal aspects of the training programme, organizational aspects within the teaching hospital<sup>12</sup> as well as the overall atmosphere.<sup>13</sup> The learning environment is thought to play a key role in the development of residents towards independent practice<sup>14</sup> and it has been postulated to be an important contributor to burnout.<sup>2</sup> A previous content analysis of instruments that assess the learning environment showed that the majority of the items of these instruments relate to a theoretical framework that characterizes the learning environment in three broad domains: the *content* of the programme, the interpersonal aspects and *atmosphere* of the programme, and the structure and *organization* of the programme.<sup>15</sup>

The learning environment plays a vital role in the development of burnout among medical students<sup>16</sup> and in a previous study we found that a better learning environment was associated with fewer symptoms of burnout and a better quality of life in orthopaedic residents.<sup>17</sup> However, it is unknown whether the association

found in medical students can be translated to residents and whether an association between the learning environment and burnout exists across specialties. As work conditions across specialties and the personalities of these residents might differ, it is likely that the previous results we found among orthopaedic residents are not generalizable to other specialties.

The aim of the present study was therefore to examine the relationship between the perceived quality of the learning environment and the development of resident burnout in a large national sample of Dutch residents from all specialties. We hypothesized that the inverse association between the perceived quality of the learning environment and the development of burnout is present across specialties. Secondly, we aimed to determine the effect size of the learning environment by controlling for other demographic and occupational predictors of resident burnout.

## **Methods**

### **Settings and participants**

In September 2015, a total of 7141 residents were registered by the national Dutch Registration Commission of Medical Specialties (Registratiecommissie Geneeskundige Specialisten, RGS) as being enrolled in one of the postgraduate medical training programmes in the Netherlands. Of these 7141, 2596 (36.4%) were members of the Dutch Junior Doctor Association. All these 2596 members received an invitation by email on the 21<sup>st</sup> of September 2015 to participate in our study and complete an online self-report survey. Members of the association were encouraged to share the link for the survey with their fellow non-member residents.

Because no patients were involved, the study was exempt from ethical board review under Dutch law. Following the Netherlands Society of Medical Education guidelines for educational research and in accordance with the Declaration of Helsinki, anonymity was guaranteed, participation was voluntary, and informed consent was obtained.



## Survey

We used an abbreviated version of the Scan of Postgraduate Educational Environment Domains (SPEED)<sup>15</sup> to measure the perceived quality of the learning environment. We chose the SPEED because it is a validated, concise and theoretically well-founded instrument to evaluate the quality of the learning environment in the Dutch postgraduate medical education context.<sup>15</sup> We used the three items that provide an overall numerical rating of the quality every domain (content, atmosphere and organization) of the learning environment. Respondents assessed these items on a scale ranging from 'very poor' (1) to 'excellent' (10). Means were calculated for each domain and these mean domain scores were used to calculate an overall mean SPEED score, which provides an overall rating for the learning environment.

We used the validated Dutch version (UBOS-C)<sup>18</sup> of the Maslach Burnout Inventory (MBI)<sup>4</sup> to measure burnout. It consists of 20 items covering the three domains of burnout: emotional exhaustion (8 items), depersonalization (5 items) and personal accomplishment (7 items). Items were scored on a 7-point Likert scale ranging from 'never' (0) to 'always' (6). Mean scores were calculated for each domain. We used cut-off scores for burnout based on a reference group of 10.552 Dutch healthcare employees.<sup>18</sup> A resident was diagnosed with burnout if there was either a mean score  $\geq 2.50$  on emotional exhaustion and  $\geq 1.80$  (men) or  $\geq 1.60$  (women) on depersonalization, or a mean score  $\geq 2.50$  on emotional exhaustion and a mean score of  $\leq 3.70$  on personal accomplishment.<sup>18</sup>

Respondents provided information on: gender, age, marital status, type of medical specialty, year of postgraduate training, clinical setting (academic centre/affiliated teaching hospital), number of hours stated in their employment contracts and true number of hours worked.

## Data analysis

All analyses were done using SPSS version 17 (SPSS Inc., Chicago, Illinois, US). Standard descriptive summary statistics were used to characterize the sample. The representativeness of our study population was assessed by comparing age, gender, and type of specialty of respondents to those of all 7141 residents enrolled in a postgraduate medical educational programme at the time of study (RGS data). Student's t tests were computed to compare mean SPEED-scores (learning environment) between residents with and without burnout. Multivariate logistic regression analysis was conducted to evaluate the association between learning environment (SPEED scores) and resident burnout, adjusted for potential predictors of burnout. In this logistic regression model, we adjusted for demographic (age, gender and marital status) and work-related factors (year of training, type of teaching hospital and type of specialty). All tests used were two-tailed and p-values < 0.05 were considered significant.

## Results

A total of 1231 residents from 33 different specialties completed the survey, representing 17.2% of the total number of residents enrolled in postgraduate medical educational programmes at the time the study was conducted. Because of our sampling strategy, an exact response rate could not be calculated. Our study sample was representative of the root population of all Dutch residents in terms of age and type of specialty; women were overrepresented in our study sample (73.6%) compared to the national root population of all residents (64.2%) ( $p < 0.01$ ). Table 1 shows the demographic and occupational characteristics of the responding residents. The mean score (SD) on the 3 SPEED domains was 7.33 (1.01) (Table 1). A total of 185 residents (15.0%) fulfilled the criteria for burnout (Table 1), of which 47 (25.4%, or 3.8% of the study population) suffered from severe burnout.

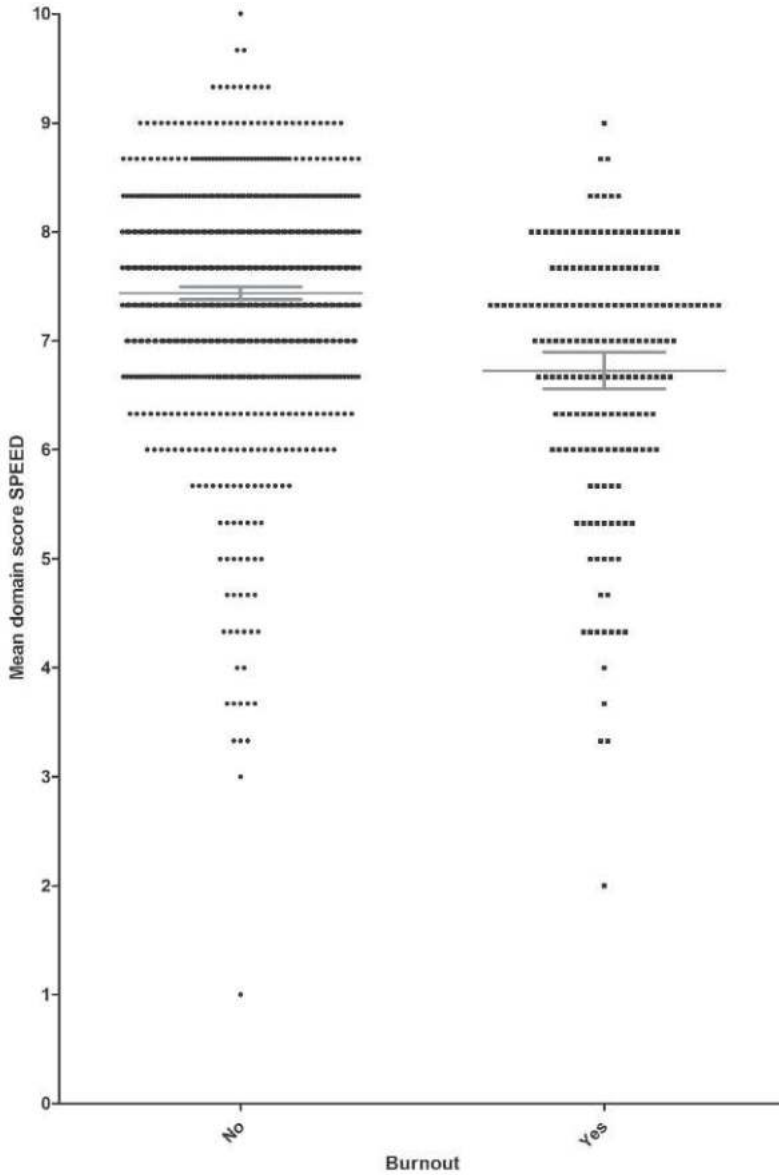
Concerning our primary research question, we found that residents without burnout gave significantly higher SPEED domain scores (mean, SD; 7.44, 0.94) than residents

with burnout (mean, SD; 6.73, 1.16) (95% confidence interval for difference; 0.56 to 0.86,  $p < 0.001$ ) (Figure 1). The mean difference of 0.71 points in the perceived quality of the learning environment between residents with and without burnout is clinically relevant [15]. After adjustment for potential demographic and work-related predictors of burnout (Table 2), the association between SPEED score and resident burnout remained both relevant and statistically highly significant (aOR 0.54 for each point higher on the SPEED, 95% CI 0.46 to 0.62,  $p < 0.001$ ). Univariate associations between the SPEED domain scores and the dimensions of burnout are displayed in Table 3. Moreover, we found a greater difference between the true number of hours spent working and the number of work-hours stated in the employment contract in residents with burnout (mean, SD; 9.49, 6.93) compared to those without burnout (mean, SD; 7.56, 6.26) (95% CI of difference 2.92 to 0.51,  $p < 0.001$ ).

**Table 1.** Demographic and occupational characteristics of participating residents.

	<b>Number (%)</b>	<b>Mean score (SD)</b>
Gender		
Male	325 (26.4)	
Female	906 (73.6)	
Age, years; median (range)	32 (26 – 40)	
Marital status		
Married or cohabiting	960 (78.0)	
Single	253 (20.6)	
Other (e.g. with parents)	18 (1.4)	
Years in training		
1	218 (17.7)	
2	252 (20.5)	
3	275 (22.3)	
4	218 (17.7)	
5	179 (14.5)	
6	73 (5.9)	
7	5 (0.4)	
Just finished training	11 (0.9)	
Burned out	185 (15.0)	
High score emotional exhaustion	314 (25.5)	
High score depersonalization	292 (23.7)	
Low score personal accomplishment	163 (13.2)	
SPEED		7.33 (1.01)
Content		7.54 (1.07)
Atmosphere		7.59 (1.25)
Organisation		6.86 (1.33)

**Figure 1.** Mean SPEED (Scan of Postgraduate Educational Environment Domains) scores of residents with (n = 185) and without (n = 1046) burnout. Horizontal bars represent mean values and T-bars indicate 95% confidence intervals. The difference in SPEED score (0.71, 95% confidence interval for difference; 0.56 – 0.86) between both groups is significant (p < 0.001).



**Table 2.** Multivariate model: demographic and occupational factors independently associated with burnout in residents.

	Odds ratio (95% CI)	p-value
Gender	0.94 (0.64 – 1.38)	0.76
Age	0.99 (0.95 – 1.04)	0.77
Marital status	1.15 (0.84 – 1.57)	0.38
Year of training	0.94 (0.83 – 1.06)	0.32
Teaching hospital	1.16 (0.97 – 1.39)	0.10
Type of specialty	0.66 (0.50 – 0.86)	0.002
SPEED score	0.54 (0.46 – 0.62)	< 0.001

**Table 3.** Associations between the SPEED (Scan of Postgraduate Educational Environment Domains) scores (95% confidence interval of difference) and overall burnout and the three dimensions of burnout in Dutch residents from 33 specialties.

		Mean score 3 items SPEED (SD)	95% CI of difference	p-value
Overall burnout	Burnout	6.73 (1.16)	0.56 to 0.86	< 0.001
	No burnout	7.44 (0.94)		
Emotional exhaustion	Exhausted	6.87 (1.20)	0.49 to 0.74	< 0.001
	Not exhausted	7.49 (0.88)		
Depersonalization	Depersonalization	6.99 (1.06)	0.32 to 0.58	< 0.001
	No depersonalization	7.44 (0.97)		
Personal accomplishment	Not competent	6.85 (1.31)	0.71 to 0.39	< 0.001
	Competent	7.40 (0.93)		

## Discussion

In a large national sample of Dutch residents from 33 different specialties we found that 15% met the criteria for moderate to severe burnout. Residents without burnout gave a higher rating for the quality of the learning environment than residents with burnout. We found a significant inverse association between the perceived quality of

the learning environment and emotional exhaustion, depersonalization, and reduced personal accomplishment. The inverse association between the perceived quality of the learning environment and the risk of burnout remained highly significant after controlling for gender, age, marital status, year of training, teaching hospital and type of specialty.

Several recent studies have reported a high prevalence of burnout among residents.<sup>1,3,17</sup> Growing awareness of the detrimental consequences of burnout on patient care and the personal lives of residents raises the question which factors drive burnout. Individual factors like personality traits<sup>19</sup> and demographics<sup>3</sup> probably influence the way stressors are perceived by residents and could therefore contribute to the development of burnout. However, the key contributor is believed to be the learning environment.<sup>6,17</sup> The results of the present study confirm and extend our earlier observations of a highly significant inverse association between the quality of the learning environment and the risk of burnout among residents.<sup>17</sup>

Several aspects of the learning environment have been implicated to play a role in the development of burnout: long working hours<sup>20</sup> lack of autonomy,<sup>21</sup> and lack of reciprocity.<sup>22</sup> Important aspects of the learning environment include aspects of supervisory support, accessibility of supervisors, teamwork (peers, nurses and other hospital personnel) and mutually supportive and beneficial relationships with supervisors.<sup>23</sup> Interventions to improve the learning environment could focus on creating a safe atmosphere with sufficient autonomy for residents,<sup>21</sup> with supervisors who provide timely and useful feedback<sup>24</sup> and are attentive to the educational needs of residents.<sup>25</sup> Recognition of the importance of the learning environment has led to quality-improvement initiatives such as the Clinical Learning Environment Review (CLER) programme in the United States.<sup>26</sup> Specific guiding findings of the first CLER report include: improving patient safety by applying a system-based approach, improving engagement in interprofessional collaboration, achieving greater understanding in appropriate titration of supervision, and paying attention to workload and work conditions to address fatigue and burnout in residents.<sup>27</sup>

Long work hours and high workload are associated with increased fatigue-related errors and a lower likelihood of participation in educational activities.<sup>28,29</sup> This has led to reforms that further reduced resident work hours in many countries. Although the true effect of number of hours worked on the development of resident burnout remains controversial, a recent study indicates that a longer working week does increase the risk of burnout in residents.<sup>20</sup> In the present study, we found an association between burnout and the number of hours worked beyond their employment contract. Reducing the workload for residents, the frequency of on-call duty and increasing participation of supervisors is associated with higher residents' satisfaction with the quality of the learning environment.<sup>30</sup> Based on these findings and our own observations, we speculate that improving the learning environment by reducing the workload is of particular importance in the prevention of resident burnout.

Our study is the first to describe a consistent association between the learning environment and burnout. Another strength of our study is the nationwide recruitment of residents from all specialties and teaching hospitals. In addition, we used the complete MBI to determine burnout whilst most previous studies on burnout in medical professions used abbreviated versions.<sup>31</sup> The ability to adjust for working hours and perceived work-life balance allowed a robust and consistent analysis between quality of the learning environment and the risk of burnout. We acknowledge the following limitations. Firstly, we were not able to determine a reliable response rate. Selective non-participation of residents in burnout cannot be excluded, which would mean that the burnout rate we reported would be an underestimate of the true burnout risk among residents. This limitation, however, applies to all studies assessing burnout among residents, so the burnout rate we reported can be reliably compared to those obtained in earlier work. Although the response rate in our study was relatively low, the study sample was large enough to allow meaningful comparisons between subgroups. Our study sample was representative in terms of age and type of specialty of the root population of



all Dutch residents. Although women were overrepresented in our study sample, burnout rates were comparable between female and male residents in our study, and we adjusted for gender in the multivariate analysis of the association between learning environment and burnout, which was the primary focus of our study. Secondly, the cross-sectional design of the study precluded causal inference.

## **Conclusion**

Despite the merits of becoming a medical specialist, residents are at risk of developing burnout. This has a tremendous impact not only on the personal lives of the residents but also on the quality of the patient care they deliver. Our study suggests that the quality of the learning environment as perceived by residents is a major determinant of the risk of resident burnout. Residents, supervisors, educators and policymakers have a shared responsibility to promote a rich learning environment in which residents flourish with minimum risk of burnout.

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## Chapter 6

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The relationship between burnout, personality traits, and medical specialty: A national study among Dutch residents

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## **Purpose**

To examine the associations between residents' personality traits, type of specialty, and symptoms of burnout.

## **Method**

A cross-sectional online survey among Dutch residents was conducted (see Supplementary Material). The 20-item Dutch translation of the Maslach Burnout Inventory was used to ascertain burnout. Personality traits were assessed with the 44-item Dutch Big Five Inventory. Logistic regression analyses, including all five personality traits, were used to assess associations with burnout. Analyses were stratified by specialties.

## **Results**

One thousand two hundred thirty one residents participated, 185 (15.0%) of whom met the criteria for burnout. Neuroticism was significantly associated with resident burnout in all specialties, more strongly in supportive (odds ratio (OR) 6.19, 95% CI 2.12–18.12) and surgical (OR 4.37, 95% CI 1.76–10.86) than in medical residents (OR 1.99, 95% CI 1.22–3.24). Extraversion was significantly associated with less burnout in surgical residents (OR 0.26, 95% CI 0.13–0.58). These findings remained highly significant after controlling for gender, overtime, autonomy at work, satisfaction between work and private life, and the perceived quality of the learning environment.

## **Conclusions**

Burnout risk was associated with personality traits in residents. Consistently, residents scoring high on neuroticism reported more burnout. Extraverted surgical residents were less susceptible to burnout. Residents scoring high on neuroticism may require more intense monitoring during their training years.

## Introduction

Residents in specialty training are at high risk of burnout. Studies worldwide have shown prevalence rates varying from 20 to 60%.<sup>1,2</sup> Burnout is defined as: 'a prolonged response to chronic emotional and interpersonal stressors on the job, described by three dimensions: emotional exhaustion, depersonalization and a low sense of personal accomplishment'.<sup>3</sup> Burnout has a major impact on residents' personal and professional life: they encounter poor quality of life, poor mental health, less work productivity, and an increased risk of substance abuse, suicidal ideation, and medical errors.<sup>2-9</sup> Identification of factors contributing to the development of burnout may help in early recognition and development of preventive strategies.

The current understanding is that chronic stressors causing burnout arise from an imbalance between job demands and job resources, as being described in the job demands resources model.<sup>10,11</sup> The quality of the learning environment has been shown to be a significant risk factor for burnout in residents.<sup>12</sup> Individual characteristics, like personality traits, are thought to play a smaller role when it comes to burnout risk.<sup>2</sup> However, personality traits affect the perception of job demands and resources, like workload, autonomy, and level of support, and may, therefore, be of interest.<sup>13-15</sup> Personality is defined as a set of psychological traits and mechanisms within the individual that are relatively stable over time and that influence interaction with, and adaptations to, the environment.<sup>16,17</sup>

Studies investigating the relationship between personality and burnout in a medical work environment are rare. A meta-analysis among employees, in general, found an association between the three dimensions of burnout and different personality traits, such as neuroticism, extraversion, conscientiousness, and agreeableness.<sup>18</sup> It has been proposed that healthcare workers may have personality traits, which make them more susceptible to burnout.<sup>19</sup> High patient-care workload together with the emotional demanding aspects of the job might explain this. A prospective study among junior doctors from the United Kingdom showed weak, but significant

correlations between personality and the dimensions of burnout. Those who scored low on extraversion or high on neuroticism suffered more from emotional exhaustion, and more agreeableness was associated with less depersonalization.<sup>13</sup> A study among postgraduate first-year residents from Taiwan found a positive association between burnout and neuroticism. However, in their prediction model, only introversion and conscientiousness predicted burnout.<sup>20</sup>

When analyzing the relationship between personality traits and burnout risk in residents, differences between residents from different specialties need to be taken into account. Firstly, burnout rates vary among different types of specialties. A large nationwide United States study found the highest prevalence of burnout in emergency medicine, general internal medicine, neurology, and family medicine physicians.<sup>21</sup> Secondly, distinctive differences in personality traits have been reported between specialties.<sup>22,23</sup> A recent study found solid and reproducible differences between surgical and medical specialties, with surgeons scoring higher on extraversion and openness to experience, but lower on neuroticism.<sup>24</sup>

The aim of our study was to examine the associations between residents' personality traits, type of specialty, and symptoms of burnout.

## **Methods**

### **Design and subjects**

We performed a nationwide cross-sectional study among Dutch residents (see Supplementary Material). In September 2015, a total of 7141 residents were registered by the national Dutch Registration Commission of Medical Specialties (Registratiecommissie Geneeskundige Specialisten, RGS) as being enrolled in one of the postgraduate medical training programs in the Netherlands, 2596 of whom (36.4%) were members of the Dutch Junior Doctor Association (De Jonge Specialist, DJS). All these 2596 members received an invitation by email on 21 September 2015 to participate in our study and complete an online self-report survey. Members of



the association were encouraged to share the link for the survey with their fellow non-member residents. The study was exempt from ethical board review under Dutch law. Following ethical review guidelines for medical education research, participation was voluntary, all participants provided written informed consent and data were analyzed anonymously.

## Measures

### *Demographic and occupational characteristics*

The questionnaire included questions about gender, age, marital status, years in training, working hours, clinical setting (university medical center/affiliated general teaching hospital), overtime (weekly hours), autonomy at work and satisfaction with balance between work and private life (Likert scale: 1 = not satisfied to 6 = very satisfied). To assess the perceived quality of the learning environment, we used the three domain scores of the Scan of Postgraduate Educational Environment Domains (SPEED).<sup>25</sup>

Based on a previous study showing distinctive task differences between groups of residents, residents' specialties were aggregated into three subgroups: surgical (general surgery, cardiothoracic surgery, otorhinolaryngology, neurosurgery, ophthalmology, orthopedics, plastic surgery, urology, obstetrics and gynecology), medical (internal medicine, cardiology, dermatology, pediatrics, geriatrics, clinical genetics, pulmonology, gastroenterology, neurology, psychiatry, rheumatology, rehabilitation medicine, emergency medicine, sports medicine and hospital medicine) and supportive disciplines (anesthesiology, clinical chemistry, clinical physics, medical microbiology, nuclear medicine, pathology, radiology, radiotherapy, and clinical pharmacology).<sup>26</sup>

## Burnout

We used the validated Dutch translation of the Maslach Burnout Inventory (MBI-HHS) to assess burnout.<sup>27</sup> This "Utrecht Burn Out Scale (UBOS-C)" was developed

for use in people working in human services and health care.<sup>28</sup> UBOS-C consists of 20 items covering the three dimensions of burnout: emotional exhaustion (8 items), depersonalization (5 items), and personal accomplishment (7 items). Each item is scored on a 7-point Likert scale ranging from 0 (never) to 6 (every day). Mean scores were calculated for each dimension. Dutch cut-off scores, based on a reference group of 10,552 Dutch healthcare employees, were used to ascertain burnout. Burnout was defined as either a mean score  $\geq 2.50$  on emotional exhaustion and  $\geq 1.80$  (men) or  $\geq 1.60$  (women) on depersonalization, or a mean score  $\geq 2.50$  on emotional exhaustion and a mean score of  $\geq 3.70$  on personal accomplishment.<sup>28</sup>

### **Personality**

We used the Five-Factor Model to measure personality. This model comprises five traits: neuroticism, extraversion, conscientiousness, openness to experience, and agreeableness.<sup>16,17,29</sup> To assess these traits, the validated 44-item Dutch Big Five Inventory (BFI) questionnaire was used. Each item is scored on a Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). There are subscales for neuroticism (8 items), extraversion (8 items), conscientiousness (9 items), openness (10 items), and agreeableness (9 items). Mean scores for each trait were calculated.<sup>16,29,30</sup>

### **Statistical analyses**

Data were analyzed using IBM SPSS Statistics for Windows, version 23 (IBM Corp., Armonk, NY, USA). To assess the representativeness of our study population, respondents' demographic characteristics were compared to those of the overall population of all Dutch specialty residents (7141 residents), at the time of the study (data supplied by the Royal Dutch Medical Association). Differences in demographic characteristics and personality traits between residents with and without burnout were assessed by independent t-test, chi-square, or Fisher exact test as appropriate. Pearson's correlation coefficient was used to determine the correlation between burnout dimensions and personality traits. Correlation coefficients  $<0.30$  were considered weak,  $0.30\text{--}0.50$  moderately strong, and  $>0.50$  strong. Analysis of

variance (ANOVA) was used to examine differences in personality traits between the three types of specialties.

We used a multivariable logistic regression model to assess the associations between personality traits and burnout, adjusted for potential confounders. Confounding was tested for demographic characteristics associated with burnout. The multivariable logistic regression model was also performed separately for the three different groups of specialties. All analyses were pre-specified, effect modification by specialty and by gender was tested. To adjust for potential multiple testing bias, we used a Bonferroni correction model to determine significant p-value thresholds. As being described under the tables in the results section, the significance thresholds ranged between  $p < 0.01$  and  $p < 0.0015$ , dependent on the number of analyses performed. For univariate analysis regarding demographic and occupational characteristics, a threshold of  $p < 0.0015$  was used. Finally, for the analyses of effect modification, a more liberal threshold of  $p < 0.05$  was used.

## Results

A total of 1231 residents (906 females, 73.6%) completed the questionnaire: 309 (25.1%) from surgical, 654 (53.1%) from medical and 268 (21.8%) from supportive disciplines. 685 respondents (56% of all respondents) were DJS members. The 1231 respondents represented 17.2% of the total number of residents enrolled in postgraduate medical educational programs at the time the study was conducted. Due to our sampling strategy, an exact response rate could not be calculated. There were no statistically significant differences in age or specialty groups between respondents and the overall Dutch population of residents. Women were slightly overrepresented in our study population (73.6 vs. 64.2% in the overall Dutch population of residents,  $p < 0.01$ ). Demographic and occupational characteristics of respondents are shown in Table 1.

A total of 185 (15.0%) residents met the criteria for burnout. Gender was not associated with burnout (15% in females vs. 15.1% in males). Age, marital status, hours worked, clinical setting and years in training were also not associated with burnout. Burnout prevalence was highest among surgical residents (18.1%), compared to residents from medical (15.4%) and supportive disciplines (10.4%), ( $p<0.03$ ). Residents who met the criteria for burnout reported working significantly more overtime (9.5 hours/week vs. 7.6 hours/week,  $p<0.001$ ), less autonomy at work ( $p<0.001$ ), and were significantly more dissatisfied with their balance between work and private life compared to residents without burnout (74.6 vs. 24.0%,  $p<0.001$ ). The perceived quality of the learning environment was significantly and inversely associated with burnout ( $p<0.001$ ).<sup>12</sup>

Correlation coefficients between the three dimensions of burnout and personality traits are presented in Table 2. Emotional exhaustion was strong and positively correlated with neuroticism and negatively correlated with extraversion. Depersonalization was positively correlated with neuroticism and negatively with agreeableness. The higher personal accomplishment was positively correlated with extraversion, agreeableness, conscientiousness, and negatively correlated with neuroticism. Between personality traits, a strong inverse correlation was found between neuroticism and extraversion. Associations between personality traits and burnout, adjusted for gender, overtime, autonomy at work, satisfaction between work and private life, and the quality of the learning environment are shown in Table 3. There was significant effect modification of personality by specialty ( $p<0.05$ ). There was no effect modification for personality by gender. In all specialty residents' disciplines, the degree of neuroticism was strongly associated with burnout, with odds ratios (OR) of 4.37 (95% CI 1.76–10.86) for surgical, 1.99 (95% CI 1.22–3.24) for medical, and 6.19 (95% CI 2.12–18.12) for supportive disciplines. In surgical residents, extraversion was strongly associated with less burnout (OR 0.26, 95% CI 0.13–0.58).

**Table 1.** Demographic characteristics for all residents

Total	1231
Gender, n (%)	
Male	325 (26.4)
Female	906 (73.6)
Age, mean years (sd)	31.6 (3.64)
Marital status, n (%)	960 (78.0)
Married or cohabiting	257 (20.9)
Single	14 (1.1)
Other	
Years in training, n (%)	218 (17.7)
1	252 (20.5)
2	275 (22.3)
3	218 (17.7)
4	179 (14.5)
5	73 (5.9)
6	5 (0.4)
7	11 (0.9)
Finished	
Hours worked, n (%)	126 (10.2)
Parttime ( $\leq$ 32 hrs)	1105 (89.8)
Fulltime ( $>$ 32 hrs)	
Clinical setting, n (%)	540 (43.9)
University medical center	540 (43.9)
General teaching hospital	76 (6.2)
Mental health clinic	15 (1.2)
Rehabilitation center	60 (4.9)
Other	

**Table 2.** Correlation coefficient between burnout domains and personality traits

	<i>Mean (SD)</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
<b>Burnout dimensions</b>								
1. Emotional exhaustion	1.86 (1.00)							
2. Depersonalization	1.19 (0.82)	0.50*						
3. Personal accomplishment	4.48 (0.78)	-0.09*	-0.07*					
<b>Personality traits</b>								
4. Openness	3.41 (0.47)	0.06*	0.05	0.10*				
5. Extraversion	3.57 (0.59)	-0.25*	-0.15*	0.25*	0.21*			
6. Neuroticism	2.51 (0.58)	0.53*	0.24*	-0.29*	-0.07*	-0.38*		
7. Agreeableness	3.90 (0.41)	-0.11*	-0.28*	0.24*	0.06*	0.05	-0.21*	
8. Conscientiousness	3.90 (0.46)	-0.19*	-0.19*	0.21*	0.06	0.16*	-0.22*	0.21*

\* $p < 0.003$  (two-tailed) was considered significant. Burnout dimensions measured on scale UBOS-C, 0 = never to 6 = everyday. Scale Big Five personality traits, 0 = strongly disagree to 5 = strongly agree.

**Table 3.** Multivariable logistic regression analysis assessing associations between personality traits and burnout after adjusting for work and learning environment.

	All specialties (n = 1231)	Surgical (n= 309)	Medical (n= 654)	Supportive (n = 268)
	Odds (95% CI)	Odds (95% CI)	Odds (95% CI)	Odds (95% CI)
Openness	1.59 (1.06-2.97)	1.49 (0.59-3.76)	1.69 (1.02-2.80)	1.51 (0.54-4.27)
Extraversion	0.72 (0.52-1.00)	0.26* (0.13-0.58)	0.82 (0.53-1.27)	0.93 (0.42-2.01)
Neuroticism	2.34* (1.61-3.41)	4.37* (1.76-10.86)	1.99* (1.22-3.24)	6.19* (2.12-18.12)
Agreeableness	0.68 (0.44-1.05)	0.73 (0.26-2.04)	0.71 (0.40-1.16)	0.54 (0.17-1.69)
Conscientiousness	0.75 (0.50-1.12)	1.16 (0.49-2.71)	0.87 (0.49-1.53)	0.61 (0.20-1.85)

Analyses including all five personality traits and are adjusted for gender, overtime, autonomy at work, satisfaction between work and private life, and quality of the learning environment.

\* $p < 0.01$  (two-tailed) was considered significant.

## Discussion

### Main findings

This study found that personality traits were associated with burnout risk. Neuroticism was the personality trait with the strongest association with burnout, among all residents. Only extraverted surgical residents were less susceptible to burnout. These findings remained highly significant after controlling for some well-known job demands and resources such as autonomy at work, satisfaction between work and private life, and the perceived quality of the learning environment. Our results suggest, contrary to the current opinion,<sup>2</sup> that the role of residents' personality as a risk factor for burnout development is being underestimated.

### Comparison with previous studies and explanatory mechanisms

#### *Neuroticism and extraversion*

Our study is the first to find that the association between neuroticism and burnout applies to residents from surgical, medical, and supportive disciplines. This is in accordance with an earlier study among Dutch anesthesiologists, and with results of a meta-analysis among general employees from Taiwan.<sup>20,31</sup> Although neuroticism was correlated with all burnout dimensions, the strongest correlation was found with emotional exhaustion. In line with the job demands-resources model, more neurotic people reported more job demands.<sup>32</sup> In this study, neuroticism significantly ( $p < 0.001$ ) correlated with the perception of higher workload, less autonomy, less peer support, and less satisfaction between balance in work and private life. Persons scoring high on neuroticism suffer more from emotional instability, have lower levels of self-esteem, and experience higher levels of stress and anxiety.<sup>13,33</sup> They tend to perceive stressful situations as threatening, and use problematic strategies like wishful thinking or withdrawal when coping with a problem.<sup>34,35</sup> These features help to explain why residents scoring high on neuroticism are more susceptible to burnout. The differences in effect size for neuroticism and burnout between surgical, medical, and supportive disciplines (OR 4.37, OR 1.99, and OR 6.19) suggest that

differences in job demands and resources between disciplines affect burnout risk. Further studies are needed to elucidate this.

Extraversion reflects the extent to which one is outgoing, cheerful, enthusiastic, and fun-loving.<sup>17</sup> Extraverted persons incline to use problem solving coping strategies,<sup>34</sup> and generally perceive their work environment more positively.<sup>36</sup> They perform better in professions involving social interaction. These characteristics could make extraverted residents less prone to burnout. In this study, extraversion was only associated with less burnout among surgical residents. A comparable effect has been found previously in Dutch anesthesiologists.<sup>31</sup> Extraversion may affect occupation wellbeing (e.g. burnout) through its influence on perceived workplace conditions.<sup>32,37,38</sup> Indirectly, extraversion could lead to experiencing more job resources,<sup>32</sup> and thus experiencing reduced job demands.<sup>10,39</sup> In this study, extraverted surgical residents significantly perceived less workload and emotional stress compared with their extraverted colleagues in the medical and supportive group (data not shown). In addition, surgical residents reported working significantly more overtime than residents from supportive disciplines. These findings suggest that extraverted surgical residents perceive a more favorable working environment than their extraverted colleagues from medical and supportive disciplines. Further research is needed to confirm or refute our finding that residents who score high on neuroticism and low on extraversion could be at an increased risk of burnout, particularly in a surgical working environment.

#### *Openness to experience, agreeableness, and conscientiousness*

Openness is associated with being imaginative, independent thinking, curious, cultured, and broad-minded.<sup>40</sup> The degree of openness was not associated with burnout in residents. Earlier studies conducted among medical and general employees found a similar effect.<sup>13,18,20,41,42</sup> Agreeableness and conscientiousness were also not associated with burnout. Previously, published research has shown contradictory findings on the association of agreeableness and conscientiousness



with burnout.<sup>13,18,20,31,42</sup> Conscientiousness is associated with persistence, dependability, and being organized, while agreeableness is related to cooperation, caring, and likeability.<sup>30</sup>

### **Strengths and limitations**

We used the complete UBOS-C to determine the rate of burnout while most previous studies on burnout in medical professions used abbreviated versions.<sup>43</sup> The national sample of 1231 residents makes the present study one of the largest performed to date. A limitation is that the recruitment strategy precludes calculation of a reliable response rate. More important, the study population was representative of the overall Dutch population of specialty residents in terms of age and specialty groups, but women were overrepresented in this study sample. Since female residents may be at a somewhat greater risk of burnout,<sup>2</sup> burnout prevalence rate may be overestimated. However, it is unlikely that this had a major impact on the main results, because we adjusted for gender in logistic regression analyses, and we found no gender-based effect modification. This study relied on self-reported data, which leaves the results vulnerable to common-method-variance and response bias, although some researchers questioned whether this is a serious problem.<sup>44</sup> Although it cannot be excluded that residents' distress and burnout affects their response to personality trait questionnaires, we are unaware of any studies examining this and personality traits are generally viewed as being relatively stable over time.<sup>45,46</sup> The cross-sectional study design precludes causal inference.

### **Implications**

Our study provides further evidence that personality matters when it comes to burnout. Customized interventions could be developed based on a resident's personality and working environment, thus providing vulnerable residents with better coping strategies.<sup>47</sup> Residents' supervisors could be trained in early identification of a resident's personality related vulnerabilities. Longitudinal cohort studies are needed to further explore the relationship between the physician's personality,

workplace conditions, and burnout development. Special attention should be paid to personality effects that vary depending on the type of specialty (e.g. extraversion). Finally, we believe that more attention to residents' personality as a risk factor for burnout, together with improvements on an institutional level (e.g. improved learning environment) can help reduce and prevent burnout.

## **Conclusions**

In this study, an association was found between burnout and residents' personality. Consistently, more neurotic residents were most affected by burnout. This suggests they may require more intense monitoring during their training years. Extraverted surgical residents seemed less susceptible for burnout. Possible effects of early recognition and support of residents at risk of burnout require further research.

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# Chapter 7

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Resident burnout: evaluating the  
role of the learning environment

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## **Background**

Although burnout is viewed as a syndrome rooted in the working environment and organizational culture, the role of the learning environment in the development of resident burnout remains unclear. We aimed to evaluate the association between burnout and the learning environment in a cohort of Belgian residents.

## **Methods**

We conducted a cross-sectional online survey among residents in a large university hospital in Belgium. We used the Dutch version of the Maslach Burnout Inventory (UBOS-C) to assess burnout and the Dutch Residency Educational Climate Test (D-RECT) to assess the learning environment.

## **Results**

A total of 236 residents (29 specialties) completed the survey (response rate 34.6%), of which 98 (41.5%) met standard criteria for burnout. After multivariate regression analysis adjusting for hours worked per week, quality of life and satisfaction with work-life balance, we found an inverse association between D-RECT scores and the risk of burnout (adjusted odds ratio; 0.47 for each point increase in D-RECT score; 95% CI, 0.23 – 0.95;  $p = 0.01$ ).

## **Conclusions**

Resident burnout is highly prevalent in our cohort of Belgian residents. Our results suggest that the learning environment plays an important role in reducing the risk of burnout among residents.



## Background

Burnout is a work-related syndrome that is primarily driven by workplace stressors.<sup>1</sup> Three dimensions define burnout: emotional exhaustion, depersonalization and a diminished sense of personal accomplishment.<sup>2</sup> Although individual traits might play a role in the development of physician burnout, a recent meta-analysis indicates that organization-directed approaches are more effective in reducing burnout compared to individual interventions.<sup>3</sup> This finding supports the hypothesis that burnout is rooted in issues related to working environment and organizational culture, instead of being an individual problem.

Burnout among medical residents is highly prevalent.<sup>4-6</sup> High educational demands, long working hours, lack of autonomy, a high level of work-home interference, a lack of reciprocity in professional relationships and uncertainty about the future are common explanations.<sup>7-10</sup> Rates between 25% and 60% have been reported in a wide spectrum of medical specialties.<sup>11</sup> These large ranges can be attributed to the use of different definitions, measurements and study designs.<sup>12</sup> Resident burnout is a major concern because it has serious consequences on patient outcomes and on the personal lives of residents. Importantly, burnout is linked with an increase in medical errors and reduced quality of patient care.<sup>7,13,14</sup> Furthermore, residents who suffer from burnout have an increased risk of substance abuse and suicidal ideation.<sup>15</sup>

Burnout could be an obvious outcome of the context residents participate in during their day-to-day work as a doctor.<sup>16</sup> This context is also known as the learning environment, which is a complex construct that includes formal and informal aspects of the training program, as well as the overall atmosphere<sup>17</sup> and organizational aspects within the teaching hospital.<sup>18</sup> The way people in a particular department approach the process of learning is considered a reflection of the learning environment.<sup>19</sup> This learning environment is thought to play a key role in the development of residents towards independent practice.<sup>20</sup> It has been hypothesized that the learning environment could be an important driver of burnout.<sup>6,17,20,21</sup>

Although specific characteristics of the learning environment appear to be critically influencing medical student burnout,<sup>22</sup> the role the learning environment plays in resident burnout is less clear. Furthermore, it is unknown which characteristics of the learning environment are associated with symptoms of burnout in residents.

We aimed to assess how the perceived quality of the learning environment relates to burnout in a sample of Belgian residents from different specialties in a single academic hospital. Secondly we set out to determine which characteristics of the learning environment are associated with resident burnout. Moreover, we aimed to determine the effect size of the learning environment by controlling for several demographic and occupational predictors of resident burnout. We hypothesized that a consistent and relevant association exists between the perceived quality of the learning environment and burnout.

## **Methods**

All residents that were enrolled in one of the postgraduate medical training programs in the University Hospitals Leuven in Belgium on the 1st of December 2016 received an invitation by email to participate in the study and complete an online self-report survey. Residents were recruited from this single academic center because all specialty training programs share the same educational framework. The invitation was sent by the local association of residents to guarantee anonymity. Residents received a reminder after two weeks if the survey was not completed by that time. The local ethical board determined that the study was exempt from formal ethical review. This study was carried out according to the ethical principles for medical research involving human subjects of the WMA Declaration of Helsinki. No individual data were collected, anonymity was guaranteed, participation was voluntary, and informed consent was obtained.

## **Learning environment**

To assess the quality of the learning environment we used the recently revised version of the Dutch Residency Educational Climate Test (D-RECT).<sup>23</sup> The revised D-RECT is a validated 35-item questionnaire to assess 9 subscales of the learning environment. The 9 subscales that comprise the D-RECT are: educational atmosphere, teamwork, role of specialty tutor, coaching and assessment, formal education, resident peer collaboration, work is adapted to resident's competence, accessibility of supervisors and patient sign-out. Respondents are asked to indicate their agreement on a scale ranging from 1 (totally disagree) to 5 (totally agree).

## **Burnout**

We used the validated Dutch version (UBOS-C)<sup>24</sup> of the Maslach Burnout Inventory (MBI) to assess burnout. This instrument consists of 20 items covering the three dimensions of burnout: emotional exhaustion (8 items), depersonalization (5 items) and personal accomplishment (7 items). Items were scored on a 7-point Likert scale ranging from 'never' (0) to 'always' (6). Mean scores were calculated for each dimension. Cut-off scores were used for ascertainment of burnout, based on a reference group of 10,552 Dutch healthcare employees.<sup>23</sup> A resident was diagnosed with burnout if there was either a mean score  $\geq 2.50$  on emotional exhaustion and  $\geq 1.80$  (men) or  $\geq 1.60$  (women) on depersonalization, or a mean score  $\geq 2.50$  on emotional exhaustion and a mean score of  $\leq 3.70$  on personal accomplishment.<sup>25</sup>

## **Demographic and training-related characteristics**

Respondents provided information on: gender, age, type of medical specialty, year of postgraduate training, total number of hours spent working per week and the number of hours per week spent on clinical (patient related) activities, administrative (non-clinical) activities and activities related to training. Furthermore, we measured residents' overall quality of life using a single-item linear analogue self-assessment (scale 1 to 5, with response options ranging from "As bad as it can be" to "As good as it

can be") and residents' satisfaction with their work-life balance using a similar 5-point scale. These instruments are validated and widely used in quality of life research.<sup>2</sup>

### **Statistical analysis**

All analyses were done using SPSS version 17 (SPSS Inc., Chicago, Illinois, US). Standard descriptive summary statistics were used to characterize the sample. Evaluations that were missing more than 17 items (>50% of total items) were excluded from further analysis. The remaining missing values were assumed to be missing at random and imputed by expectation maximization. Independent Student's t tests (continuous variables) were computed to compare means. Multivariate logistic regression analysis was conducted to evaluate the association between learning environment (D-RECT scores) and resident burnout, adjusted for potential predictors of burnout. Predictors of burnout were determined in a univariate analysis. In the multivariate model, we adjusted factors that were independently associated with burnout. None of the included variables were associated with the D-RECT scores, thus the assumption of linearity was not violated. All tests used were two-tailed and p-values < 0.05 were considered significant.

## **Results**

### **Sample descriptive statistics**

Of the 682 residents who received an invitation, 252 participated. A total of 16 evaluations were excluded due to missing values, which gave us a sample of 236 (29 different specialties) evaluations (response rate 34.6%). A total of 98 (41.5%) residents fulfilled the standard criteria for burnout. 125 residents (53.0%) scored high on the scale of emotional exhaustion, 125 (53.0%) scored high on the scale of depersonalization, and 60 (23.4%) scored low on the scale of personal accomplishment. The mean score (SD) of the D-RECT was 2.65 (0.43). The median age of the residents was 28 years (range 26 – 40). Residents spent an average of 60.9 (SD; 10.1) hours working per week. A total of 32.6 (SD; 14.9) hours per week were spent on clinical activities, 23.4 (SD; 14.2) on administrative activities and 4.3

(SD; 5.5) on training related activities. Residents with burnout spent an average of 2.61 working hours more per week compared to those without burnout (95% CI of difference; -5.23 to 0.004,  $p = 0.05$ ). We found no association between burnout and the total number of hours per week spent on clinical (patient related) activities ( $p = 0.60$ ), training activities ( $p = 0.08$ ) or non-training activities (e.g. administrative tasks) ( $p = 0.25$ ). Table 1 shows the demographic and occupational characteristics of the responding residents and their association with burnout.

**Table 1.** Demographic and occupational characteristics of participating residents and associations (Pearson's chi squared tests) between demographic, occupational and quality of life characteristics and burnout.

	<b>Total number of participating residents (% of total)</b>	<b>Number of residents with burnout (% of total)</b>	<b>p-value of difference in burnout rate per characteristic</b>
Gender			
Male	96 (40.7)	45 (46.9)	
Female	140 (59.3)	53 (37.9)	
			0.17
Years in training			
1	52 (22.2)	22 (42.3)	
2	23 (9.7)	11 (47.8)	
3	31 (13.1)	8 (25.8)	
4	50 (21.2)	24 (48.0)	
5	45 (19.1)	18 (40.0)	
6	25 (10.6)	11 (44.0)	
7	8 (3.4)	2 (25.0)	
			0.49
Type of specialty			
Surgical	57 (24.2)	26 (45.6)	
Medical	144 (61.0)	59 (41.0)	
Supportive	34 (14.4)	12 (35.3)	
missing	1 (0.4)		
			0.62

**Table 1.** Demographic and occupational characteristics of participating residents and associations (Pearson’s chi squared tests) between demographic, occupational and quality of life characteristics and burnout. (continued)

	<b>Total number of participating residents (% of total)</b>	<b>Number of residents with burnout (% of total)</b>	<b>p-value of difference in burnout rate per characteristic</b>
Satisfaction with work/life balance			
Very dissatisfied	31 (13.1)	21 (67.7)	
Dissatisfied	4 (1.7)	2 (50.0)	
Neutral	69 (29.2)	14 (20.3)	
Satisfied	130 (55.1)	61 (46.9)	
Very satisfied	2 (0.8)	0 (0.0)	
			< 0.001
Quality of life			
As bad as it can be	12 (5.1)	10 (83.3)	
Bad	59 (25.0)	37 (62.7)	
Neutral	79 (33.5)	37 (46.8)	
Good	77 (32.6)	14 (18.2)	
As good as it can be	9 (3.8)	0 (0.0)	
			< 0.001
Burned out <sup>a</sup>			
Emotionally exhausted <sup>b</sup>	98 (41.5)		
Depersonalized <sup>b</sup>	125 (53.0)		
Reduced personal accomplishment <sup>b</sup>	125 (53.0)		
	60 (23.4)		

<sup>a</sup>Represents a high score (>75<sup>th</sup> percentile of reference group, Schaufeli ea.) on emotional exhaustion, combined with a high score on depersonalization and/or a low score (<25<sup>th</sup> percentile of reference group) on personal accomplishment.

<sup>b</sup>Cut-off scores are determined as >75<sup>th</sup> percentile of the reference group (Schaufeli ea.) for emotional exhaustion and depersonalization and <25<sup>th</sup> percentile of the reference group for reduced personal accomplishment.

### Multivariate analysis

We used univariate analyses to identify demographic and occupational predictors of burnout. We found that gender (p = 0.17), year of training (p = 0.49), type of specialty (p = 0.62) and age (p = 0.32) were not associated with burnout. However, we found

that the true number of hours worked per week ( $p = 0.05$ ), satisfaction with work-life balance ( $p < 0.001$ ) and overall quality of life ( $p < 0.001$ ) were associated with burnout. After controlling for these predictors of resident burnout in a multivariate regression analysis, we found an inverse relationship between the mean D-RECT score and the risk of burnout (adjusted odds ratio, 0.47 for 1-point increase in D-RECT score; 95% CI, 0.23 – 0.95;  $p = 0.01$ ).

### Bivariate analysis

We found that residents without burnout gave significantly higher D-RECT scores (mean, SD; 2.71, 0.39) than residents with burnout (mean, SD; 2.56, 0.46) (95% confidence interval for difference; 0.03 to 0.46,  $p = 0.006$ ). The difference in D-RECT score between residents with and without burnout can be explained by a difference in D-RECT score for the dimension of emotional exhaustion and depersonalization (Table 2).

**Table 2.** Association between the 3 dimensions of burnout and overall burnout and the mean overall D-RECT scores (learning environment) in Belgian residents.

		Mean score D-RECT (SD)	95% CI of difference	p-value
Emotional exhaustion	Exhausted	2.57 (0.39)	0.06 to 0.27	0.003
	Not exhausted	2.74 (0.44)		
Depersonalization	Depersonalization	2.57 (0.41)	0.06 to 0.27	0.003
	No depersonalization	2.73 (0.42)		
Reduced personal accomplishment	Not competent	2.64 (0.36)	-0.12 to 0.14	0.86
	Competent	2.65 (0.45)		
Overall burnout	Burnout	2.56 (0.46)	0.03 to 0.46	0.006
	No burnout	2.71 (0.39)		

### Subscales of the D-RECT

Regarding the subscales of the D-RECT, we found that the scores on the subscales 'role of the specialty tutor' and 'coaching and assessment' were significantly higher in residents without burnout compared to those who suffer from burnout (Table 3).

**Table 3.** Comparison (Student's t-tests) of overall D-RECT scores (learning environment) and D-RECT subscale scores in residents with and without burnout. To adjust for multiple comparisons p values < 0.01 were considered significant.

Subscale of the D-RECT	Mean score D-RECT in residents with burnout	Mean score D-RECT in residents without burnout	95% CI for difference	p value
Educational atmosphere	2.31	2.46	-0.04 – 0.33	0.12
Teamwork	2.80	3.02	-0,02 – 0.45	0.07
Role of specialty tutor	2.35*	2.59*	0.08 – 0.39	0.003*
Coaching and assessment	2.06*	2.53*	0.26 – 0.66	< 0.001*
Formal education	2.78	2.99	0,03 – 0.39	0.02
Resident peer collaboration	2.78	2.72	-0.35 – 0.22	0.64
Work is adapted to resident's competence	3.00	3.06	-0.16 – 0.27	0.61
Accessibility of supervisors	2.95	2.66	-0.54 – -0.02	0.03
Patient sign-out	2.86	2.85	-0.26 – 0.25	0.91
Overall D-RECT score	2.56 <sup>a</sup>	2.71 <sup>a</sup>	0.05 – 0.26	0.006*

<sup>a</sup>Statistically significant

## Discussion

### Main findings

In this study, we examined the association between the perceived quality of the learning environment and resident burnout. We found that, even after adjusting for predictors of burnout, there was a significant and relevant association between



the learning environment and burnout in our sample of Belgian residents from 29 different specialties.

### **Environmental factors associated with burnout**

Our multivariate analysis suggests that there is a significant and strong exposure-response relationship (OR 0.47) between the learning environment and burnout. Analysis of the subscales that comprise the D-RECT (learning environment) shows environmental factors that explain the association between learning environment and burnout are the subscales 'role of the specialty tutor' and 'coaching and assessment'. The environmental factor role of the specialty tutor focuses on the behaviour of the supervisor. The amount of support from faculty members and the perception of being mistreated are strongly related to burnout among medical students.<sup>22</sup> Stressful relationships with supervisors<sup>5</sup> and insufficient autonomy<sup>26</sup> are in a similar way associated with burnout in residents. In contrast, residents who find their relationship with their supervisors mutually supportive and beneficial have fewer symptoms of burnout than trainees who feel under-appreciated by their supervisors.<sup>27</sup> Our results regarding the role of supervisory support in resident burnout are in agreement with these findings. The environmental factor 'coaching and assessment' is concerned with feedback, assessment of medical and general competencies and with supervisors evaluating whether a resident's performance in patient care is in line with that resident's level of training. Our results underline previous reports on the importance of regular feedback in the prevention of burnout.<sup>28</sup> When regular feedback regarding preparedness is lacking, residents might feel uncertain about whether they are prepared to perform a specific task,<sup>29</sup> which could drive burnout.

### **Learning environment scores explained**

A recent study found a considerably higher rating for the quality of the learning environment in a large cohort of Dutch residents compared to the rating we found in our study.<sup>30</sup> We were able to use the same instrument (D-RECT) to assess the

learning environment because the residents participating in our study share the same language as their Dutch counterparts. We have to acknowledge that the D-RECT has not been validated in the Belgian context and minor language and culture differences might affect the interpretation of some of the items. Nevertheless, we think that these minor differences cannot explain the large difference in D-RECT scores between the two studies. Little is known about what a specific score in the D-RECT says about the underlying construct, but score differences between teaching hospitals could guide initiatives to improve the learning environment. Several educational differences exist that could partly explain this difference in the perceived quality of the learning environment between Belgian and Dutch residents. Educational programs in the Netherlands have been modernized to become competency-based.<sup>31</sup> These competency-based programs promote learner-centeredness and shift the focus away from what is taught, towards what is learnt. The Belgian curriculum is mainly time-based and, although initiatives have been taken to put more emphasis on the development of generic competencies, appraisal tools have yet to be introduced. Novel coaching and assessment tools, that have been introduced and are broadly used in the Netherlands,<sup>31</sup> generate more attention to feedback, which is likely appreciated by residents and reflected in higher D-RECT scores. On the other hand, we have to note that based on our study results, we are unable to determine which environmental factors are responsible for a difference in D-RECT score between the Belgian and Dutch residents. Moreover, the learning environment is believed to form the center of educational change<sup>17</sup> and the effectiveness of competency-based innovations seems to benefit from a supportive learning environment.<sup>20</sup> Hence, more research is needed to understand the dynamics of the relationship between educational innovations and perceived quality of the learning environment.

### **Burnout prevalence**

We found a burnout rate of 41%, which is much higher than the rate of 21% that was found in a national Dutch study,<sup>1</sup> which used the same instrument and criteria for burnout as we did. This can be explained by the shorter workweek of 48 hours

of Dutch residents, which is reasonably lower than the workweek we found our cohort: 60.9 hours per week. We have to state that the difference in work hours between residents with burnout and without burnout was relatively small in the current study (2.6 hours), which makes it doubtful whether this difference is relevant. The effect of number of hours worked on the development of resident burnout remains controversial, but a recent study indicates that a higher number of work hours does increase the risk of resident burnout.<sup>7</sup> An earlier study conducted in Belgium, including residents from multiple teaching hospitals and using the same instrument to assess burnout (UBOS-C), found a rate of 33.5% resident burnout,<sup>3</sup> which is still lower than the rate we found. This difference in burnout rate can be explained by the fact that our study was conducted in a single academic center, instead of including multiple hospitals.

### **Practical implications and future research**

The results of a recent meta-analysis suggest that burnout among physicians, including residents, is driven by organizational factors rather than individual factors.<sup>15</sup> These results are in agreement with insights that burnout is not an indication of personal failing but rather of a failing working and social environment.<sup>32</sup> This environment includes aspects of the workload, schedule, communication, workflow and teamwork.<sup>15,33</sup> Several training-related factors, like high educational demands and lack of autonomy, pose an additional risk to residents when compared to physicians that are not in training.<sup>1</sup> Moreover, some even state that burnout is the obvious outcome of the disconnect between medical training programs and the realities of the need to work with colleagues, hospital personnel and patients who have different visions of how the healthcare organization should operate.<sup>16</sup> We have to note however, that burnout is assumed to be the result of a chronic imbalance between job demands and job resources.<sup>13</sup> Hence, we cannot conclude that resident burnout is simply caused by a poor learning environment. Nevertheless, we do believe that the learning environment plays an important role in the motivational process of residents, because a healthy learning environment fosters growth, learning and

development.<sup>17,20,22</sup> Initiatives to improve the learning environment and contribute to burnout prevention should preferably address the learning environment as a whole and focus in particular on improving supervisory support and improve the quality of coaching and assessment. This could be achieved by the implementation of faculty staff development, which provides faculty members with requisite pedagogic tools needed to enhance supervisory performance (e.g. giving feedback, application of coaching and assessment), establish an optimal learning environment and enable them to detect and respond to emotional distress.<sup>34</sup> Additional research is needed to explore causal relationships between the environmental factors associated with burnout and to determine which approach has the highest potential for minimising resident burnout. Future prospective studies could be designed that randomise residents to a training program that pays attention to more generic competencies, versus a more traditional program, because training generic competencies has shown to reduce the risk of burnout in junior medical specialists.<sup>35</sup> These study designs could also evaluate new assessment and appraisal tools, because they are thought to aid in better preparing residents for practice and improve their well-being in the end.<sup>20,35</sup>

### **Strengths and limitations**

The current study is the first to describe a consistent association between the learning environment and burnout among residents using the complete MBI and D-RECT rather than abbreviated versions. We were able to adjust for work hours, quality of life and work life balance, which allowed a robust analysis of the quality of the learning environment and the development of burnout. This study has several limitations. The response rate of 34.5% was relatively low, although it is higher than most other survey studies using online questionnaires.<sup>1,4</sup> The absolute difference in D-RECT (learning environment) scores we found when comparing residents with and without burnout was rather small. It could be possible that this difference, although significant, is too small to be relevant. What argues against this explanation is the fact that the D-RECT makes use of a 5-point Likert scale, which restricts residents in their

ability to indicate improvement as they only have very few options to discriminate between levels of agreement with every item. Earlier work on learning environment using the same instrument has shown similar significant but small differences.<sup>18</sup> Our cross-sectional study design precludes determination of whether the learning environment is causally related to burnout. It could be possible that residents who suffer from burnout are simply more likely to give a lower rating for the learning environment. However, only specific aspects of the learning environment (role of the specialty tutor, coaching and assessment) were associated with burnout and other aspects were not, which argues against an overall lower rating of the learning environment by residents with burnout. Furthermore, we didn't include an instrument to evaluate personality traits, which is thought to be a risk factor of resident burnout. Nevertheless, the extent to which personality relates to the development of resident burnout has yet to be determined and organizational factors are thought to play a more important role than individual factors.<sup>15</sup> Moreover, our study was conducted at a single institution, limiting the generalizability of our results. Finally, despite the high response rate our results are possibly limited by response bias. Residents with burnout could be more likely to complete questionnaires regarding burnout because the topic is relevant to them, but they could also be apathetic to complete the questionnaire. The way resident burnout influences response rate is unknown.

## Conclusions

We found a consistent association between the perceived quality of the learning environment and burnout in residents. Given the serious personal and professional ramifications of resident burnout, there is a need for interventions addressing factors of the learning environment that drive burnout. It is desirable that these include improvement of supervisory support and coaching and assessment. Future research should evaluate which organization-directed approaches are most effective in preventing resident burnout.

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# Chapter 8

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Relationship between clinical learning environment and work engagement: Relighting the fire in residents suffering from burnout

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Submitted

## **Background**

A supportive clinical learning environment (CLE) is considered crucial in preventing resident burnout. Work engagement is the positive antithesis of burnout. The impact of the quality of the CLE on engagement is unknown. In-depth knowledge of aspects of the CLE that are related to engagement could be vital in improving resident well-being. We aimed to determine which aspects of the CLE are related to resident engagement. Secondly we aimed to evaluate the relationship between the aspects of the CLE and resident burnout.

## **Methods**

We assessed the CLE, work engagement and burnout among residents from a university hospital in Belgium. Path analysis was used to examine the associations between the domains of CLE, work engagement and burnout.

## **Results**

236 evaluations could be analyzed (response rate: 35%). We found the strongest positive relationship between the CLE domain 'coaching and assessment' and work engagement ( $\beta = 0.27$ ,  $p < 0.001$ ). 'Coaching and assessment' was also positively related to personal accomplishment ( $\beta = 0.17$ ,  $p < 0.05$ ) and negatively to emotional exhaustion ( $\beta = -0.19$ ,  $p < 0.05$ ). 'Role of the specialty tutor' was negatively related to emotional exhaustion ( $\beta = -0.17$ ,  $p < 0.05$ ) and 'formal education' to depersonalization ( $\beta = -0.19$ ,  $p < 0.05$ ).

## **Conclusion**

Supervisors play a key role in enhancing resident work engagement and reducing the risk of burnout. Aspects of supportive coaching and constructive feedback appear to be strong job resources for residents.

## Introduction

Work engagement is defined as a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication and absorption.<sup>1</sup> Generally, residents show high levels of work engagement,<sup>2,3</sup> which is important because engaged residents report fewer medical errors and show better professional performance.<sup>3,4</sup> Engagement can be considered as the opposite of the work-related syndrome of burnout,<sup>5</sup> while others describe engagement as a separate entity that is negatively related to burnout. In addition, engagement is negatively related to burnout.<sup>6</sup> This syndrome of burnout is defined by three dimensions: emotional exhaustion, depersonalization and reduced personal accomplishment.<sup>5</sup> Resident burnout is a major problem, because residents who suffer from burnout deliver suboptimal quality patient care.<sup>7</sup> The increasing risk of resident burnout should therefore be a concern to residents, their supervisors and their patients.<sup>8</sup>

The Job Demands-Resources (JD-R) model is often used to predict and explain engagement and burnout.<sup>9</sup> Job resources refer to physical, psychological, social or organizational aspects of the job.<sup>9</sup> Job demands refer to such aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological costs, including exhaustion.<sup>9</sup> According to JD-R theory, job resources are positively related to engagement and gain extra potential when employees are confronted with high job demands.<sup>9,10</sup> However, job demands only mediate the positive link between job resources and engagement, and are thus not directly linked to engagement.<sup>9,11</sup>

There is growing awareness that the clinical learning environment (CLE) is an important determinant for the mental well-being of residents.<sup>12-14</sup> The CLE has been described as the social, cultural and material context in which residents learn while doing their daily work as a doctor<sup>15</sup> and can be thought of as a psycho-social-physical construct that encompasses personal, social, organizational and material dimensions.<sup>16</sup> These different dimensions of the CLE comprise many aspects

that could act as job resources (e.g. supervisory support, coaching, feedback, opportunities for development and growth in competence).<sup>9</sup> In a series of previous studies we found a strong and dose dependent association between the quality of the CLE, as perceived by residents, and their risk of burnout.<sup>12,13,17</sup> Although the number of studies that confirm the association between CLE and resident burnout is rapidly increasing,<sup>12,14,17</sup> the impact of the CLE on work engagement in residents remains unknown. In view of the aforementioned important role of engagement on resident performance and its negative association with burnout, it is desirable to further elucidate the relationship between the CLE and engagement in residents.

Our study builds on JD-R theory that assumes that work engagement and burnout are independent but correlated constructs that can mainly be predicted by the interplay of job resources and job demands.<sup>9</sup> Because a poor CLE is associated with an increased risk of burnout in residents, we hypothesize that a good and supportive CLE can serve as an important job resource promoting resident engagement. Insight into the CLE aspects that act as job resources allows us to inform supervisors, hospital-wide education committees and regulatory authorities how to optimize the CLE in order to promote resident well-being.<sup>18</sup> Therefore, we aimed to examine which domains of the CLE are related to resident work engagement and could thus serve as job resources for residents. Secondly, we aimed to examine which domains of the CLE are related to the dimensions of burnout.

## **Methods**

### **Study population and setting**

We conducted a cross-sectional, single center (University Hospitals Leuven, Belgium) study among all residents that were enrolled in one of the postgraduate training programs on the 1<sup>st</sup> of December 2016. Residents were recruited from this single center because all specialty-training postgraduate medical education programs participate in the same training program. To guarantee anonymity, the online invitation was sent by the local association of residents. Residents were asked to

complete an online self-report survey containing items related to the CLE, work engagement and burnout. Besides, respondents were asked to provide information about their gender, age, type of medical specialty and year of training. A reminder was sent after two weeks, if the survey was not completed by that time.

### **Clinical learning environment**

We used the revised version of the Dutch Residency Educational Climate Test (D-RECT)<sup>19</sup> to assess the perceived quality of the CLE. This widely used and validated questionnaire contains 35 statements covering 9 domains: educational atmosphere, teamwork, role of specialty tutor, coaching and assessment, formal education, resident peer collaboration, work is adapted to resident's competence, accessibility of supervisors and patient sign-out. Respondents are asked to indicate their agreement with each statement on a Likert scale ranging from 1 (totally disagree) to 5 (totally agree). For analysis purposes, mean domain scores and mean overall D-RECT scores are calculated, which can range from 1 (worst) to 5 (best).

### **Work engagement**

We assessed work engagement using the short version of the Utrecht Work Engagement Scale (UWES-9).<sup>1</sup> This is a 9-item instrument covering the 3 dimensions of engagement: vigor, absorption and dedication. Items are scored on a 7-point Likert scale ranging from 0 (never) to 6 (always). The mean score of the 9 UWES items can be calculated and is considered the total engagement score.<sup>1</sup>

### **Burnout**

We used the 20-item Utrechtse Burnout Scale (UBOS-C),<sup>20</sup> which is the Dutch adaptation of the Maslach Burnout Inventory for health care professions.<sup>5</sup> Items are scored on a 7-point scale, similar to the UWES-9. Means can be calculated for each of the 3 dimensions of burnout. Following cut-off scores for burnout based on a reference group of 10,552 Dutch healthcare employees, a resident was diagnosed with burnout if there was either a mean score > 2.50 on emotional exhaustion and

$\geq 1.80$  (men) or  $\geq 1.60$  (women) on depersonalization, or a mean score  $\geq 2.50$  on emotional exhaustion and a mean score of  $\leq 3.70$  on personal accomplishment.<sup>20</sup>

### **Data analysis**

Only completed questionnaires were used for analysis after performing listwise deletion. Data were screened on multicollinearity (bivariate correlations between the observed variables higher than  $r = .85$ ) and non-normality (skewness index greater than 3; kurtosis index higher than 10).<sup>21</sup> [Weston et al. 2006] Mean scores (SD) of the D-RECT (CLE), UBOS-C (burnout) and UWES-9 (work engagement) were calculated. Inter correlations between the domains of the CLE were computed using Pearson's  $r$ .

We analyzed our data using path analysis, which is a subset of structural equation modeling (SEM) using only measured variables. A measurement model was developed that assessed the relationships between the nine domains of the D-RECT (CLE) on the one hand and work engagement and the dimensions of burnout on the other hand. These hypothesized relationships, or pathways, represent assumptions based on prior studies and theory as described in the introduction. Confirmatory factor analysis (CFA) was used to confirm this hypothesized measurement model. All items loaded on the corresponding hypothesized latent variable. The model was compared to alternative models and the latent variables were allowed to covary. The fit of each model was evaluated using the Comparative Fit Index (CFI), Non-Normed Fit Index (NNFI), Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Residual (SRMS) and the  $\chi^2$  difference test. We controlled for age and gender. The model fit was assessed based on the above-mentioned fit indices, and the strength of individual relations was calculated by means of standardized regression coefficients (Beta values). Standardized path coefficients ( $\beta$ ) with values of less than 0.10 can be interpreted as small effects, values of around 0.30 can be interpreted as medium effects and values above 0.50 can be interpreted as large effects.<sup>22</sup> Analyses were performed with SPSS 19 and AMOS 22. Significance level was set at 0.05.

## Ethics

The local ethical board (UZ Leuven, Belgium) reviewed the study and determined that the study was exempt from formal ethical review. We carried this study out according to the ethical principles for medical research involving human subjects of the WMA Declaration of Helsinki. No individual data were collected, participation was voluntary, informed consent was obtained and anonymity was guaranteed.

## Results

### Study population

Of the 682 residents, 252 returned their surveys. After exclusion of 16 incomplete surveys, 236 completed questionnaires were available for analysis (response rate 35%). A total of 98 residents (42%) met the criteria for burnout. The demographic and work-related characteristics of residents have been reported previously.<sup>12</sup> Table 1 displays residents' engagement and burnout scores and their evaluations of the CLE. Table 2 shows means, standard deviations and correlations of the domains of the CLE, work engagement and burnout dimensions.

### General model for resident work engagement and burnout

There was no evidence of multicollinearity or non-normality of the collected variables indicating no evidence for potential problems for their use in the subsequent analyses. The hypothesized model demonstrated a better fit compared to the other alternatives. Figure 1 shows the associations between the different domains of the CLE and work engagement and Figure 2 is a similar display of CLE domains related to burnout.

### CLE domains related to engagement (figure 1)

We found that the domains 'coaching and assessment' and 'work is adapted to residents' competence' were positively related to engagement. Surprisingly, the domain 'collaboration peers' showed a small but negative association with engagement. We did not find any relationships between the other domains of the CLE and work engagement.

### **CLE domains related to burnout (figure 2)**

The CLE domains 'coaching and assessment' and 'work is adapted to residents' competence' were positively associated with personal accomplishment. The 'role of the specialty tutor' and 'coaching and assessment' were negatively associated with emotional exhaustion. Furthermore 'formal education' was negatively associated with depersonalization. In line with the surprising negative association with engagement, we found weak but significant positive associations between the domain 'collaboration peers' and the burnout dimensions 'emotional exhaustion' and 'depersonalization'. No relationships between the other domains of the CLE and the dimensions of burnout were found.

### **Demographics**

Age was negatively related to work engagement ( $\beta = -0.21$ ,  $p < 0.01$ ) and positively associated with emotional exhaustion ( $\beta = 0.14$ ,  $p < 0.05$ ). Male gender was associated with higher scores on depersonalization ( $\beta = 0.26$ ,  $p < 0.001$ ).



**Table 1.** Residents' evaluation scores on the domains of the clinical learning environment (D-RECT) and on the dimensions of work engagement (UWES-9) and burnout (UBOS-C).

<b>Variable</b>	<b>Mean score (SD)</b>
Emotional exhaustion	3.58 (1.12)
Depersonalization	2.75 (1.16)
Personal accomplishment	5.22 (0.90)
<hr/>	
Vigor	4.35 (1.16)
Dedication	5.04 (1.11)
Absorption	4.42 (1.18)
<i>Overall engagement</i>	<i>4.60 (1.04)</i>
<hr/>	
Educational atmosphere	2.39 (0.71)
Teamwork	2.93 (0.90)
Role of specialty tutor	2.49 (0.60)
Coaching and assessment	2.33 (0.80)
Formal education	2.90 (0.70)
Resident per collaboration	2.74 (1.10)
Work is adapted to resident's competence	3.04 (0.81)
Accessibility of supervisors	2.78 (1.01)
Patient sign-out	2.85 (1.00)
<i>Overall D-RECT score</i>	<i>2.65 (0.43)</i>

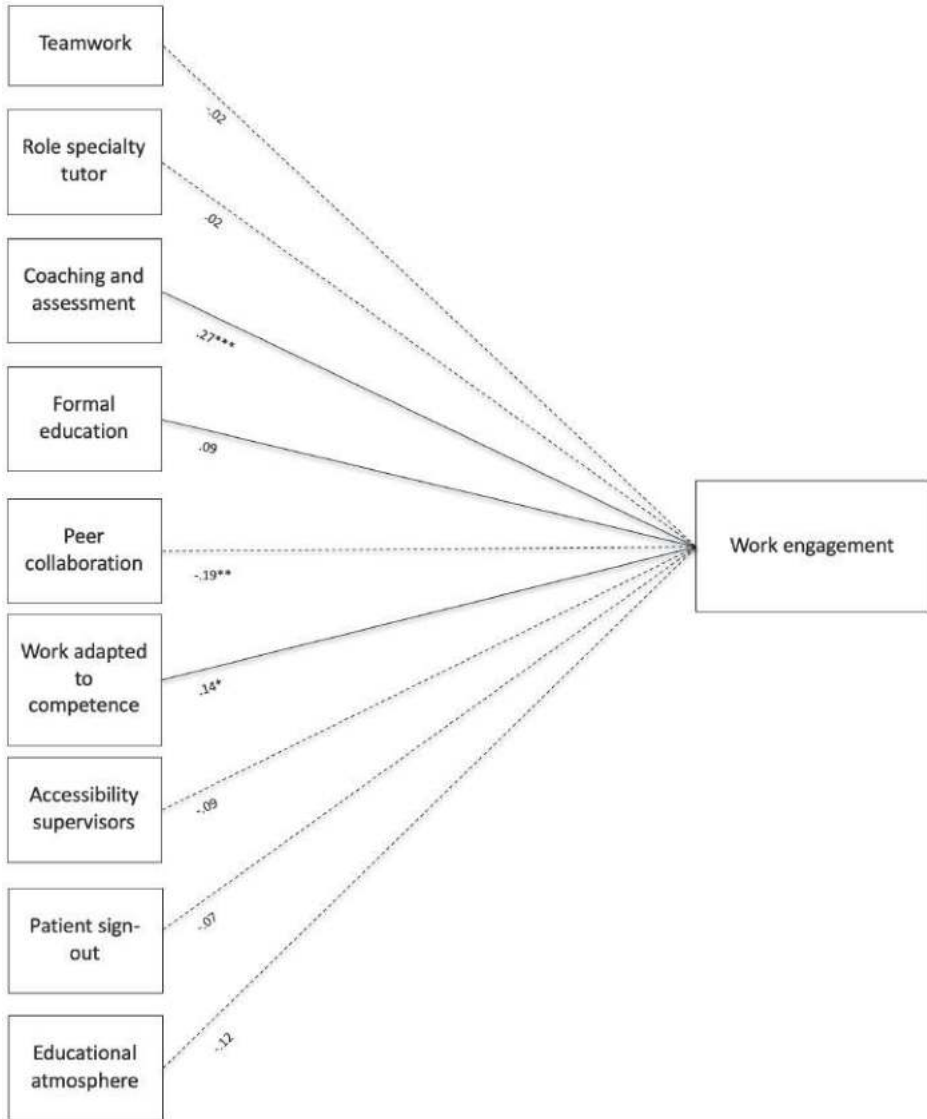
**Table 2.** Means, standard deviations and correlations of the domains of the clinical learning environment, work engagement and burnout dimensions (n = 194).

Domain	M +/-SD	WE	EE	DP	PA	EA	TW	RS	CA	FE	CP	WA	AS	SO
WE														
EE	2.57 +/- 1.08	-.28***												
DP	1.74 +/- 1.17	-.21**	.56***											
PA	4.23 +/- 0.90	.41***	-.14	-.23**										
EA	2.41 +/- 0.69	.07	-.08	-.08	-.10									
TW	2.93 +/- 0.91	-.07	-.09	-.04	-.12	.29***								
RS	2.48 +/- 0.61	.05	-.29***	-.24**	.02	.39***	.25***							
CA	2.32 +/- 0.81	.27***	-.29***	-.22**	.13	.34***	.16*	.51***						
FE	2.92 +/- 0.72	.07	-.20**	-.23**	.09	.27***	.18*	.28***	.29***					
PC	2.75 +/- 1.10	-.18*	.16*	.09	-.14	.11	.24**	.02	-.04	.04				
WA	3.03 +/- 0.83	.01	-.08	-.07	.11	.20**	.14	.13	.06	.05	.16*			
AS	2.81 +/- 1.02	-.15*	.10	.08	-.09	.19**	.24**	.12	.08	.02	.09	.19**		
SO	2.85 +/- 0.99	-.08	.10	-.06	-.11	.26***	.32***	.19**	.14	.14*	.13	.15*	.25***	

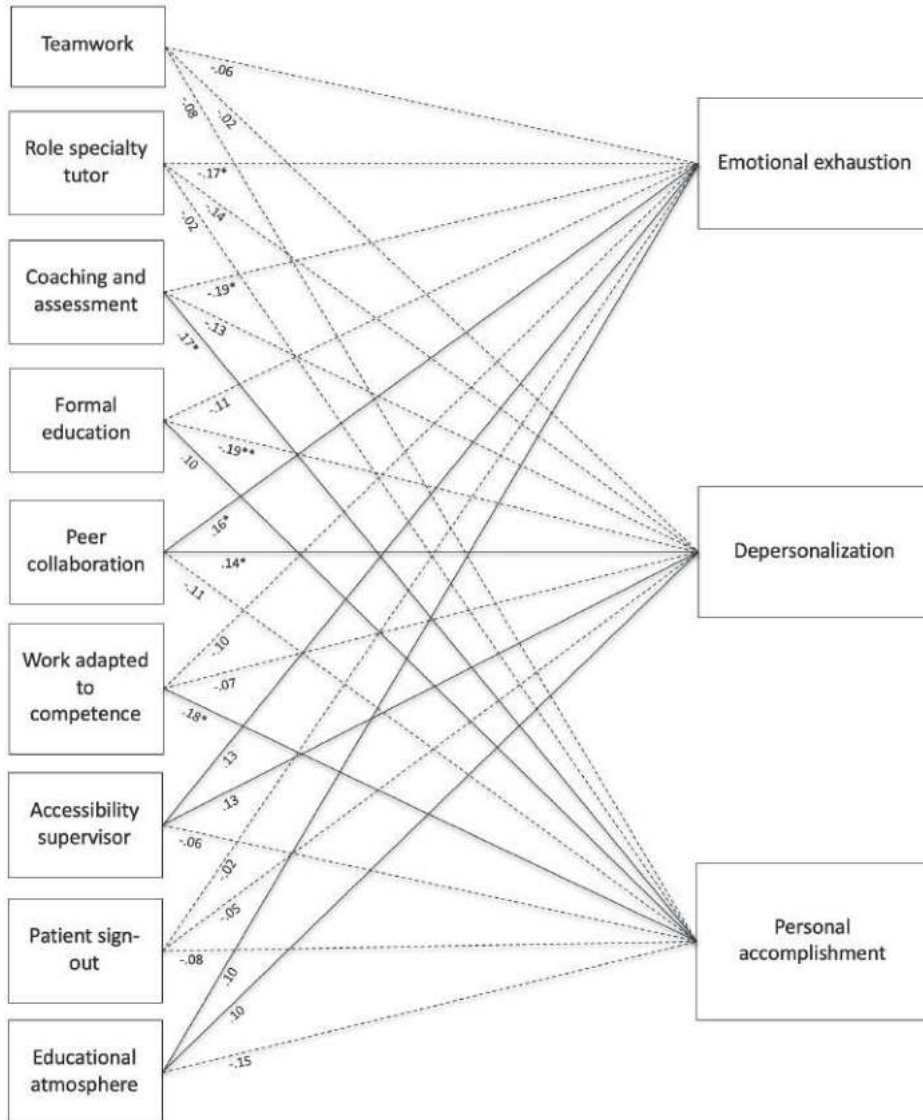
M = Mean; SD = Standard Deviation; WE = Work engagement; EA = Educational atmosphere; TW = Teamwork; RS = Role specialty tutor CA = Coaching and assessment; FE = Formal education; PC = Resident peer collaboration; WA = Work adapted to residents' competence; AS = Accessibility supervisor; SO = Patient sign-out EE = emotional exhaustion; DP = depersonalisation; PA = personal accomplishment

\* p < .05; \*\*p < .01; \*\*\* p < .001

**Figure 1.** Path analysis of domains of the clinical learning environment associated work-engagement (n = 194). Standardized  $\beta$ -weights are shown. Positive associations are indicated as full line, negative associations as dotted line. \* $p < .05$ ; \*\* $p < .010$ ; \*\*\* $p < .001$ .



**Figure 2.** Path analysis of domains of the clinical learning environment associated with the three dimensions of burnout (emotional exhaustion, depersonalization and personal accomplishment) (n = 194). Standardized  $\beta$ -weights are shown. Positive associations are indicated as full line, negative associations as dotted line. \* $p < .05$ ; \*\* $p < .010$ ; \*\*\* $p < .001$ .



## Discussion

### Main findings

With this study we aimed to gain insight in the relationship between the different domains of the CLE and work engagement in residents. Secondly we examined the relationship between the CLE domains and resident burnout. Domains of the CLE that were important predictors of work engagement were ‘coaching and assessment’ and ‘work is adapted to residents’ competence’. These CLE domains were also positively related to personal accomplishment. CLE domains that were negatively associated to resident burnout were: ‘coaching and assessment’, ‘role of the specialty tutor’ and ‘formal education’.

### Job demands and resources for residents

Our findings can be explained by using JD-R theory.<sup>9</sup> Residents are continuously exposed to high job demands (e.g. heavy workloads, long working hours, time pressure, educational demands) during their daily clinical work. High job demands can negatively impact resident well-being, especially in the absence of sufficient job resources.<sup>2,9,23</sup> JD-R theory assumes that work engagement, and thus well-being, is enhanced by job resources that help residents cope with high job demands.<sup>9,23</sup> The CLE has been described as a job resource previously.<sup>14</sup> Our findings add to this knowledge by showing that the CLE construct may be too broad to be considered a single job resource, because we found that the different domains of the CLE impact well-being in different ways, both in direction (some affect engagement, others burnout) and in strength.

The most important job resource supporting resident engagement we found was the CLE domain ‘coaching and assessment’. This domain comprises aspects of coaching by supervisors and feedback exchange between resident and supervisor. The importance of supervisors that effectively take on a coaching role has been described by other researchers.<sup>24,25</sup> The coaching role of supervisors has been defined by several core features: mutual growth-oriented engagement, reflection involving

both resident and supervisor, acknowledgment of failure as a catalyst for learning, longitudinal goal setting, observation through workplace-based assessments and the provision of meaningful feedback.<sup>24–26</sup> The importance of coaching supervisors for promoting resident well-being is further emphasized by our results, as we found that the domain ‘coaching and assessment’ was not only positively associated with engagement, but also negatively with burnout. Supervisors that adequately coach seem to support resident well-being by stimulating engagement and by reducing the negative effect of job demands and thereby the risk of burnout. One of the core characteristics of adequate coaching is the exchange of constructive feedback between supervisor and resident.<sup>27</sup> Items concerning feedback quality and frequency are included in the CLE domain ‘coaching and assessment’ and might therefore also be an important job resource for residents.

Surprisingly, our results do not support prior research that described the importance of peer support as a job resource for residents.<sup>13</sup> Although social support is associated with mental well-being,<sup>9,28</sup> we think several aspects of residency (e.g. frequent rotations, competition) might hinder building fruitful and longstanding professional relationships between residents and can thus be a barrier to peer support.<sup>28</sup> This may be dependent on specialty, hospital context and on cultural aspects. The study in which we found peer support to be an important job resource was performed in Dutch orthopedic surgery residents from different hospitals. The present study was performed in residents of various specialties in a single large academic institution in which peer support among residents is not a matter of course.<sup>29</sup>

### **Strengths and limitations**

Our study is the first to determine which aspects of the CLE are predictors of work engagement and a lower risk of burnout, and are thus considered important job resources for residents. Therefore, we believe our results are an important next step in promoting resident well-being through stimulating and conserving resident work engagement.

Our study has some limitations. Firstly, although the results of the path analysis suggest causal relationships between aspects of the CLE and work engagement, the cross-sectional design of our study precludes causal inference. The relationship between CLE and resident engagement might be reverse, i.e. that engaged residents give higher ratings for the CLE. What argues against this, is that some aspects of the CLE are related to engagement while other aspects are not. In addition, prior research has shown that the social and working environment plays a key role in determining physician well-being,<sup>30</sup> making reverse causality even more unlikely. Secondly, all participating residents were trained at a single university hospital, which limits the generalizability of our results to residents in other settings. Nevertheless, we believe that, although the quality of the CLE might differ between hospitals, the association between the CLE and resident well-being is hospital independent.<sup>17</sup> Finally, with a response rate of 35%, our results could possibly be limited by response bias. It might be possible that residents with burnout are more likely to complete questionnaires regarding burnout because the topic is more relevant to them, but they could also be too apathetic to participate in a survey study. The way resident burnout influences survey response rate is largely unknown.

### **Implications and future research**

Our results emphasize the importance of a supportive CLE in enhancing resident well-being through stimulating resident work engagement. Besides, our findings support the relevance of supervisors that coach and provide effective feedback as job resources for residents. We think it could therefore be useful to include coaching skills in faculty development programs. Although our findings support the role of coaching in fostering resident well-being, further qualitative and quantitative studies are needed to provide more information about the effectiveness of coaching in improving resident well-being.

## **Conclusion**

Because resident well-being is crucial in delivering high quality patient care, revealing aspects of the CLE that support resident well-being is important. This study shows that aspects of coaching and feedback exert the most positive influence on resident well-being, both by stimulating engagement and by reducing the risk of burnout. Adapting tasks to residents' learning goals also fosters resident well-being. The aspects we found that affect resident well-being are largely determined by supervisors. Promoting supervisors' awareness of their key role in influencing the mental well-being of residents could be the first step towards improving their well-being.



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# Chapter 9

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“It’s sink or swim”

How learning environment  
differences affect resident burnout  
risk

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Submitted

## **Context**

Supportive learning environments are vital for the professional growth and well-being of residents. In previous studies we found a strong and consistent relationship between the quality of the learning environment and the risk of resident burnout and a much higher rate of burnout symptoms in Belgian than in Dutch residents.

## **Objectives**

This qualitative study, among residents who had experience in working both in Belgian and Dutch postgraduate educational environments, explored residents' perceptions of the aspects of the learning environment that promote or hinder their well-being.

## **Methods**

We conducted semi-structured interviews with 12 residents who spent part of their residency training in Belgium and part in the Netherlands, to obtain an in-depth understanding of residents' experiences of the learning environment and their well-being in both settings. Data were analyzed using interpretive phenomenological analysis.

## **Results**

Participating residents noted a key role for supervisors in creating a supportive learning environment that promotes their well-being. They appreciated supervisors who nourished their work engagement by being positive role models, facilitating their learning process by workplace coaching attuned to their learning aims, and valuing the work they put in (reciprocity). Residents felt strongly that effective provision of constructive feedback is crucial in reciprocal supervisor-resident relationships. Promoting opportunities to grow towards professional autonomy and being able to balance these against workload was also considered important by residents in determining their well-being.

## **Conclusions**

Resident well-being is greatly enhanced by supervisors who are positive role models through coaching residents in the workplace, providing constructive feedback and fostering residents' growth towards autonomy. These results suggest that faculty development interventions may promote resident well-being.

## Introduction

The goal of postgraduate medical education (PGME) is to optimally prepare residents for their future role as autonomously functioning medical specialists. Although the key educational value of clinical work and patient contact in PGME remains undisputed, PGME has been redesigned considerably over the past two decades, with more focus on the structure of the program and on creating supportive learning environments.<sup>1-3</sup>

Whilst the importance of an effective clinical learning environment to support learning in PGME has been recognized for decades,<sup>4</sup> more recent studies also highlight the association between the learning environment and resident well-being.<sup>5,6</sup> In a series of studies, we previously found a strong and consistent dose-dependent relationship between the quality of the learning environment, as perceived by residents, and their risk of burnout.<sup>7-9</sup> This was demonstrated first in a study of nearly all orthopedic surgery residents in the Netherlands,<sup>7</sup> and was later confirmed in a large sample of Dutch residents from many different specialties.<sup>8</sup> A third study showed a much higher rate of burnout symptoms in Belgian residents, strongly associated with considerably lower scores on experienced quality of learning environment.<sup>9</sup>

Although these results strongly support the importance of the quality of the learning environment in PGME for resident well-being, they do not answer the question of what specific aspects of the learning environment strengthen or threaten resident well-being. Previous studies suggested an important role for supervisory support in reducing the risk of resident burnout.<sup>9,10</sup> However, detailed information of environmental aspects that affect the risk of resident burnout is lacking. This may be partly explained by the complexity of the construct *learning environment*, e.g. the context in which residents learn while they perform their daily clinical work. The learning environment has been conceptualized in two systematic approaches.<sup>11,12</sup> By using a snowballing method to investigate the theoretical underpinnings of



educational environment measurement instruments, Schönrock-Adema *et al* found a framework describing three domains of the educational environment: the content, organization and atmosphere of a residency training program.<sup>11</sup> A more recent scoping review proposed a two-dimensional framework to characterize the medical learning environment with a psychosocial and a material dimension, in which the psychosocial domain comprises personal, social, and organizational components, and the material domain reflects the adequacy of the physical and virtual spaces for learning.<sup>12</sup> Both reviews recommended that further empirical work is needed to understand the learning environment better, evaluate its quality, and improve it. This study aims to improve our understanding of the aspects of the learning environment that support or hinder resident well-being.

Most residents in PGME programs follow their training in one or sometimes two teaching hospitals within the same country. This limits their ability to compare differences in the learning environment between residency programs, and to reflect on their potential impact on burnout risk. Because of our previous finding that Belgian residents reported a considerably higher burnout risk and gave significantly lower scores to their learning environment, we argued that residents who spend part of their training in the Netherlands and part of their training in Belgium would be in a unique position to compare the Belgian with the Dutch learning environment. The experiences of these residents could give vital information about facilitators and barriers to quality improvement of learning environments and about how the difference in learning environment quality impacts resident burnout risk. The purpose of this study was therefore to explore which differences in residency learning environment (between Belgium and the Netherlands) promote or hinder resident well-being. We also aimed to determine which aspects of the learning environment are responsible for the previously described differences in quality of the learning environment (between Belgium and the Netherlands).

## **Methods**

### **Study design**

We used interpretive phenomenological analysis (IPA) to explore residents' perceptions of the learning environment using in-depth semi-structured interviews. Phenomenology studies appearances of things (phenomena),<sup>13,14</sup> in this study: the learning environment – from the point of view of those who experience it, in this study: the residents. This method emphasizes studying conscious experiences as a way of understanding the reality around us. We used IPA to examine the spectrum of residents' perceptions of their learning environment and burn-out experiences. A key element of the IPA approach is that it explores the phenomenon through direct interaction between the researcher and the subject and that the subject is a direct representative of the world in which he or she lives.<sup>14</sup> The process of IPA also involves the interpretive activity of the members of the research team.<sup>13,14</sup> We used a stepwise approach that consisted of a mix of data collection, bracketing, coding, categorization, intuiting, reflection and describing.<sup>14</sup>

### **Participants**

Residents were eligible for participation in this study if they had followed at least one year of their PGME training in a Belgian teaching hospital, and at least one year in a Dutch teaching hospital, and were still in PGME training or had finished it no more than one year before the interview. Eligible participants from several different specialties and working in different hospitals were purposively recruited by using connections from the authors' professional networks. Eligible participants were invited to voluntarily participate in the study by email and a total of 2 emails were sent as reminder when residents did not respond to previous invitations. The aim, the procedure and the ethical considerations of the study were explained in the email.

### **Data collection**

The lead author (SV) conducted the semi-structured interviews in person or by telephone from April 2018 until June 2019. The interviews were conducted at a

time of participants' choice to encourage the residents to speak freely. We used an interview topic guide to facilitate residents to share their perceptions and experiences regarding the main topics: learning environment and resident well-being. All interviews were audio recorded and transcribed anonymized and verbatim afterwards. The mean duration of the interviews was one hour (35 – 80 minutes). We ceased collection of data when we considered our data were sufficient for answering our research questions.<sup>15</sup> This process resulted in a total number of 12 participating residents.

### **Data analysis**

We used MAXQDA version 2020 for coding and categorizing the transcripts. Analysis of the data closely followed the steps described by Smith et al.<sup>14</sup> The lead researcher started with reading and rereading the first interview and annotated everything that was considered of significance. Each interview transcript thereafter was read and reread by the lead researcher, ensuring a global understanding of residents' experiences. The first interview was coded and 'bracketed'. Assumptions were made explicit by describing these assumptions in a diary and discussing both the assumptions and coding of the first interview in the research team, attempting to reduce researcher bias.<sup>16</sup> The further coding process occurred concurrent with data collection, and throughout this iterative process of data collection and coding the research team frequently met to discuss, compare newly gathered data, categorize the codes and develop themes. To refine the coding process and deepen our understanding of the data, two more researchers (SL and PB) also coded three randomly chosen interview transcripts. Differences in coding were then discussed until agreement was reached. Emergent themes were connected, patterns established and super-ordinate themes were identified.

### **Reflexivity**

The researchers' prior conceptions of the researched subject interact with new experiences brought forward by the participants and is therefore of significance

in IPA. When using IPA, the researchers need to be aware of their own attitudes, experiences and perceptions regarding the subject in order to enrich the interpretation of the data instead of being an obstacle to analyzing the experiences of the participants.<sup>17</sup> This can be achieved through the process of reflexivity, which can be described as the process of awareness how the researcher inevitably influences the research process.<sup>17</sup>

The lead researcher, who was also the interviewer, had worked as a resident in PGME until 2016, both in Belgium and the Netherlands, giving him the advantage of knowing both the cultural and the training context of the participating residents. We believe this advantage increased the residents' willingness to share their experiences and perceptions concerning the differences in learning environment quality and risk of burnout.<sup>18</sup> These advantages also came with several challenges. Firstly, the researcher's preconceptions of the topics under study could influence the data collection and analysis. Secondly, the specialist-resident interview structure might serve as a barrier for residents to openly share their perceptions. To preempt this potential barrier as much as possible, the anonymity of the given information was emphasized before the interview. Through the process of bracketing – setting aside prior assumptions of the researcher – the possible researcher bias was addressed. Furthermore, the researcher frequently sought advice from the other members of the research team throughout the process of data collection and analysis in order to clarify the interpretation of resident's responses. The other members of the research team were not involved in interviewing the residents and were therefore able to view and interpret the data from an outsider perspective.

## **Ethics**

Ethical approval for this study was granted by Ethical Review Board of the Netherlands Association for Medical Education (ERB-NVMO file number 1003). Participation in the study was voluntary. Participating residents could withdraw their cooperation at any given moment. The names of the residents were only known

to the lead researcher who also conducted all the interviews. After transcribing the audio recorded interviews, the recordings were discarded and the transcripts deidentified by removing the names of the residents (ID numbers were assigned to each resident before the interviews were entered in MAXQDA) ensuring the anonymity of the residents. Participating residents provided written informed consent prior to the interview.

## Results

Characteristics of the 12 participating residents are shown in table 1. In the text below, each participating resident is identified by an ID number and an abbreviation of their specialty (table 1), and we indicate which quotes describe the Belgian and which the Dutch learning environment.

Data analysis revealed 6 main themes that pervaded all 12 interviews and reflected the respondents' description of how the residents felt the learning environment impacted their well-being. A conceptual model describing the connections between these themes is displayed in figure 1. All residents acknowledged a key role for the supervisor in influencing resident well-being, which lies at the heart of the model. Participants described how their well-being is influenced by factors affected by the supervisor (themes: 'role model' and 'atmosphere'), by the relationship between resident and supervisor (themes: 'reciprocity' and 'workplace coaching'), by the residents' drive to grow towards professional autonomy (theme: 'autonomy') and by the context of the training program (theme: 'organization').

### Supervisor as role model

All residents recognized the supervisors as the cornerstone of a supportive learning environment. A recurrent theme was the supervisor acting as a role model for residents. When residents felt supported by their supervisors, both in their clinical work and in their learning process, they experienced more confidence and appreciation. Participants felt that their supervisors should feel responsible for the

entire process of a resident's professional growth, which means they have to actively integrate coaching of residents into their daily work. Residents experienced less engagement and more stress when supervisors considered learning opportunities completely separate from clinical work.

'At the end of the week, my supervisor here [Netherlands] reviews and discusses the learning aims I defined myself at the beginning of the week. Supervisors are thus actively involved in my training, which is something I wasn't used to. In Belgium, you're allowed to organize a journal club or some other kind of educational activity, if you kindly ask your supervisors, but you have to arrange it yourself.' (7-ped)

Residents strongly felt that supervisors who provide coaching and actively promote well-being have a preventive effect on burnout. Supervisors who considered residents as persons with families, social lives, uncertainties and needs, were viewed by participants as positive role models who could energize residents and increase their work satisfaction. However, when residents felt distance between them and their supervisors, this negatively influenced their well-being by making them more uncertain, anxious and less appreciated.

'My supervisor here [Netherlands] asked me whether I slept well before starting my night shifts. I said: "Well, actually I have some trouble sleeping before my shifts". "Then you might benefit from doing yoga". This is what the gynecologist, who is responsible for our training program, said! A supervisor asking me whether I experience stress, homesickness or whether I feel alright. That's completely new to me, it would never have happened in my former training hospital, no yoga there [Belgium].' (10-gyn)

### **Atmosphere of the training program**

Residents described several issues related to the atmosphere of the department which they considered important in determining their well-being, including a mutually respectful and supportive relationship with their supervisors, support from their peers and good interpersonal contact with other hospital personnel. Overall, residents considered the atmosphere of a department as very important in determining their job satisfaction. In a supportive and safe atmosphere, residents felt more confident and were more likely to ask questions and seek feedback.

‘In Belgium it really is ‘sink-or-swim’ during your shifts. You just need to survive. You have to be really good at prioritizing and above all be able to do it yourself. I believe your supervisors see you as a better resident if you call them less during the night shifts, while this is actually more unsafe.’  
(8-ped)

Support from peers was found to be of great importance in preventing stress, especially when the relationship with supervisors was suboptimal. Residents felt that they could handle heavy workloads, long working hours and lack of teaching moments better when they could rely on the support of their peers. Furthermore, residents mentioned that the absence of peer support seriously increased their level of stress.

‘I was involved in a car accident and was in hospital as a patient to stay overnight. I then called my fellow residents to ask if they could do my weekend shift, but nobody could or wanted to. So, I went to do the shift myself. My dad drove me to the hospital, because I couldn’t drive myself due to the accident. My supervisors then sent me home, because my face was swollen and blue and they weren’t confident I could safely take care of my patients.’ (12-gyn) [Belgium]

## **Reciprocity**

When it concerned their well-being, residents felt that it was important that the effort they put into their daily clinical work was balanced against the rewards they received for doing this work. Rewards that residents mentioned as energy resources were: getting opportunities to learn new things, receiving frequent constructive feedback, and being supported by supervisors in difficult clinical situations. Residents also noted that their salary was higher and that they had more vacation time in the Netherlands. They also noted that when supervisors allowed them to influence their work schedule (e.g. by planning shifts and holidays) enhanced their feeling of being in control of their work-life balance. Three residents articulated concerns about not being allowed to take more than a week time off in Belgian hospitals.

‘I think you’re just spiraling down. You have the feeling that you’re not making any progress, while you have to work really hard, without seeing any results. We, Residents, are getting very little in return for all our efforts.’  
(12-gyn) [Belgium]

When residents experienced heavy workloads, they felt that appreciation by their supervisors, even a simple compliment, gave them the energy of staying engaged. Supervisors and peers rewarding residents by giving them the feeling of being part of the team greatly enhanced engagement.

‘I’m willing to work really hard but I also want to be seen as a true member of the team and not just as some random person who does the medical administration.’ (12-gyn) [Belgium]

## **Workplace coaching**

Another difference that residents considered important was that whilst clinical teaching and clinical work were completely separated in Belgium, they were more integrated in the Netherlands, with supervisors regularly providing structured



feedback based on direct observation of residents performing clinical duties. Residents felt that such structured and constructive feedback enhanced their ability to improve their skills. This was considered a strong means of supporting professional growth, which made residents feel more confident and engaged.

‘Something that I experienced as a big difference, was that residents are really meant to learn something during their daily work. In the Netherlands, our training is a priority, in Belgium however, I feel they put an emphasis on working, on doing the necessary clinical tasks. This means you have to see as much patients as possible, that you have to do shifts, that you have to continue doing a lot of non-training related tasks and that time for teaching is lacking. Only when there is time, which is only rarely, supervisors are willing to explain something. Residency training is of secondary importance.’ (5-ped)

The most important differences they noted between the Belgian and Dutch approach of workplace coaching was that feedback in Belgium was often judgmental and not based on clinical observations.

‘You don’t really get feedback, unless it’s negative. Hence, you only get feedback when they think you’ve done something wrong. Sometimes they can even tell you that you’re not capable of becoming a gynecologist, without giving you any chance to prove them wrong.’ [Belgium] (12-gyn)

Residents noted that in a culture in which giving and receiving feedback is an established routine, both supervisors and residents expect to give and be given feedback. This greatly improved the quality and frequency of the feedback. Residents mentioned time pressure and a culture of politeness, in which supervisors and residents feel uncomfortable giving and receiving feedback, as barriers to receiving meaningful feedback.

'I think the Dutch culture is more open than the Belgian, a bit clearer in everything when it comes to communication. In Belgium we are shyer, a little more reserved. Somehow there is a greater threshold to ask for feedback for us. It feels impolite to ask for feedback, like you're fishing for compliments.' (5-ped) [Belgium]

### **Growth towards professional autonomy**

Most residents indicated that being able to make relatively autonomous decisions regarding their training was one of the most important drivers of staying engaged. The autonomous decisions they mentioned could relate to personalizing their own training (e.g. residents greatly appreciated it when they were given the opportunity to choose a subspecialty during their last year of training), or to making decisions in daily clinical care (e.g. residents appreciated it when they've been given the opportunity to see simpler cases on the outpatient clinic during their first months of training).

'Here you have frequent appointments with your supervisor. You can then discuss your learning goals for your year of training in the Netherlands and for the coming period. They will then adjust your working schedule to facilitate your learning goals.' (12-gyn) [Netherlands]

Several residents from surgical specialties appreciated the stepwise approach in learning surgical procedures which they encountered in the Netherlands. They experienced that this gradual increase in gaining responsibility and autonomy improved their feeling of safety and reduced stress associated with doing tasks that they felt were not yet suitable for their level of training.

'In Belgium you're only watching surgical procedures until you can prove you're able to perform them yourself. Sometimes you're allowed to start, for example a cesarean section, but right at the point when it becomes a little

bit difficult, your supervisor takes over. Here in the Netherlands it is standard that you're allowed to do the entire procedure.' (10-gyn)

### **Organization of the training program**

All residents mentioned excessive workload as a very important factor negatively influencing their well-being. Residents noted that they generally worked far fewer hours in the Netherlands than in Belgium. Working hours negatively affecting the time to sleep and the opportunity to participate in social and sport activities contributed to emotional exhaustion.

'I remember myself being at the ward at 3 o'clock at night. It happened quite often, because we had too much work to do. At that point I was just too tired to go home and I crawled into one of the empty hospital beds on the ward and slept until around 7 o'clock in the morning. That's just the way it goes, you work the entire day, then the entire evening and then all of a sudden, it's in the middle of the night and you think to yourself: I'm really not going home right now, I'm just going to sleep a couple of hours here on the ward.' (12-gyn) [Belgium]

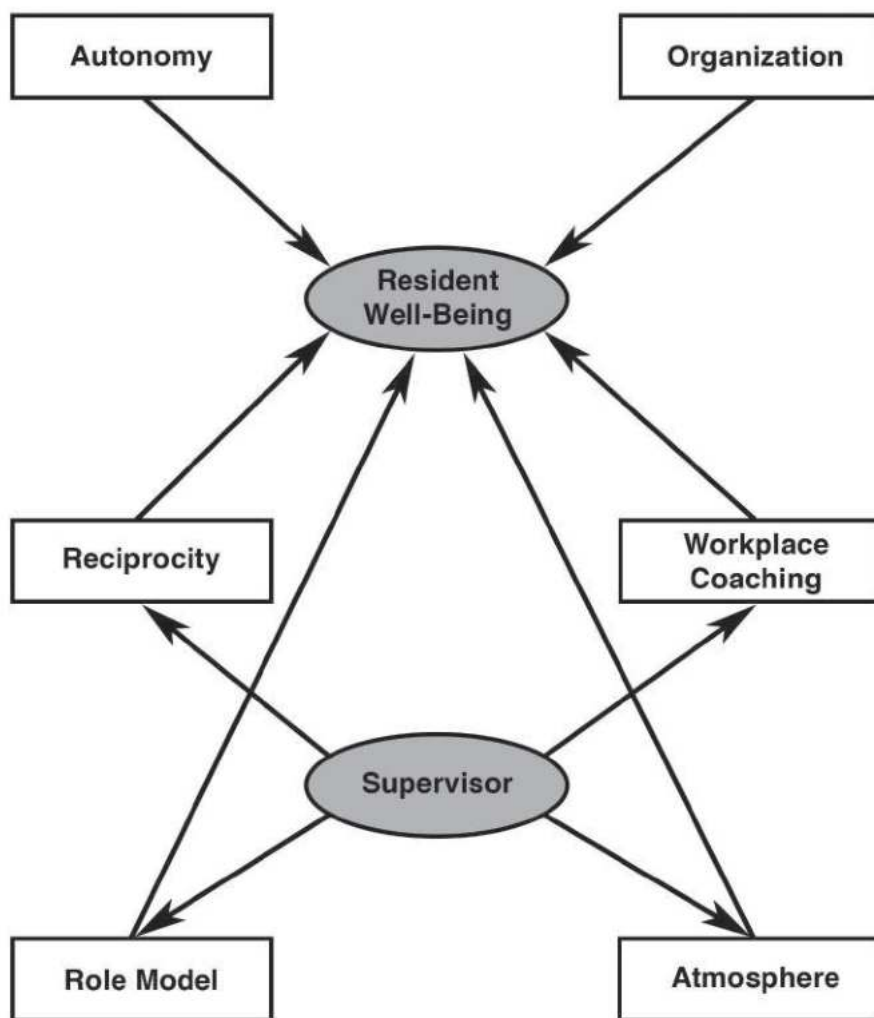
All residents acknowledged that supervisors in Belgium, unlike their Dutch counterparts, did not attend any faculty development program. Residents appreciated supervisors who were trained in giving feedback, facilitating learning goals and addressing resident's particular needs.

'I know that general practitioners in Belgium have to attend to a special faculty development course if they want to participate in the training program as supervisors. I think this course is indispensable and I therefore believe it's much better organized for general practitioners than for medical specialists in Belgium. I don't think any medical specialist in Belgium is trained to be a teacher, I have never heard of such a program in Belgium anyway.' (3-gyn)

**Table 1.** Participant demographics

<b>Participant</b>	<b>Specialty</b>	<b>Male/Female</b>	<b>Postgraduate year of training</b>	<b>Age</b>
1-gyn	Gynecology	F	2	27
2-gyn	Gynecology	F	2	27
3-gyn	Gynecology	F	7	32
4-ped	Pediatrics	F	3	28
5-ped	Pediatrics	F	5	29
6-ped	Pediatrics	F	6	29
7-ped	Pediatrics	F	3	28
8-ped	Pediatrics	F	3	28
9-em	Emergency Medicine	M	4	29
10-gyn	Gynecology	F	2	27
11-gyn	Gynecology	F	2	26
12-gyn	Gynecology	F	3	28

**Figure 1.** A conceptual model of residents' experiences concerning aspects of the learning environment affecting their well-being. Themes are represented as text boxes.



## Discussion

This study explored why residents experienced a more supportive learning environment in Dutch training programs than in Belgian programs and how this difference in learning environment quality impacts resident well-being. Our findings highlight the pivotal role of the supervisor in creating a supportive learning

environment that enhances resident well-being. Residents experienced the coaching role as an essential characteristic of their supervisors in being positive role models. They found that heavy workloads need to be balanced against opportunities to grow professionally (reciprocity). This can be facilitated by workplace coaching that is attuned to their learning aims. Additionally, residents suggested that they need a certain degree of professional autonomy to foster their growth and stimulate their engagement, which could be achieved through self-directed learning.

All participating residents acknowledged that effective role modeling of supervisors is of paramount importance in creating a supportive learning environment. In accordance with previous work on role modeling, characteristics of supervisors whom participants described as positive role models included clinical competence (e.g. technical knowledge and skills), teaching skills (e.g. creating a supportive learning environment) and personal qualities (e.g. integrity and enthusiasm for both clinical care and teaching).<sup>19,20</sup> Another feature of an effective role model that participants in our study highlighted was the coaching role. This coaching role has recently been conceptualized and comprises three core features: mutual engagement that is oriented towards resident growth, reflection that involves both resident and supervisor and acknowledgement of failure as a catalyst for learning.<sup>21</sup> Characteristics of the coaching role are provision of feedback, longitudinal goal setting and observation through workplace-based assessments.<sup>22,23</sup> Residents highlighted the positive impact on their well-being of supervisors effectively taking on the coaching role.<sup>24</sup> Prior research revealed that adequate coaching by supervisors facilitates growth and talent development.<sup>23</sup> Participants emphasized the importance of two types of workplace coaching: short term (coaching in the moment) and longitudinal (coaching over time).<sup>25</sup> The positive association between learning environment and resident well-being has been widely recognized.<sup>8,9</sup> Our findings reveal that supervisors play a key role in creating a supportive learning environment. Residents noted that supervisors can create supportive learning environments by investing in coaching, both coaching in the moment as coaching over time. We therefore believe that supervisors

who are committed to the growth of their residents, by coaching them in the moment and over time, will enhance their well-being.

A key feature of effective coaching is the supervisor-resident feedback exchange.<sup>26</sup> As our study explored learning experiences of residents who worked in two countries, differences in learning culture between the Belgian and Dutch hospitals impacted both receptivity for and readiness to engage in feedback, which is in line with previous work on cultural differences in feedback exchange.<sup>27</sup> The participants acknowledged a great difference in the learning culture between the countries. The Belgian culture was mostly described as one where the reputation of the institution and its faculty hindered the provision of feedback (which has been described as a “culture of excellence”).<sup>28</sup> Participants described the Dutch culture as one that featured frequent observation and goal-directed feedback that included plans for future improvement without hierarchal barriers (“culture of growth”).<sup>28</sup>

Our findings suggest that reciprocity in the relationship between residents and supervisors supports resident well-being. Earlier work showed that efforts made by residents which are not balanced by rewards from supervisors are associated with an increased risk of burnout.<sup>29</sup> This is in line with the job demands and resources model, which posits that an imbalance between positive (job resources) and negative (job demands) work-related factors can lead to burnout.<sup>30</sup> Work engagement, conversely, is stimulated by job resources.<sup>30,31</sup> Participants in the present study experienced more stress when heavy workloads (job demands) were insufficiently balanced with learning experiences, feedback and coaching (job resources). However, supervisors who created sufficient learning opportunities (job resources) that allowed for personal growth of residents enhanced residents’ work engagement.

Residents in our study described the importance of a certain degree of professional autonomy for their well-being, and that they felt more engaged in a learning environment in which they could make relatively autonomous decisions. In the job demands and resources model, autonomy is recognized as an important job

resource through its association with engagement<sup>32</sup> and by mitigating the impact of job demands.<sup>33</sup> Residents in this study expressed the view that they could achieve more autonomy when their learning process was self-directed. Self-directed learning occurred when participating residents could help set their own learning goals, plan their training strategies and evaluate the outcomes with their supervisors, on their path to performing clinical tasks with increasing autonomy. Previous work has shown how a positive learning environment and the use of specific educational tools like the entrustable professional activity can support such self-directed learning in residents.<sup>34</sup>

Approaching clinical supervision and long-term coaching of residents as instruments to support residents towards performing the key tasks related to their medical specialty with increasing autonomy finds further theoretical support from the self-determination theory, which posits that (increasing) autonomy, (increasing) competence and relatedness are the basic needs allowing humans to grow and function optimally.<sup>35</sup>

### **Strengths and limitations**

To our knowledge, this is the first study in which residents with experience in two different learning environments were asked to reflect on the differences between these learning environments in relation to their work engagement and well-being. By interviewing residents from different specialties and settings, we obtained a wide range of contrasting experiences, which gave us a thorough understanding of the differences between the learning environment and resident well-being experienced in completely different training settings (Belgium versus the Netherlands). A limitation of our study is that our findings represent the experiences of residents of a limited number of specialties. However, our results show that the experiences of residents from different specialties were very similar. The contrasting experiences we found related much more to the differences between the Belgian and the Dutch learning



environments than to different specialties. Nevertheless, further studies are needed to explore the generalizability of our findings across other settings and nations.

### **Implications**

Our results suggest that improving supervisors' coaching performance should be a priority in residency training programs, as participating residents reported that supervisors were generally unfamiliar with a coaching role, and because of the perceived importance of this coaching role in enhancing residents' work engagement. Furthermore, residents need a certain degree of autonomy in their training which can be achieved through self-directed learning. Future research could focus on the role of EPA's to facilitate the growth process of residents by allowing for gradually gaining responsibilities. This growth process was noted by participants as being of importance in enhancing resident well-being.

### **Conclusions**

Residents with experience in greatly contrasting learning environments in neighboring countries stress the key role for supervisors in creating a supportive learning environment that enhances resident well-being. Residents highlighted the coaching role as an important characteristic of their supervisors in being an effective role model. Effective feedback exchange is essential in reciprocal supervisor-resident relationships, which is best achieved in a culture of growth. Additionally, a self-directed learning process increases residents' feeling of autonomy which stimulates their engagement and reduce their burnout risk. These resident experiences could guide the development of interventions aimed at improving resident well-being through the creation of a supportive learning environment.

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# Chapter 10

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Emotional well-being of Dutch residents during the first wave of the COVID-19 pandemic

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Submitted

## **Objective**

To evaluate the impact of treating COVID-19-patients on burnout risk, quality of life and fear of getting infected among residents, during the COVID-19-pandemic.

## **Design**

Online survey

## **Method**

All 207 residents working in Isala hospital (Zwolle, the Netherlands) during the COVID-19-pandemic (March and April 2020) were invited by mail in May 2020 to fill in an online survey. Burnout was assessed using the Utrecht Burnout Scale, which is the Dutch version of the Maslach Burnout Inventory. Quality of life, work-life balance, fear of getting infected and the feeling of being burnt out were assessed using validated items.

## **Results**

A total of 121 (58.5%) residents completed the survey. Two (1.7%) met the standard criteria for burnout. Both were not involved in COVID-19-care. We did not find symptoms of burnout (emotional exhaustion, depersonalization and reduced personal accomplishment) more frequently among residents working on COVID-19-wards compared to residents not involved in COVID-19-care. We did not find differences in residents' quality of life, work-life balance and fear of getting infected between the two groups. However, residents treating COVID-19-patients on the intensive care unit felt more burnt out during the pandemic compared to before the pandemic

## **Conclusion**

Despite the tremendous impact of the COVID-19-pandemic on health care systems, we did not find a higher burnout risk among residents directly involved in the treatment of COVID-19-patients. A peer support program, a chance to learn, the team spirit and the appreciation during the acute phases of the crisis are possible explanations.

## **Impact van COVID-19-zorg op het emotionele welzijn van aios en anios**

### **Doel**

Onderzoeken wat de impact is van het zorgen voor COVID-19-patiënten op het burn-outrisico, de kwaliteit van leven en de angst voor besmetting van Nederlandse aios en anios tijdens de COVID-19-pandemie.

### **Opzet**

Digitaal vragenlijstonderzoek

### **Methode**

We nodigden alle 207 a(n)ios die werkzaam waren in Isala (Zwolle) ten tijde van de piek van de COVID-19-pandemie (maart en april 2020) in mei 2020 uit om een digitale vragenlijst in te vullen. Burn-out werd gemeten met de Utrechtse burn-outschaal. We evalueerden kwaliteit van leven, werk-privé balans, angst voor besmetting en opgebrand gevoel met behulp van gevalideerde items.

### **Resultaten**

In totaal vulden 121 (58,5%) a(n)ios de vragenlijst volledig in. Twee (1,7%) voldeden aan de standaard criteria van burn-out. Beiden waren niet betrokken bij COVID-19-zorg. Symptomen van burn-out (emotionele uitputting, depersonalisatie en verminderde persoonlijke bekwaamheid) vonden we niet vaker bij a(n)ios die werkzaam waren op een COVID-19-afdeling dan bij a(n)ios die op een afdeling werkten zonder COVID-19-patiënten. Ook kwaliteit van leven, werk-privé balans en angst voor besmetting werden niet anders ervaren tussen beide groepen. Wel voelden a(n)ios die werkzaam waren op de intensive care zich ten tijde van het onderzoek meer opgebrand dan voor de COVID-19-pandemie.

## **Conclusie**

Ondanks de enorme impact die de COVID-19-pandemie heeft op ons zorgsysteem, vonden wij dat a(n)ios die werkzaam waren op COVID-19-afdelingen ten tijde van de piek van de pandemie, geen hoger risico liepen op het ontwikkelen van symptomen van burn-out. Een peer support programma, de pandemie als een kans om te leren, de teamspirit en waardering in de acute fase van de crisis zijn mogelijk verklaringen.



De COVID-19-pandemie zorgt voor enorme druk op artsen die dagelijks zorgen voor de in het ziekenhuis opgenomen patiënten met deze nieuwe levensbedreigende aandoening.<sup>1</sup> Artsen kunnen grote stress ervaren doordat ze geconfronteerd worden met ernstig zieke patiënten met een onvoorspelbaar verlopend ziektebeeld, terwijl er medisch weinig behandelmogelijkheden zijn. Daarnaast zorgt de pandemie voor lange en zware werkdagen, weinig mogelijkheden om patiënten en hun naasten emotioneel bij te staan en voor angst om zelf besmet te raken.<sup>1-3</sup> Onderzoek laat zien dat artsen die betrokken zijn bij COVID-19-zorg kampen met meer symptomen van angst en slapeloosheid dan hun collega's die op afdelingen werken zonder COVID-19-patiënten.<sup>1</sup> Deze hevige en langdurige stress zou het risico op burn-out kunnen verhogen.

Burn-out is een werkgerelateerd syndroom gekenmerkt door emotionele uitputting, depersonalisatie en verminderde persoonlijke bekwaamheid.<sup>4</sup> Informatie over burn-out bij artsen die voor COVID-19-patiënten zorgen is belangrijk, omdat artsen met burn-out slechtere patiëntenzorg leveren.<sup>5,6</sup> Bovendien hebben artsen met burn-out een grotere kans op depressie, middelenmisbruik en suicide.<sup>7</sup> Preventie van burn-out onder artsen is dus zeer wenselijk.

Wij onderzochten de impact van het zorgen voor COVID-19-patiënten op het burn-outrisico, de kwaliteit van leven en de angstbeleving van artsen in een Nederlands ziekenhuis tijdens de COVID-19-pandemie.

## Methoden

In Isala, een groot opleidingsziekenhuis in Zwolle, werd de dagelijkse medische zorg voor klinische COVID-19-patiënten grotendeels geleverd door artsen in opleiding tot specialist (aios) en artsen niet in opleiding tot specialist (anios). Vanaf begin maart 2020 werd voor a(n)ios werkzaam op afdelingen met COVID-19-patienten een ondersteuningsprogramma (peer support) opgestart. Dit programma bestond uit informatie delen (dagelijkse debriefing), uitleg en normalisering van de emoties die

de COVID-19-zorg oproept, aandacht voor zelfzorg en een aanbod voor verdere psychologische ondersteuning op vraag.

We nodigden alle a(n)ios, die ten tijde van de piek van de COVID-19-pandemie (maart en april 2020) werkzaam waren in Isala uit voor deelname aan dit onderzoek. Op 29 maart werd het hoogste totale aantal klinische COVID-19-patienten in Isala bereikt: 118, waarvan 22 op de intensive care (IC). Het hoogste aantal COVID-19-patiënten op de IC werd bereikt op 9 april: 37. Zowel a(n)ios die betrokken waren bij de COVID-19-zorg als zij die hier niet bij betrokken waren werden uitgenodigd, zodat beide groepen met elkaar vergeleken konden worden. Ze werden op 1 mei 2020 per mail uitgenodigd om een online-vragenlijst in te vullen. De a(n)ios kregen op 7 mei, 13 en 18 mei een herinnering via de mail.

De vragenlijst bevatte zowel demografische items als vragen over specialisme en opleidingsjaar. Deelnemers werd gevraagd op welke afdeling ze de afgelopen 2 maanden (maart/april 2020) hadden gewerkt: de intensive care (IC), de spoedeisende hulp (SEH), COVID-19-cohort afdeling of op een afdeling waar geen COVID-19-patienten opgenomen lagen. Ook werd deelnemers gevraagd om aan te geven hoeveel uur ze per week gemiddeld aan patiëntenzorg hadden besteed gedurende de afgelopen 2 maanden (maart/april 2020) en hoeveel van deze uren aan de zorg voor COVID-19-patienten.

Burn-out hebben we gemeten met de Utrechtse burn-outschaal voor contactuele beroepen (UBOS-C).<sup>8</sup> Deze bestaat uit 20 items in 3 schalen: emotionele uitputting (8 items), depersonalisatie (5 items) en persoonlijke bekwaamheid (7 items). De items werden gescoord variërend van nooit tot altijd (score 0 - 6). Per schaal werden gemiddelde scores berekend. Een (zeer) hoge score op emotionele uitputting in combinatie met een (zeer) hoge score op depersonalisatie en/of een (zeer) lage score op persoonlijke bekwaamheid werd als indicatief beschouwd voor burn-out.<sup>9</sup> De

afkapwaarden om (zeer) hoog en (zeer) laag te bepalen volgen uit de normtabel van de handleiding van de UBOS-C.<sup>8</sup>

Kwaliteit van leven en de werk-privé balans hebben we gemeten met twee gevalideerde items die veel gebruikt worden in onderzoek naar kwaliteit van leven.<sup>10-</sup>

<sup>12</sup> Het eerste item vraagt aan de respondent het algehele gevoel van kwaliteit van leven te scoren op een schaal van 1 (slecht) tot 5 (uitstekend). Op een vergelijkbare manier hebben we a(n)ios gevraagd om op een schaal van 1 (heel ontevreden) tot 5 (heel tevreden) de tevredenheid met de werk-privé balans aan te geven.

Tenslotte hebben we twee recent ontwikkelde items gebruikt die COVID-19 specifieke attitudes meten.<sup>13</sup> We hebben a(n)ios gevraagd aan te geven op een schaal van 1 (helemaal eens) tot 5 (helemaal oneens), in welke mate ze het eens zijn met de stelling: 'Ik voel me nu meer opgebrand dan voor de COVID-19-crisis.' Op vergelijkbare wijze hebben we a(n)ios gevraagd aan te geven op een 5-puntsschaal in welke mate ze het eens zijn met de stelling: 'Ik maak me zorgen over zelf geïnfecteerd te raken met COVID-19.'

De studie werd goedgekeurd door de lokale METC. Deelname aan het onderzoek was vrijwillig, a(n)ios mochten op elk moment hun medewerking opzeggen en persoonsgegevens werden door het online-systeem gecodeerd en waren nooit herleidbaar tot het individu.

We gebruikten SPSS (versie 22) voor de statistische analyses, voor vergelijkingen tussen categorische variabelen Pearsons chi-kwadraattoets en voor het vergelijken van gemiddelden Student's t-toets. Correlaties tussen variabelen werden bepaald met Pearson's r. Voor alle analyses (alle toetsen tweezijdig) werd een p-waarde < 0,05 als statistisch significant beschouwd.

## Resultaten

Van de 207 a(n)ios (114 aios en 93 anios) die uitgenodigd werden voor het onderzoek, vulden in totaal 121 (respons: 58,5%) de vragenlijst volledig in. Van de respondenten waren 66 (54,5%) aios en 55 (45,5%) anios. In totaal waren 56 (46,3%) a(n)ios direct betrokken bij de COVID-19-zorg. Kenmerken van de deelnemende a(n)ios staan weergegeven in tabel 1.

**Tabel 1.** Kenmerken van de a(n)ios die deelnamen aan de studie\*

<b>Kenmerk</b>	<b>Totaal aantal a(n)ios (n = 121)</b>	<b>Aantal a(n)ios werkzaam op COVID-19-afdeling (n = 56)</b>
Geslacht		
Vrouw	78 (64,5)	37 (66,1)
Man	43 (35,5)	19 (33,9)
Leeftijd in jaren; gemiddelde (range)		30 (24 – 42)
Specialismed		
Spoedeisende hulp	19 (15,7)	19 (33,9)
Intensive care	13 (10,7)	13 (23,2)
Interne geneeskunde	12 (9,9)	9 (16,1)
Cardiologie	6 (5,0)	4 (7,1)
Longgeneeskunde	4 (3,3)	4 (7,1)
Maag- darm- levergeneeskunde	5 (4,1)	2 (3,6)
Urologie	4 (3,3)	2 (3,6)
Heelkunde	8 (6,6)	1 (1,8)
Sportgeneeskunde	2 (1,7)	1 (1,8)
Revalidatie	1 (0,8)	1 (1,8)
Overige	47 (38,9)	-
Opleidingsjaar		
Niet in opleiding	55 (45,4)	31 (55,3)
1 <sup>e</sup>	9 (7,4)	1 (1,8)
2 <sup>e</sup>	25 (20,7)	13 (23,2)
3 <sup>e</sup>	9 (7,4)	6 (10,7)
4 <sup>e</sup>	7 (5,8)	1 (1,8)

**Tabel 1.** Kenmerken van de a(n)ios die deelnamen aan de studie\* (continued)

<b>Kenmerk</b>	<b>Totaal aantal a(n)ios (n = 121)</b>	<b>Aantal a(n)ios werkzaam op COVID-19-afdeling (n = 56)</b>
5 <sup>e</sup>	10 (8,3)	2 (3,6)
6 <sup>e</sup>	4 (3,3)	2 (3,6)
7 <sup>e</sup>	2 (1,7)	0 (0)
Aantal uren patiëntenzorg per week; gemiddelde (range)		36,5 (1 – 160)
Aantal uren COVID-19-zorg per week a(n)ios werkzaam op COVID-19-afdeling; gemiddelde (range)		25,0 (2 – 50)

\*Getallen zijn n (%), tenzij anders aangegeven

†Alleen specialismen vermeld die a(n)ios vertegenwoordigen werkzaam op een COVID-19-afdeling

In de gehele groep (n = 121) voldeden 2 (1,7%) van de a(n)ios aan de standaard criteria van burn-out. Deze 2 a(n)ios waren beiden niet betrokken bij COVID-19-zorg. Tussen aios en anios vonden we geen verschillen wat betreft hun: emotionele uitputting (p = 0,10), depersonalisatie (p = 0,97), persoonlijke bekwaamheid (p = 0,98), kwaliteit van leven (p = 0,54), werk-privé balans (p = 0,73), angst voor besmetting (p = 0,11) en opgebrand gevoel (p = 0,41). Wel voelden a(n)ios die zorgden voor COVID-19-patienten en werkzaam waren op de IC zich nu significant meer opgebrand dan voor de COVID-19-pandemie (tabel 2).

**Tabel 2.** Vergelijkingen aspecten emotioneel welzijn tussen a(n)ios die werkten op een COVID-19-afdeling (IC, SEH en COVID-19-cohort) en a(n)ios die niet werkzaam waren op een COVID-19-afdeling

	A(n)ios werkzaam op niet-COVID-afdeling Gemiddelde score (SD) n = 65	A(n)ios werkzaam op COVID-afdeling Gemiddelde score (SD) n = 56	p-waarde
Dimensies burn-out			
Emotionele uitputting	1,0 (0,60)	1,0 (0,71)	0,50
Depersonalisatie	0,7 (0,67)	0,9 (0,69)	0,13
Persoonlijke bekwaamheid (schaal 0-6)	4,1 (0,89)	4,3 (0,64)	0,24
Kwaliteit van leven	4,2 (0,70)	4,3 (0,64)	0,79
Werk-privé balans (schaal 1-5)	3,7 (0,79)	3,7 (0,79)	1,00
Opgebrand gevoel	4,1 (1,11)*	3,6 (1,19)*	0,03*
Angst voor besmetting (schaal 1-5)	3,6 (1,13)	3,7 (1,08)	0,75

\*significant

De vergelijkingen tussen a(n)ios die werkten op een afdeling met COVID-19-patienten en a(n)ios die op een niet-COVID-19-afdeling werkten en aspecten van hun emotionele welzijn staan weergegeven in tabel 2. De vergelijkingen tussen a(n)ios die werkzaam waren op verschillende typen COVID-19-afdelingen (IC, SEH en COVID-19-cohort) en a(n)ios die niet werkzaam waren op een COVID-19-afdeling staan weergegeven in tabel 3.

**Table 3.** Vergelijkingen emotioneel welzijn a(n)ios werkzaam op verschillende COVID-19-afdelingen met a(n)ios die niet werkzaam waren op een COVID-19-afdeling†

	A(n)ios werkzaam op niet-COVID-afdeling; Gemiddelde score (SD) n = 65	A(n)ios werkzaam op IC; Gemiddelde score (SD) n = 13	p-waarde	A(n)ios werkzaam op SEH; Gemiddelde score (SD) n = 20	p-waarde	A(n)ios werkzaam op COVID-19-cohortafdeling; Gemiddelde score (SD) n = 14	p-waarde
<b>Dimensies burn-out</b>							
Emotionele uitputting	1,0 (0,60)	1,0 (0,65)	0,75	0,9 (0,48)	0,64	1,1 (1,12)	0,43
Depersonalisatie	0,7 (0,67)	0,7 (0,33)	0,78	0,9 (0,68)	0,31	0,9 (0,62)	0,31
Persoonlijke bekwaamheid (schaal 0-6)	4,1 (0,89)	4,1 (0,78)	0,85	4,3 (0,63)	0,38	4,7 (0,45)*	0,04*
Kwaliteit van leven	4,2 (0,70)	4,1 (0,49)	0,50	4,5 (0,51)	0,17	4,1 (0,86)	0,74
Werk-privé balans (schaal 1-5)	3,7 (0,79)	3,4 (0,77)	0,31	3,8 (0,89)	0,55	3,7 (0,73)	0,84
Opgebrand gevoel	4,0 (1,16)	3,2 (1,24)*	0,02*	3,7 (1,14)	0,16	3,9 (1,03)	0,55
Angst voor besmetting (schaal 1-5)	3,6 (1,08)	3,5 (1,05)	0,79	3,9 (1,18)	0,46	3,9 (1,03)	0,50

\*significant

†9 a(n)ios gaven aan op zowel de SEH als op een COVID-19-cohortafdeling te werken, deze zijn buiten de vergelijking gelaten

We vonden geen correlatie tussen de mate van emotionele uitputting ( $r = -0,02$ ;  $p = 0,88$ ), depersonalisatie ( $r = -0,17$ ;  $p = 0,22$ ), verminderde persoonlijke bekwaamheid ( $r = 0,07$ ;  $p = 0,60$ ) en het aantal uren dat a(n)ios besteden per week aan COVID-19-zorg. Zelfs a(n)ios die aangaven dat ze de gehele werkweek besteed hadden aan COVID-19-zorg ( $n = 10$ ) waren niet meer emotioneel uitgeput ( $p = 0,42$ ), gedepersonaliseerd ( $p = 0,61$ ) of verminderd persoonlijk bekwaam ( $p = 0,31$ ) dan hun collega's die niet betrokken waren bij COVID-19-zorg.

## Beschouwing

Ons onderzoek toont aan dat a(n)ios die betrokken waren bij de zorg voor COVID-19-patienten ten tijde van de piek in COVID-19-ziekenhuisopnames (maart en april 2020) niet meer symptomen van burn-out vertoonden dan hun collega's op een afdeling werkten waar geen COVID-19-patiënten lagen opgenomen. Daarnaast werd de kwaliteit van leven en werk-privé balans door a(n)ios werkzaam op een COVID-19-afdeling niet slechter ervaren en was er ook geen grotere angst voor besmetting. Opvallend was het zeer lage percentage burn-out onder de deelnemende a(n)ios (1,7%), wat veel lager is dan eerder beschreven onder Nederlandse aios (15%).<sup>14</sup>

Er zijn verschillende mogelijke verklaringen voor het goede emotionele welzijn van onze a(n)ios betrokken bij COVID-19-zorg. Ten eerste werd in Isala (Zwolle) al in een vroeg stadium van de COVID-19 pandemie (begin maart 2020) een programma van peer support gestart.<sup>3</sup> Peer support verkleint het risico op stressgerelateerde symptomen in tijden van een gezondheids crisis, zoals bijvoorbeeld eerder beschreven tijdens de SARS-epidemie.<sup>2</sup> De eerste ervaringen over peer support voor artsen betrokken bij COVID-19-zorg tonen aan dat de betreffende artsen enorme steun ervaren.<sup>3,15,16</sup> Een dergelijk programma kan, naast het bieden van emotionele steun en stimuleren van veerkracht,<sup>3,15,16</sup> ook bestaan uit frequente en gestructureerde informatievoorziening.<sup>15,16</sup> Dit laatste kan onzekerheid en angst onder zorgmedewerkers reduceren.<sup>15,16</sup>



Ten tweede kan de COVID-19-pandemie ook als een unieke kans worden gezien door a(n)ios om te leren.<sup>3,17,18</sup> Voorwaarden hiervoor zijn een veilige leeromgeving waarbij supervisors, ondanks de crisissituatie, hun opleidersrol blijven vervullen door a(n)ios te coachen en feedback te geven.<sup>18</sup> Ook zullen a(n)ios betrokken bij de COVID-zorg het gevoel hebben dat ze een zinvolle bijdrage kunnen leveren, wat eerder al werd beschreven bij medisch studenten die ingezet werden op COVID-19 afdelingen.<sup>17,19</sup>

Ten derde is bekend uit eerdere rampen dat de acute fases van een crisis (zogenaamde heroïsche en honeymoonfase) gekenmerkt worden door adrenaline geïnduceerde teamspirit, altruïsme, verbondenheid en daarmee een stijging van het emotionele welzijn.<sup>20,21</sup> Dit fenomeen wordt ondersteund door studies die een beter emotioneel welzijn aantoonde onder zorgpersoneel betrokken bij COVID-19-zorg vergeleken met personeel van niet-COVID-afdelingen.<sup>13,22</sup> Nederlands zorgpersoneel kreeg in de acute fase enorme waardering, zowel van binnen (collega's, opleiders en ziekenhuismanagement) als buiten het ziekenhuis (media). Het is aannemelijk dat, ondanks de zware taak die a(n)ios dagelijks uitvoerden, ze hierdoor een sterk gevoel van bevoegenheid, toewijding en waardering kregen wat ze in belangrijke mate beschermde tegen burn-out. Echter, eerder onderzoek ten tijde van de SARS-epidemie laat zien dat langdurige emotionele belasting, door bijvoorbeeld een nieuwe stijging in opnames van besmette patiënten, het risico op burn-out kan doen toenemen.<sup>2</sup> Daarnaast volgt op de acute fases van de crisis vaak een fase van teleurstelling en de langdurige stress zijn tol eist.<sup>20,21</sup>

Dit is het eerste onderzoek dat de impact van de directe zorg voor COVID-19-patiënten op het emotionele welzijn van betrokken a(n)ios onderzocht. Daarnaast was het responspercentage voor een online vragenlijst hoog (58,5%), wat de representativiteit van onze steekproef vergroot. Respons op een digitale vragenlijst onder medici is vaak niet hoger dan 20%.<sup>23</sup> Het onderzoek had ook een aantal beperkingen. Ten eerste kunnen we door onze cross-sectionele onderzoeksopzet

geen oorzaak geven voor het vinden van geen verschil tussen de groepen a(n)ios. Het is mogelijk dat structurele en dus langdurige betrokkenheid bij COVID-19-zorg wel degelijk leidt tot symptomen van burn-out. Wij vonden dat a(n)ios werkzaam op de IC zich nu meer opgebrand voelden dan voor de COVID-19-pandemie, wat kan wijzen op een eerste uiting van emotionele uitputting. Longitudinaal onderzoek moet uitwijzen wat de lange termijn gevolgen zijn voor a(n)ios die zorgen voor COVID-19-patiënten. Ten tweede vond het onderzoek plaats in één ziekenhuis. Het is mogelijk dat in andere ziekenhuizen de betreffende artsen wel een hoger risico op burn-out liepen. Wij denken echter dat factoren die het emotionele welzijn bedreigen van artsen die vooropgaan in de zorg voor patiënten ten tijde van een pandemie universeel zijn, namelijk: lange werkdagen, confrontatie ernstig zieke en stervende patiënten en angst om zelf besmet te raken.

## **Conclusie**

De impact van de COVID-19-pandemie op ons zorgsysteem is gigantisch. Desondanks bleek dat a(n)ios die directe zorg verleenden aan COVID-19-patiënten ten tijde van de piek van de pandemie geen hoger risico op het ontwikkelen van symptomen van burn-out liepen. Een systematisch peer supportprogramma, de unieke kans om te leren en de adrenaline geïnduceerde teamspirit en waardering van de acute fase van de crisis zijn mogelijke verklaringen. Nu de grootste toestroom van COVID-19-patiënten naar de ziekenhuizen in Nederland voorbij lijkt te zijn, is het een geruststellende gedachte dat de COVID-19-pandemie het emotionele welzijn van de betrokken aios en anios tot op heden niet geschaad heeft.

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# Part IV

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General discussion

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# Chapter 11

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General discussion

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In the introduction of this thesis, I shared my personal experiences about being a resident myself. Now, after a decade of conducting research in the field of medical education, one might think that I've become an expert on this topic. For me though, it still feels like I only know the tip of the iceberg. Every new insight, discovery of new information or finding of answers to my research questions left me with myriad new questions. This however has not marred my enthusiasm for engaging in research regarding these topics. On the contrary, I think it will continue to fuel my drive to find the answers to the questions that have risen in this thesis. In the current chapter I will describe the answers to several of these questions, as outlined in the introduction. After an overview of our main findings, I will place our results in a broader theoretical and practical perspective, discuss the strengths and limitations of this thesis and its implications for practice and future research.

## Overview of main findings

The general aim of this thesis was to evaluate how the introduction of core components of competency-based medical education (CBME) in postgraduate medical education (PGME) affects the learning environment and how this learning environment influences resident well-being. In the first section of the thesis, we examined the effects of the introduction of key aspects of CBME in Dutch orthopedic residency training, and in the second section we explored the relationship of the learning environment to resident well-being (box 1).

### Box 1. Aims of this thesis

To evaluate:

- the impact of the introduction of several core components of CBME in orthopedic residency training on the learning environment (*chapter 2*).
- orthopedic residents' compliance with recording the required number of competency assessments in their digital portfolios (*chapter 3*).

- the association between the learning environment and orthopedic residents' and symptoms of burnout (*chapter 4*).
- the association between the learning environment and burnout among Dutch residents from different specialties (*chapter 5*).
- the association between residents' personality traits and burnout (*chapter 6*).
- the association between the learning environment and burnout among Belgian residents (*chapter 7*).
- which domains of the learning environment are responsible for the association between the learning environment and resident work engagement and burnout (*chapter 8*).
- residents' perceptions of the aspects of the learning environment that promote or hinder their well-being, in residents with experience in contrasting learning environments (Belgium vs the Netherlands) (*chapter 9*).
- the impact of caring for COVID-19-patients during the COVID-19-pandemic on resident burnout risk, their quality of life and fear of getting infected (*chapter 10*).

## **Part I – Competency based medical education in Dutch orthopaedic residency training**

**Chapter 2** describes the results of a prospective dynamic cohort study in which orthopedic residents in the Netherlands were asked to complete the Dutch Residency Educational Climate Test (D-RECT), which is a validated instrument to assess the quality of their clinical learning environment. Surveys were completed once every year, at a national compulsory orthopedic training day. We compared D-RECT scores before introduction of several core components of CBME (2009 – 2010) with D-RECT scores after this introduction (2013 – 2014). These core components included the use of structured formative feedback, improved supervisory support and the introduction of a digital portfolio. When evaluating the quality of the

learning environment as perceived by orthopedic residents over a 6-year period, we found that the quality of supervision and the quality of coaching and assessment improved significantly after modernizing the training program. Given the significance of supportive supervision, coaching and assessment for acquiring competency, we concluded that these are reassuring findings.

**Chapter 3** describes the results of a national cohort study in which we evaluated the compliance of orthopedic residents with the requirements of their digital portfolio in the Netherlands. We collected data regarding the recorded number of objective structured clinical skills evaluations, critically appraised topics and 360-degree feedback appraisals in the portfolio of the residents who had finished their training between 2012 and 2015, and compared these with the minimum requirements laid down by the training curriculum. We found that only one-third of the minimally required number of assessments were recorded in the portfolios of orthopedic residents in the Netherlands. We concluded that our findings may be important for the development of a new curriculum, which should be less complex (i.e., should contain less assessments) and more practical. Our findings could also be of interest for scientific associations of other specialties, as they are in the same process of introducing CBME curricula.

## **Part II – Resident well-being: Role of the learning environment**

In **chapter 4** we describe the results of a national cross-sectional study (2014), in which the association between the quality of the learning environment, symptoms of burnout and quality of life among Dutch orthopedic resident was assessed. We used the D-RECT to evaluate the learning environment. We assessed symptoms of burnout using 2 key items of the Maslach Burnout Inventory (MBI) and quality of life using 2 well-studied single-item linear analogue self-assessments. We found symptoms of burnout in 28% of residents, poor quality of life in 18%, and dissatisfaction with work-private life balance in 47% of the orthopedic residents. Higher ratings for the learning environment were significantly associated with fewer symptoms of burnout and

with a better quality of life in these residents. Our findings suggest that the learning environment plays an important role in the development of resident burnout.

**Chapter 5** describes the results of a similar study on the relationship between the learning environment and resident well-being in a large sample of Dutch residents from 33 different specialties. In this study we used another validated instrument to assess the perceived quality of the learning environment, namely the Scan of Postgraduate Educational Environment Domains (SPEED). We assessed symptoms of burnout using the Dutch version of the Maslach Burnout Inventory (UBOS-C). Of the 1231 residents who participated in this study, a total of 15% met the criteria for burnout. Even after adjusting for demographic (age, gender and marital status) and work-related factors (year of training, type of teaching hospital and type of specialty), we found a strong and consistent statistically significant inverse association between SPEED scores (learning environment) and the risk of burnout. With this study we confirmed that the association between learning environment and burnout does not only exist in orthopedic residency training, but exists across all residency training programs (33 specialties) in the Dutch setting.

The survey we described in chapter 5 also included the 44-item Dutch Big Five Inventory, the most widely used validated instrument to assess personality. As both environmental factors and personality related factors may affect the risk of burnout in residents, the study we describe in **chapter 6** examined the association between residents' personality traits and risk of burnout, in the same national cohort of Dutch residents as described in chapter 5. We found that neuroticism was significantly associated with resident burnout, although the effect size was small. In addition, extraversion was significantly associated with less burnout, but only in surgical residents. These findings supported our conclusion from earlier chapters that the learning environment plays a leading role in the development in burnout, because the effect of personality traits we found in the study in this chapter was relatively small.

In **chapter 7**, we examined whether the results of the studies we describe in chapters 4, 5 and 6 among Dutch residents were also applicable in another Western European country, i.e. Belgium. This study evaluated the association between the learning environment (D-RECT) and resident burnout (UBOS-C) among Belgian residents in a single large academic teaching hospital. In this study, a staggering 42% of the participating residents reported symptoms of burnout. After adjusting for hours worked per week, quality of life and satisfaction with work-life balance, we found a significant inverse association between D-RECT scores (learning environment) and the risk of burnout, like we did in Dutch residents. These Belgian residents provided considerably lower D-RECT scores than their Dutch colleagues in chapter 4. We concluded that the association between learning environment and resident burnout does not only exist across medical specialties but also in another Western European country.

To deepen our understanding of the association between learning environment and resident well-being, we assessed which aspects of the learning environment were most strongly related to resident work engagement and burnout (**chapter 8**) in the same sample of Belgian residents as described in chapter 7. We used the same instruments to evaluate the learning environment (D-RECT) and burnout (UBOS-C), and used the short version of the Utrecht Work Engagement Scale (UWES-9) to assess work engagement. Whilst the scores on the learning environment domain ‘coaching and assessment’ were strongly positively related to ‘work engagement’ and to ‘personal accomplishment’, and were negatively related to ‘emotional exhaustion’, scores on the domain of the ‘role of the specialty tutor’ were negatively related to ‘emotional exhaustion’, and ‘formal education’ scores to ‘depersonalization’ ratings. These findings suggested a key role for clinical supervisors in both resident engagement as development of resident burnout.

**Chapter 9** presents the results of an interview study among 12 residents with working experience in contrasting (Belgian and Dutch) learning environments. In

this study, we explored the experiences of these residents within these two learning environments. We asked them to reflect on aspects of these learning environments in relation to their well-being. Analysis of the interview transcripts showed a key role of clinical supervisors' behavior in resident well-being. Supervisors who act as positive role models through coaching residents in the workplace, who provide effective constructive feedback, and who foster residents' growth towards autonomy provide the residents with job resources which counteract the negative effects of job demands like heavy workloads.

In **chapter 10** we describe the results of a survey study that evaluated the impact of caring for coronavirus disease 2019 (COVID-19) patients on burnout risk, quality of life and fear of getting infected among residents, during the COVID-19 pandemic. All residents working in a large teaching hospital (Isala hospital, Zwolle, the Netherlands) during the COVID-19 pandemic (March and April 2020) were invited to fill in an online survey. We used the UBOS-C to assess burnout and validated items to evaluate quality of life, work-life balance, fear of getting infected and the feeling of being burnt out. We found a surprisingly low overall burnout rate (1.7%). We did not find symptoms of burnout (emotional exhaustion, depersonalization and reduced personal accomplishment) more frequently among residents working on COVID-19 wards compared to residents who were not involved in COVID-19 care. Furthermore, we did not find differences in residents' quality of life, work-life balance and fear of getting infected between the two groups. However, we found that residents caring for COVID-19 patients on the intensive care unit were more emotionally exhausted during the pandemic compared to before the pandemic. Possible explanations for not finding a detrimental effect of caring for COVID-19-patients on the well-being of residents are: a peer support program, the pandemic as a unique chance to learn, the team spirit and the appreciation during the acute phases of the crisis.

## Putting findings in perspective

In the following section we will discuss our main findings against the background of current literature on the clinical learning environment and resident well-being.

### Perspectives on how modernizing residency training impacts the learning environment

Although the importance of a supportive clinical learning environment in postgraduate medical education (PGME) is well recognized,<sup>1-4</sup> accurately defining the construct of the learning environment remains challenging.<sup>5</sup> The Royal Dutch Medical Association describes a supportive learning environment as: “the conditions to support the provision of postgraduate education with maximal learning effect for the residents”.<sup>6</sup> A systematic review of instruments designed to assess the quality of the learning environment found that a theoretical framework describing environments in which humans interact was also applicable to the PGME setting.<sup>7</sup> In this framework, the learning environment is characterized in three broad domains: the *content* of the program, the inter- personal aspects and *atmosphere* of the program, and the structure and *organization* of the program.<sup>7</sup> There is agreement in the literature that the learning environment is a complex construct, covering both material and psychosocial dimensions.<sup>3,4</sup> There is also consensus that in the absence of a gold standard to assess the true quality of a learning environment, residents’ evaluations of how they perceive the learning environment is the most useful and valid method to assess it.<sup>8,9</sup>

At the start of this thesis, the first validated instrument to assess the learning environment for the Dutch language area, the Dutch Residency Educational Climate Test (D-RECT), had just been developed.<sup>1</sup> This instrument consists of 50 items divided over 11 subscales; each item is scored on a 5-point Likert scale ranging from ‘completely disagree’ (1) to ‘completely agree’ (5). After its introduction, it rapidly became widely used, both in quality cycles of PGME programs and in research concerning the learning environment.<sup>6,10,11</sup> Users felt that it was a comprehensive



and a feasible tool to assess the quality of the learning environment as perceived by residents.<sup>1,12</sup> Following studies outlining key characteristics of an effective and constructive learning environment,<sup>2,3,5</sup> the D-RECT was revised to a slightly more compact version with 35, instead of the original 50 items.<sup>10</sup> In 2015, another questionnaire to assess the learning environment was developed, the Scan of Postgraduate Educational Environment Domains (SPEED). The development of the SPEED was driven by the desire to have a compact instrument to assess the learning environment, based on the consideration that shorter questionnaires generally achieve higher completion rates.<sup>13,14</sup> Another perceived advantage of the SPEED was its theoretical foundation, because it was based on a framework describing the three core domains of the learning environment.<sup>5</sup> The SPEED was validated as a comprehensive questionnaire covering the content, atmosphere, and organization of the postgraduate learning environment.<sup>7</sup> In addition to 15 items scored on Likert scales (five in each domain), the SPEED also features three domain grade scores which are appealing to residents and easy to use.<sup>7,15</sup> In this thesis, we used all three questionnaires (D-RECT, revised D-RECT and SPEED) in different studies to assess the learning environment, and found comparable results, supporting the face and construct validity of these instruments.

#### *Evaluating quality improvement after introducing a competency-based curriculum*

During the time period of the studies described in this thesis, PGME witnessed a major shift from time-based to competency-based medical education (CBME).<sup>16,17</sup> Presently, CBME residency programs have been introduced in many countries around the globe,<sup>16,17</sup> including the Netherlands.<sup>18</sup> These programs aim to ensure that residents, at completion of their training, have been verified as being clinically competent medical specialists, based on a thorough programmatic assessment of their performance during their training.<sup>17,19,20</sup> Because the introduction of these programs was accompanied by major time and effort investments from residents, supervising faculty, program directors, and hospital boards, and generated considerable costs to society, we aimed to assess which aspects of the perceived quality of the training

program improved after the conversion from time-based to CBME (chapter 2). The quality of a training program is equally difficult to operationalize and assess as the quality of a doctor, therefore we used the learning environment as a proxy measure of PGME program quality.<sup>1,10,21</sup> Although we found no overall change in learning environment quality after the introduction of some of the core components of CBME (chapter 2), the introduction of CBME was accompanied by residents giving higher scores to supervision and to coaching and assessment. This is likely to be the result of mandatory faculty development courses that supervisors had to attend during the introduction of CBME in the Netherlands. Similar effects of faculty development courses have been described by researchers in other countries.<sup>22,23</sup> This finding suggested a pivotal role for the supervisor in creating a supportive learning environment, which was supported by the results of the studies described in chapters 8 and 9. In chapter 8, we showed that resident engagement and resident burnout were associated with features of supervisor behavior. These features included (chapter 8): supervisors who effectively coach residents, supervisors who adapted residents' tasks to their level of competence and the organization of formal education.

Residents in our interview study (chapter 9) felt that certain supervisor behaviors promoted their well-being, and offered protection from the stress caused by hard and demanding work. These residents (chapter 9) appreciated supervisors who supported them by effectively taking on a coaching role. The coaching role has been conceptualized recently and is thought to comprise three core characteristics: mutual growth oriented engagement, reflection involving both resident and supervisor and acknowledgment of failure as a catalyst for learning.<sup>24</sup> Features of the coaching role also include: provision of meaningful feedback, longitudinal goal setting and observation through workplace-based assessments.<sup>23,25</sup> Our findings (chapter 9) suggest that supervisors who take on a coaching role, do not only support residents' learning process,<sup>23,26,27</sup> but also promote resident well-being, which is important because it is thought to be conditional for delivering high quality patient care.<sup>28,29</sup> A well-organized learning environment seems to moderate the effect of coaching by

supervisors,<sup>25</sup> which is supported by our findings (chapter 9). Effective coaching in PGME comprises both ‘coaching in the moment’ (structured reflection on isolated clinical activities with the aim of highlighting both things done well and points for improvement) and ‘coaching over time’ (supporting the development of clinical skills over time, leading towards progressive autonomy and independence as a competent medical specialist).<sup>23</sup>

Staying motivated is another relevant topic in PGME, because residents’ motivation is positively associated with resident performance, learning and well-being.<sup>30–33</sup> Human motivation is thought to be driven by three innate psychological needs: autonomy, competence and relatedness.<sup>32</sup> Modernized PGME programs aim to gradually grant residents more autonomy during their growth towards independent practice.<sup>16</sup> Residents in our interview study (chapter 9) confirmed the importance of autonomy and acknowledged the crucial role of supervisors who coach and support them in this process. In PGME programs, residents develop and refine their competence.<sup>16</sup> Both the development of competence and growth towards autonomy is best achieved when resident and supervisor work together by building an educational alliance (chapter 9).<sup>34</sup> Our results highlight the importance of professional relatedness between resident and supervisor (chapter 9), both for fostering resident well-being and for residents to stay motivated.<sup>35</sup> Our study shows that coaching supervisors are able to enhance resident feelings of relatedness (chapter 9), which underlines the importance of successful coaching in PGME training.

#### *Capturing and storing professional performance of residents: the digital portfolio*

One of the key changes that was implemented in PGME with the introduction of CBME was the use of a digital portfolio. Such a portfolio is not only used to document growth towards competence, but also for planning of learning activities, and to support coaching and reflection.<sup>36,37</sup> The portfolio should contain a sufficient number of workplace assessment procedures, such as mini clinical examination exercises (mini-CEXes) and objective structured assessments of technical skills

(OSATS), to allow reliable assessment of the resident's professional performance.<sup>38,39</sup> In our study of Dutch orthopedic residents' use of their digital portfolio however, only one-third of the minimally required number of assessments was recorded in their portfolios (chapter 3). These findings suggest a misalignment between the requirements laid out by the national orthopedic curriculum design committee for the minimal number of workplace assessments to be recorded in a portfolio and the daily orthopedic PGME practice in teaching hospitals. The recognition of this misalignment has led policymakers to implement a new, easier to use portfolio with fewer required portfolio entries to enhance compliance with its use.<sup>40</sup> Thus, our study has contributed to the growing body of evidence that portfolios can be used to support learning in PGME,<sup>37,41</sup> but that its success is dependent on the content of the portfolio, the way in which the portfolio use is being supervised and coached by faculty, and the way in which faculty assesses and interprets the data collected in a digital portfolio.<sup>42-44</sup> To support learning in PGME, a clear distinction between feedback intended to support growth and formal high-stakes assessment is essential.<sup>45-47</sup> The tendency of residents to regard workplace-based assessments intended to support growth (like the mini-CEX) as high-stakes exams,<sup>48</sup> will increase residents' hesitation to request workplace assessments from their supervisors and record these in their portfolio. Residents' belief that these assessment tools provide the most important proof to demonstrate their clinical competence increases their hesitation,<sup>49</sup> unless the assessments show a favorable representation of their competence.<sup>50</sup> Supervisors and program directors can reduce this 'playing the game' behavior from residents by highlighting the distinction between low-stakes coaching for growth and high-stakes assessments of competence,<sup>23</sup> providing frequent constructive feedback to support growth,<sup>24</sup> and help to develop a nonhierarchical department culture which supports the provision and reception of bidirectional feedback between residents and supervisors.<sup>51</sup>

## **Perspectives on how aspects of the learning environment influence resident well-being**

### *Resident well-being under pressure*

Over the past 15 years, burnout has emerged as an important issue threatening employees' (or residents in PGME) well-being.<sup>52</sup> The work-related syndrome of burnout involves three dimensions: emotional exhaustion, depersonalization and reduced personal accomplishment.<sup>52</sup> Emotional exhaustion is the process of mental energy depletion, which results from chronic stress and is therefore more than being tired or feeling worn out after a day of hard work. Depersonalization is characterized by a negative, cynical or detached response to patients and colleagues. Reduced personal accomplishment is the perception of lacking competence in performing tasks requiring responsibility. Burnout is particularly relevant in PGME, because the well-being of residents is essential for delivering high quality patient care.<sup>28</sup> The increasing prevalence of resident burnout is therefore not only a major concern to residents themselves,<sup>53</sup> but also to their patients. Residents suffering from burnout commit more medical errors,<sup>54,55</sup> have twice as many patient safety incidents<sup>56</sup> and deliver suboptimal quality patient care<sup>28</sup> compared to residents not suffering from burnout.

The problem of physician burnout is widespread and has now reached 'global epidemic' levels.<sup>57</sup> Recent reports show burnout rates as high as 78% among physicians in the United States.<sup>57,58</sup> In the United Kingdom, 80% of physicians were at high or very high risk of burnout, with residents most at risk.<sup>59</sup> The reported ranges of burnout rates are wide and vary between 15% (chapter 5) and 80%.<sup>59</sup> These wide ranges can be partly attributed to the use of different definitions and instruments to assess burnout,<sup>60,61</sup> but the differences in burnout rates between countries described in the literature are too big to be entirely explained by different definitions and measures of burnout.

Because one of the components of burnout is an individual's mental energy depletion,<sup>52</sup> it could be hypothesized that a person who is suffering from burnout lacks resilience,<sup>62</sup>

thus implying a role for personal factors in the development of burnout. Although we indeed found personality traits to be associated with burnout (chapter 6), the effect size was small and the positive effect of one personality factor (extraversion as a protective factor) was only seen in surgical residents. Most researchers in the field of burnout agree that burnout is rooted in issues concerning the social and working environment:<sup>63–66</sup> Burnout is not a problem of people or the individual, but of the social environment in which they work.<sup>63</sup> In PGME, this social work environment is the clinical learning environment.<sup>1,7</sup> In the following sections we will discuss the association between the learning environment and resident well-being, and explore which aspects of the learning environment are responsible for this association.

#### *Enhancing resident well-being: key role of the learning environment*

Before the start of this thesis, the scant available literature on the role of the learning environment in determining resident well-being showed an increased risk of resident burnout when residents perceived little reciprocity in the professional relationships with their supervisors.<sup>67</sup> Reciprocity can be described as a social norm that involves one person rewarding positive actions of the other.<sup>67</sup> In the daily practice of residency training, reciprocity often involves faculty rewarding the efforts of a resident (e.g. doing on call duties, ward rounds and administration), with an appropriate amount of learning opportunities.<sup>67</sup> Residents experiencing reciprocity in the relationship with their supervisors found that effective supervision, sufficient operating time and attention to the individual competence throughout their training positively influenced their well-being.<sup>68</sup> Although these early studies examined how specific aspects of the learning environment are related to resident well-being, the role of the overall learning environment in relation to resident well-being and burnout risk remained unclear. In a series of studies presented in this thesis, we identified a strong, consistent, dose-dependent inverse association between the perceived quality of the learning environment and burnout risk among residents (chapter 4, 5, 7 and 8). Residents giving higher scores to their learning environment had less symptoms of burnout (chapter 4 and 5). After first demonstrating this association in a population

covering almost all Dutch orthopedic residents (chapter 4), we then generalized these findings to Dutch residents across the full range of medical specialties (chapter 5) and to residents from a different country (Belgium) (chapter 7 and 8), supporting the robustness of the association between learning environment and resident well-being. A recent study showing a positive association between learning environment and resident engagement and job satisfactions is in line with our findings that the overall learning environment is associated with resident well-being.<sup>69</sup>

### *Job Demands and Resources Model*

A useful theoretical lens of interpreting the results from these studies is the job demands and resources (JD-R) model (Figure 1).<sup>70,71</sup> The JD-R model describes the relationship between stress, exhaustion and engagement in an employee (in PGME: the resident) based on the balance between job demands and job resources. Job demands exhaust residents whilst job resources foster engagement. In addition, job resources can buffer the negative impact of job demands, thus reducing the risk of burnout.<sup>71,72</sup>

In our study described in chapter 7, we found that the D-RECT domains ‘role of the specialty tutor’ and ‘coaching and assessment’ were rated significantly higher by residents without symptoms of burnout compared to those with symptoms of burnout. Several studies in the field of occupational psychology have shown that supervisors play an important role in fostering the well-being of employees.<sup>70,73</sup> We can add to this knowledge that, also in the specific setting of residency training, supportive supervision is a crucial job resource for residents. In our qualitative study (chapter 9) residents mentioned that reciprocity in the relationship with their supervisors, and supervisors who effectively took a coaching role greatly enhanced their engagement. This finding is consistent with prior research among medical students<sup>74</sup> and rural doctors<sup>75</sup> and was also described in a recent review on coaching in medical education.<sup>76</sup>

Another aspect of supportive supervision, and thus an important job resource, is professional autonomy (chapter 9). The association between autonomy and well-

being is widely acknowledged in the literature.<sup>32,71,77,78</sup> Supervisors can actively promote their residents' well-being by offering residents a certain degree of autonomy both in performing daily clinical tasks and in facilitating the achievement of learning goals. Granting autonomy to residents can be supported by the process of self-directed learning.<sup>79</sup> A practical way of operationalizing self-directed learning is the use of entrustable professional activity (EPA)-based assessment.<sup>80</sup> The EPA, which is considered a specific task or unit of professional practice, is a relatively new instrument to facilitate self-directed learning.<sup>80</sup> EPA's are the link between assessment and decision making about entrustment, they promote the development of competencies and facilitate the move towards CBME by making competencies meaningful, trainable and assessable for supervisors.<sup>80-82</sup> Residents act with a gradually decreasing amount of supervision on their way towards full entrustment as their competence grows.<sup>80</sup> Therefore, scales of supervision and entrustment have been designed to assess residents and entrust them with increasing levels of autonomy.<sup>80</sup> EPA's create opportunities for residents to safely participate in daily clinical practice, while being supported by a safety net of supervisors.<sup>83-86</sup> Safe participation can thus be considered an outcome of entrustment<sup>86</sup> and a means for preparing residents for independent practice.<sup>80,87</sup> One of the key mechanisms to achieve safe participation is feedback, which is widely recognized as one of the leading facilitators of learning.<sup>88,89</sup>

Feedback is a bidirectional process and thus considered a mutual co-construction of resident performance, constructed both by supervisors and residents.<sup>86</sup> The way residents experience feedback and how feedback acquires meaning is highly complex and influenced by individual, contextual and cultural factors.<sup>90,91</sup> Barriers to successful feedback exchange described in the literature are: perceived adverse consequences, unclear expectations, perceived threats to self-esteem or autonomy and lack of space for reflection.<sup>92-94</sup> It has also been acknowledged in prior research that if the professional culture creates barriers to feedback, this attenuates the value of feedback and learning.<sup>91</sup> Our qualitative study confirmed that a culture of excellence



(chapter 9), in which the reputation of the institution and pedigree of residents inhibited meaningful feedback,<sup>92</sup> compromises both the delivery and the reception of meaningful feedback. Conversely, a culture of growth in which constructive bidirectional feedback exchange is commonly accepted helps to support residents in achieving increasing competence (chapter 9).<sup>91,92</sup> Hence, the learning culture can be both an important job demand or job resource, which is supported by the experiences of residents in our interview study (chapter 9).

After gaining insight in aspects of the learning environment that influence the risk of burnout, we evaluated learning environment aspects that serve as job resources by promoting resident engagement (chapter 8). We found that the learning environment domains 'coaching and assessment' and 'work adoption to residents' competence' were positively associated with engagement (chapter 8). These findings suggest that when residents are given tasks that are in line with their level of competence and given opportunities to learn new tasks, this serves as an important job resource. A recent review described similar findings, namely that opportunities to learn are associated with greater resident well-being.<sup>95</sup> Another study showed that the learning environment domains 'role of the specialty tutor' and 'work adoption to resident's competence' were also associated with greater job satisfaction in residents,<sup>96</sup> which emphasizes our results (chapter 9) that supervisors and opportunities to develop competence are important job resources for residents. The ability of job resources (e.g. workplace coaching, effective feedback, opportunities to grow, autonomy) to buffer job demands (e.g. heavy workloads) was consistently acknowledged by residents in our qualitative study (chapter 9).<sup>71,72</sup> Sufficient learning opportunities are essential for residents to develop competence, which helps them to stay motivated<sup>32</sup> and promotes their well-being (chapter 9).<sup>30,31,33</sup>

We propose that the aspects of the learning environment we mentioned above (e.g. supportive supervision, effective feedback, sufficient autonomy) can become job demands when they are absent. Among medical students, negative role modeling

of supervisors has been associated with an increased risk of depression.<sup>97</sup> Moreover, supervisors who do not provide coaching, who are highly demanding towards residents, and who provide inadequate professional autonomy or are harassing, have a detrimental effect on resident well-being by seriously increasing their risk of burnout.<sup>98,99</sup> Our findings (chapter 4, 5, 7, 8, 9) strongly support the notion that supervisors play a crucial role in nourishing the well-being of residents and thereby indirectly supporting the health of their patients. This means supervisors have an exceptionally great responsibility, which is something they should be aware of every day they supervise residents. The literature supports the hypothesis that supervisors can best achieve their goal of promoting resident well-being by investing in a coaching, non-hierarchic supportive way of supervising residents.<sup>92</sup>

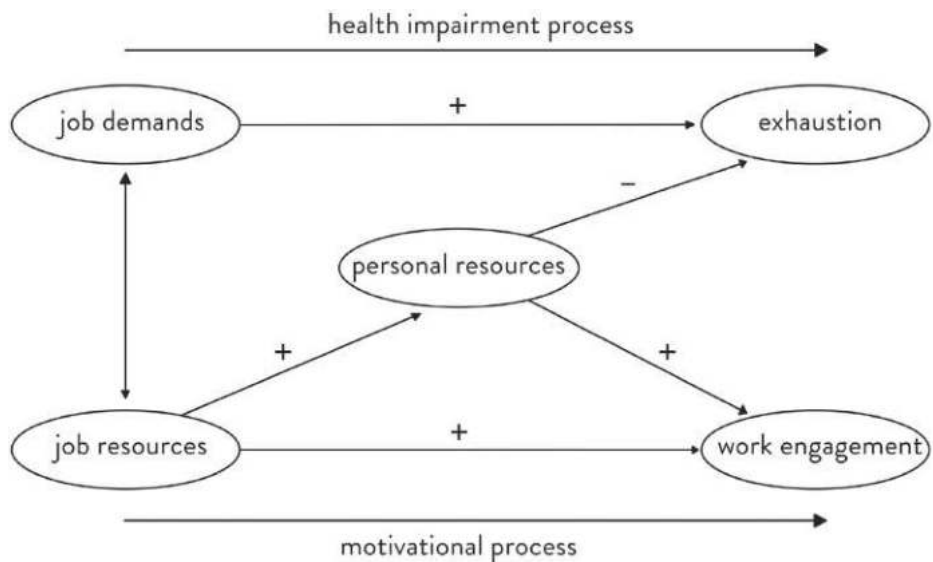
#### *Resident well-being in times of crisis: the COVID-19 pandemic*

Prior research has shown that a health crisis such as a pandemic poses a serious threat to the well-being of health care workers.<sup>100</sup> Safeguarding resident well-being is a challenge during a health crisis like the recent COVID-19 pandemic, because residents are often working at the forefront of patient care and thus have to deal with a high volume of patients, the fear of getting infected themselves, the limitations imposed by protective measures, hindering them from providing the emotional support their patients and families need most. Besides, especially during a pandemic, appropriate supervision is as vital as the patient care itself.<sup>101</sup>

Despite the apparent strain and stress that has been placed on residents during the COVID-19 pandemic, we found that residents' well-being was unaffected by providing daily care to COVID-19 patients (chapter 10). This finding is in contrast with another recent study that showed an increase in depression, anxiety, insomnia and stress among those who care for COVID-19 patients.<sup>102</sup> We think there are several possible explanations for our findings. Firstly, residents taking part in our study who cared for COVID-19 patients participated in a peer support system that included daily debriefing sessions and emotional support. Peer support is known to reduce

the risk of stress-related symptoms like burnout and post-traumatic stress disorder,<sup>103</sup> and residents participating in such a program during the COVID-19 pandemic highly appreciated it.<sup>104,105</sup> Secondly, we believe that the COVID-19 pandemic could also be regarded as a unique learning opportunity for residents, which is supported by reports of medical students working on COVID-19 wards.<sup>101,106</sup> It should be noted though that effective learning in a crisis can only be successfully achieved in a supportive learning environment in which supervisors continue to coach residents and provide them with feedback.<sup>101,104</sup> Thirdly, studies on previous major disasters and crises have shown that the acute phases of a crises are characterized by adrenaline-induced team spirit, altruism, social bonding and enormous appreciation.<sup>107</sup> This phenomenon can be regarded as an important job resource, which is supported by studies describing a lower burnout risk in those involved in COVID-19 care.<sup>108,109</sup> Long-term follow-up of the cohort that we studied is needed to examine whether their psychological well-being is maintained in the long run, or that adverse psychological sequelae develop in a later aftermath of the COVID-19 crisis.

**Figure 1.** The Job Demands-Resources Model.



*Adapted from Mastenbroek ea*

## Strengths and limitations

One of the main strengths of this thesis lies in the relevance of the topics we studied: how changes in the design of the PGME curriculum affect the learning environment and how the learning environment itself affects resident well-being. Optimal resident well-being is a prerequisite for delivering high quality patient care,<sup>28,29,54</sup> which emphasizes the societal relevance of our studies. Another important strength is the use of mixed methods to conduct our research. The quantitative studies gave us insight in aspects of the learning environment that residents noted to be improved by introducing a CBME program, and these studies also revealed the consistent and dose-dependent association between learning environment and resident well-being. The qualitative study we conducted gave us in-depth knowledge of factors that promote or hinder resident well-being. Another strength is that we conducted studies among residents from different specialties and from different countries. The association between learning environment and resident well-being was apparent across specialties and countries, which increased the generalizability of our findings.

A limitation of the studies in this thesis is that we relied solely on the resident's perception of the complex construct of the learning environment.<sup>1,3</sup> Despite this limitation, the use of validated and theory-based instruments like the D-RECT and the SPEED proved easy to use and allowed the assessment of the relationship between learning environment and resident well-being in large groups of residents from different specialties and countries. Our qualitative study contributed to the construct validity of the D-RECT and the SPEED by highlighting the key role of supervisor behavior in the perceived quality of the learning environment. A recent study showing that residents' judgments of the learning environment are not influenced by social desirability bias or by fear of repercussions from supervisors<sup>15</sup> also supports the validity and reliability of these assessment methods of the quality of the learning environment. Another limitation is the cross-sectional design of most of our studies, which precluded us from finding a causal relationship between

learning environment and resident well-being. In our qualitative study however, the experiences of residents confirmed our assumptions that supportive learning environments foster resident engagement and reduce the risk of burnout.

## Implications for practice and future research

### Implications for practice

#### *For residents*

In reciprocal relationships between resident and supervisor it ‘takes two to tango’, which implies that both residents and supervisors should invest in their professional PGME relationship.<sup>34</sup> Residents can achieve this by taking the initiative to discuss their learning goals and points for improvement with supervisors. This process of self-directed learning can be enhanced by assigning a mentor or coach to residents, because coaches are able to support residents’ learning process by facilitating the use of learning plans and long-term goal setting.<sup>79,110</sup>

We found that in a hierarchal learning culture resident feel reluctant to seek for feedback, because in such a culture, feedback is often perceived as a test instead of a chance to learn (chapter 9). This implies residents need to be aware of the goal of feedback, which is aimed at learning and thus an effective means of developing competence. Awareness of the goal of feedback can promote their feedback seeking behavior and receptivity.<sup>50,92,111</sup> Our findings imply that being receptive to feedback not only enhances the residents’ learning process, but also positively influences their well-being through stimulating their engagement (chapter 9).

Most of the factors that contribute to the development of burnout, like non-supportive learning environments (chapter 4, 5, 7, 8, 9) and personality traits (e.g. neuroticism) (chapter 6) are beyond the control of residents.<sup>52,63,64,112</sup> There are however some individual choices (e.g. increasing social support by building relationships, ensuring enough time to rest and sleep, engaging in hobby’s and exercise, maintaining good personal health, participating in resilience training and reducing financial debt)

residents can make that influence how work-related stressors impact their well-being.<sup>113–116</sup> In making these choices, residents take ownership of their personal well-being by integrating their private and professional lives,<sup>99</sup> which implies they can promote their own well-being by allocating time for personal study, social activities, hobbies and rest. It should be realized, that data suggests that physicians are poor at calibrating their own well-being<sup>117</sup> and may be reluctant to seek help when they are in distress or suffer from burnout.<sup>118</sup> Therefore, we suggest that residents discuss their well-being with supervisors regularly, even if they feel they are doing alright and perceive no issues concerning their well-being. Although these personal actions may have some positive effect on their well-being, they are unlikely to be effective when taken as isolated measures. The results of this thesis strongly support the notion that burnout can only be successfully prevented in a safe and supportive learning environment, which should therefore be the primary goal of interventions aimed at improving resident well-being.<sup>52,63,64,112,119</sup>

#### *For supervisors*

Supervisors need to be aware of their pivotal role in creating a supportive learning environment and in nourishing resident well-being. Positive role modelling is crucial and this can be achieved by taking on the coaching role, which enhances resident well-being (chapter 9). The positive effect of coaching on resident well-being is supported by prior research.<sup>76</sup> Practical features of coaching include the frequent provision of constructive feedback, longitudinal goal setting, observation through workplace-based assessments and taking a personal interest in residents.<sup>23,25</sup> In our opinion specific faculty training programs on how to serve as coaches could be very helpful for supervisors.<sup>22</sup> In addition to faculty development, effective collaboration of supervisors seems to benefit the learning environment, which implies that not only individual teaching skills but also effectiveness of teamwork should be targeted when supervisors aim to improve the learning environment.<sup>120</sup>

Modern CBME training programs tend to be more individualized, addressing personal goals and needs of the individual resident.<sup>17,40,81,121</sup> A special focus on well-being should be included in this individual approach, as every resident has its own characteristics, preferences and personality. Therefore, well-being could be integrated in the training related conversations that residents have with their supervisors. It might be helpful if they did not only discuss their training goals, but also the job resources and demands they experience. The way residents care for themselves, which includes their personal well-being, can be considered part of medical professionalism, because their well-being impacts the patient care they deliver.<sup>28,54,64</sup> Professionalism is a competence that is trained in modern CBME programs<sup>121</sup> and we suggest that supervisors view well-being as an integral part of residency training, which means it can be discussed and calibrated during bilateral conversations between a supervisor and a resident and appropriated actions can be taken accordingly.

#### *For policy makers*

In this thesis we found strong and consistent association between the learning environment and resident well-being. This finding implies that monitoring and improving clinical learning environments should be a top priority for hospital-wide education committees. These committees have been installed for monitoring the quality of residency training, supporting continuous quality improvement efforts and promoting healthy learning environments.<sup>122,123</sup> Hospital-wide education committees are thought to have an increasing ability to commence supporting steps towards improving PGME,<sup>122</sup> which they can achieve by the use of Plan-Do-Check-Act (PDCA) cycles.<sup>123</sup>

Several initiatives have been launched around the world that try to review and improve learning environments. One example is the Clinical Learning Environment Review Program (CLER) in the United States.<sup>124</sup> The aim of the CLER program is to provide participating teaching hospitals with periodic feedback that addresses

the quality of the learning environment.<sup>124–126</sup> Dutch initiatives to improve the learning environment, including PDCA cycles, have been proposed by a committee (Scherpbier Committee) appointed by the government with the task of investigating indicators of quality assurance and propose actions for improvement.<sup>6</sup> The goals of the Dutch PDCA cycles and the CLER program are similar: they aim for quality assurance and improvement of learning environments in PGME by a systematic organizational-level approach.<sup>6,122,124</sup> The findings in this thesis underline the importance of system-based approaches that facilitate exchange of policies and best practices of continuous quality improvement in PGME, thereby contributing to a supportive learning environment for residents.

Furthermore, we found that supervisors who take on a coaching role effectively support the growth of residents towards professional autonomy (chapter 9). The recognition of the importance of the coaching role has led to the exploration of new approaches to faculty development in CBME, like the Canadian ‘Coaching-by-Design’ program.<sup>23</sup> This initiative puts an emphasis on the coaching role of the supervisor in enhancing the learning environment. We found that supervisors are generally unfamiliar with the coaching role (chapter 9), therefore we suggest hospital-wide education committees invest in faculty development aimed not only at improving didactic skills of supervisors but also at developing a coaching role.

### **Implications for future research**

The results of the studies in this thesis provide several new opportunities for future research. We highlighted the role of the supervisor in establishing a supportive learning environment that nourishes resident well-being repeatedly in this thesis. The aim of faculty development programs is to improve supervisors’ skills as educators and teachers and research has confirmed its effectiveness in achieving this goal. Faculty development could therefore provide supervisors with the essential skills to become successful ‘feedback-coaches’ of residents<sup>127</sup> and is considered an imperative next step in the further development of CBME programs.<sup>23</sup> Although



the importance of coaching in residency training seems clear, there is still lack of evidence for specific faculty development initiatives and future research is needed to evaluate and guide the development of faculty development for coaching.

In addition, we described in this thesis that increasing autonomy experienced by residents during their training enhances their engagement. The process of self-directed learning could grant residents with more autonomy by using EPA-based assessment. Dutch PGME curricula are now being redesigned to include EPA-based assessment. A supervisor who entrusts an EPA to a resident, grants that resident the permission to perform that specific task unsupervised from that specific moment onwards.<sup>80</sup> To increase the reliability of these decisions, it appears logical to involve all faculty members involved in the resident's training in making entrustment decisions. A previous study in Dutch PGME showed that faculty reach a group judgment on residents' competence by sharing and exchanging information about working with the residents in formal and informal meetings.<sup>49</sup> Future research could focus on how all supervisors involved in the training of a specific resident, can reach summative entrustment decisions.

Several interventions, like resilience training,<sup>128</sup> mindfulness courses<sup>129</sup> and heart coherence techniques,<sup>130</sup> have been proposed to prevent resident burnout. We believe these interventions could have a positive effect on resident well-being, but the results presented in this thesis support the crucial role of environmental factors in the development of burnout and in promoting resident engagement. Our findings are supported by other studies that found a key role for the learning environment in determining burnout risk.<sup>63,64,71,131</sup> Despite the pivotal role of the learning environment in determining resident well-being, intervention studies are needed to determine whether interventions aimed at improving the learning environment reduce the risk of resident burnout.

Furthermore, in the studies described in this thesis we evaluated the perceptions of residents. The experiences of other professionals who interact with residents, especially the supervising medical specialists, might have enriched our data. We think future research evaluating the learning environment and resident well-being could also include the experiences of the entire spectrum of health care professionals involved in the training of residents.

Finally, we revealed that residents caring for patients with COVID-19 did not show more symptoms of burnout or perceived lower quality of life during the COVID-19 pandemic. However, the treat of this contagious and life-threatening disease is not likely to resolve in the near future and it is unknown how the pandemic affects resident well-being in the long term. Longitudinal studies are needed to determine the long-term effects of caring for COVID-19 patients.

### **Personal implications**

While writing this thesis I have begun to better appreciate the complexity of integrating residency training into daily clinical practice. This increased my feelings of respect for my own supervisors as I realized how difficult it is to be a medical specialist focusing on patient care, while being an effective and supportive supervisor at the same time. I have also learnt how energizing and fun it can be, seeing and facilitating residents grow professionally. At the same time, I memorized the that it can be a hard life for residents keeping a lot of balls in the air. Residency training should not be a matter of “sink or swim” or “keep yourself alive”, as some residents working in unhealthy environments described their training period. Bringing the importance of supportive learning environments to the attention of residents, supervisors and policymakers are to me the most important personal implications.

### **Concluding remarks**

Over the past decade I've been meticulously scrutinizing some of the major educational changes in residency training and several important aspects of resident

well-being. This work resulted in several new perspectives about CBME in residency training, its effect on the perceived quality of the clinical learning environment and the association between this learning environment and resident well-being. I sincerely hope that this thesis contributes to the understanding and the improvement of both the learning environment and resident well-being. Besides, I hope it will instigate new research, as residency training should not be static but a dynamic educational process that will need to constantly adapt to ever changing societal and patient needs. Although I've only rarely mentioned *the patient* in this thesis, I have to emphasize that the ultimate goal of modernizing residency training and promoting a supportive learning environment that enhances resident well-being, is the improvement of patient care. Therefore, this thesis is dedicated to all residents, who will be our medical specialists of tomorrow, responsible for our care and the care of our children.

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# Chapter 12

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## Summary

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In chapter 1 we introduced the topics and the aims of this thesis. The topics of this thesis are: modernizing postgraduate medical education (PGME), the impact of this modernization process on the learning environment and the role of the learning environment in determining resident well-being. Our aims were to examine (1) how the introduction of competency-based medical education (CBME) in PGME affects the quality of the learning environment and (2) the relationship between the quality of the learning environment and resident well-being.

In chapter 2 we examined how the introduction of core components of CBME in orthopedic PGME impacts the perceived quality of the learning environment. The current era of PGME witnessed major changes during the worldwide introduction of CBME programs. CBME is a learner-centered approach to PGME, which focusses on acquiring competencies, instead of spending a predetermined amount of time in a training program. Core components of such programs include the use of structured formative feedback, increased supervisory support and the introduction of a digital portfolio. Modernizing PGME involves considerable costs and efforts from residents, supervising faculty, program directors and hospital boards. This raises the issue of whether CBME actually improves the quality of PGME. Because the quality of training programs is difficult to operationalize and assess, we used the so-called learning environment as a proxy measure of PGME program quality. The learning environment is a complex construct that refers to the social interactions, organizational culture and structures, and physical and virtual spaces that surround and shape the learners' experiences, perceptions, and learning. Residents' perceptions of the learning environment are thought to be the most useful and valid method to assess its quality. We conducted annual surveys among Dutch orthopedic residents in a national dynamic cohort study. In this study we used the Dutch Residency Educational Climate Test (D-RECT), a well-studied and validated instrument, to assess the perceived quality of the learning environment. We compared D-RECT scores from before (2009 and 2010) to after (2013 and 2014) the introduction of CBME core components. After the introduction of CBME, residents

perceived a higher quality of supervision and of coaching and assessment, but their overall appreciation of the learning environment did not change. These findings likely reflect the positive effect of faculty development courses that supervisors had to attend during the introduction of CBME in the Netherlands, because faculty development had similar positive effects on the quality of supervisory support in other countries. These results highlighted a key role for the supervisor in creating a supportive learning environment.

One of the core components of CBME is the use of a digital portfolio. Portfolios are used in PGME to document residents' growth towards independent practice, to support reflection and coaching and as a tool for planning learning activities. Sufficient numbers of workplace-based assessments (e.g. mini clinical examination exercises (mini-CEx) and objective structures assessments of technical skills (OSATS)) need to be recorded in the portfolio to support a reliable assessment of residents' professional performance. In chapter 3 we described Dutch orthopedic residents' compliance with keeping a digital portfolio. Over a 4-year period we collected the number of mini-CExes and OSATS recorded in the portfolios of all Dutch orthopedic residents upon finishing their training. We compared these data with the requirements laid down by the PGME curriculum and found that only one-third of the minimally required number of workplace-based assessments were recorded in the portfolios of these residents. Our results suggest a mismatch between minimum requirements that the national orthopedic curriculum design committee laid out and the daily orthopedic PGME practice in teaching hospitals. These findings are in agreement with existing evidence that the use of portfolios support learning, but that the success of a portfolio is dependent on its content, the way its use is being supervised and coached, and the way supervisors assess the documented data in a portfolio.

In chapter 4 to 9 we examined how the learning environment affects resident well-being. There is considerable concern in the medical educational literature about

the increasing prevalence rates of symptoms of burnout among residents. Burnout is a work-related syndrome that involves three dimensions: emotional exhaustion, depersonalization and reduced personal accomplishment. A theoretical model to understand burnout is the so-called job demands and resources (JD-R) model. At the heart of this model lies the assumption that an imbalance between positive (job resources) and negative (job demands) work-related factors can lead to burnout. Burnout among residents is a particularly relevant topic, because optimal resident well-being is a prerequisite for delivering high quality patient care, and burnout among residents is associated with an increased risk of medical errors and patient safety incidents. Most burnout researchers agree that burnout should not be regarded as a problem of the individual, but that it is rooted in issues concerning the social and working environment, which is the learning environment in PGME. Therefore, we hypothesized that the learning environment plays a crucial role in determining resident work-related well-being. In chapter 4 we presented the results of a national cross-sectional survey study among Dutch orthopedic residents, in which we examined the association between learning environment, symptoms of burnout and quality of life. We evaluated the learning environment using the D-RECT, burnout symptoms using two key items of the Maslach Burnout Inventory (MBI) and quality of life using two validated single-item linear analogue self-assessments. Orthopedic residents giving higher scores to the quality of the learning environment had less symptoms of burnout and better quality of life. These findings led to our conclusion that a supportive learning environment promotes the well-being of orthopedic residents in a Dutch PGME setting.

In chapter 5 we described the findings of a study that further explored the role of the learning environment in influencing resident well-being. We aimed to generalize the results, described in chapter 4, from orthopedic residents to Dutch residents from all medical specialties. In this study we used a different instrument to measure learning environment quality, the Scan of Postgraduate Educational Environment Domains (SPEED), which is another validated tool to assess the learning environment, and has



the advantage of being shorter than the D-RECT and is based on a solid theoretical framework. We assessed burnout using the Dutch version of the MBI: the UBOS-C. In this national cohort of Dutch residents from 33 specialties, 15% met standard criteria for burnout. We found a strong and statistically significant inverse association between SPEED scores and burnout, which remained significant after adjustment for demographic (age, gender and marital status) and work-related factors (year of training, type of teaching hospital and type of specialty). We concluded that the association we described in chapter 4 among orthopedic residents, also exists across all other Dutch residency training programs.

Because personal factors can also influence resident well-being, we examined to which extent personality traits contribute to the development of resident burnout in the study described in chapter 6. For this study we used the same sample of Dutch residents described in chapter 5 and evaluated personality using the validated 44-item Dutch Big Five Inventory. Among participating residents, we found that neuroticism was significantly, but weakly associated with burnout. Extraversion was significantly associated with less burnout, but only in surgical residents. We concluded that although personality traits contribute to resident burnout, the effect size was relatively small and the positive effect of one single personality factor (extraversion as a protective factor) was only seen in surgical residents. Taken together, these findings support the earlier conclusions of chapter 4 and 5, that the quality of the learning environment is leading in determining resident burnout risk among residents.

To further assess the robustness of the association between learning environment and resident well-being, we conducted a study (chapter 7) among residents in a different country: Belgium. We evaluated the learning environment, using the revised version of the D-RECT, and burnout, using the UBOS-C, among Belgian residents in a single academic hospital. In this study, an astounding 42% of participating residents suffered from symptoms of burnout. These findings generalized the results

from chapters 4 and 5 to residents from another country, because we again found a significant inverse association between the quality of the learning environment (D-RECT scores) and burnout (UBOS-C scores), also after adjusting for hours worked per week, quality of life and satisfaction with work-life balance. The association between learning environment and resident burnout therefore exists across countries. Besides, burnout rates among Belgian residents were much higher than found among Dutch residents (chapter 5) and the quality of the learning environment (D-RECT scores) was rated considerably lower by Belgian residents than by Dutch residents (chapter 4).

In chapters 4 to 7 we identified a strong, consistent, dose-dependent inverse association between the perceived quality of the learning environment and resident burnout. The positive antithesis of burnout is called work engagement, which is defined as a fulfilling, work-related state of mind that is characterized by vigour, dedication and absorption. Engaged residents report better professional performance and fewer medical errors. In chapter 8 we described our study evaluating which aspects of the learning environment were most strongly related to resident work engagement and which to burnout, using the same sample of Belgian residents described in chapter 7. We used the short version of the Utrecht Work Engagement Scale (UWES-9) to assess work engagement. We found that the learning environment domain 'coaching and assessment' was strongly positively related to 'work engagement' and to 'personal accomplishment', and was negatively related to 'emotional exhaustion'. The domain of the learning environment 'role of the specialty tutor' was negatively related to 'emotional exhaustion' and the domain 'formal education' was negatively related to 'depersonalization'. We concluded that our findings further highlighted the crucial role for clinical supervisors, both in promoting resident engagement as in preventing resident burnout.

In chapter 7 we described that Belgian residents, compared to Dutch residents, reported a considerably higher risk of burnout risk and gave much lower scores to

the quality of their learning environment. These findings instigated our qualitative study described in chapter 9, in which we explored which differences (between Belgium and the Netherlands) in learning environment were perceived by the participating residents as responsible for the aforementioned differences in burnout rate and learning environment quality. We interviewed 12 residents who spent part of their training in Belgium and part in the Netherlands. We argued that these residents would be in the unique position of being able to compare both learning environments (the Belgian and the Dutch) and thus could provide crucial information about how the differences in learning environment quality impacts resident burnout risk and about facilitators and barriers to quality improvement of learning environments. Analysis of the interview transcripts revealed a key role for the supervisor in creating a supportive learning environment that promotes resident well-being. Residents strongly felt that supervisors who were positive role models facilitated their learning process by workplace coaching that was attuned to their learning aims and stimulated their well-being. They also highlighted that provision of meaningful feedback is vital in reciprocal supervisor-resident relationships. In addition, they mentioned the importance of autonomy and being able to balance opportunities to grow towards independent practice against heavy workloads in determining their well-being. We concluded that resident well-being can be considerably promoted by supervisors who act as positive role models through coaching their residents, providing meaningful feedback and nourishing residents' growth towards autonomy.

Chapter 10 dealt with the impact of the recent COVID-19 pandemic on the well-being of residents who were involved in providing medical care to COVID-19 patients. We evaluated burnout risk, quality of life and fear of getting infected among 207 Dutch residents during the peak of the COVID-19 pandemic (March and April 2020). Burnout was assessed using the UBOS-C. Quality of life, work-life balance, fear of getting infected and the feeling of being burnt out were assessed using validated items. A total of 121 (58.5%) residents completed the survey. Two

(1.7%) met the standard criteria for burnout. We did not find symptoms of burnout (emotional exhaustion, depersonalization and reduced personal accomplishment) more frequently among residents working on COVID-19 wards compared to residents not involved in COVID-19-care. Moreover, we did not find differences in residents' quality of life, work-life balance and fear of getting infected between the two groups. However, residents caring for COVID-19 patients on the intensive care unit felt more burned out during the pandemic compared to before the pandemic. Despite the tremendous impact of the COVID-19-pandemic on health care systems, we did not find a higher burnout risk among residents directly involved caring for COVID-19-patients. We noted that a peer support program, a chance to learn, the team spirit and the appreciation during the acute phases of the crisis are possible explanations.

In chapter 11 we reflected on our findings and gave new perspectives on modernizing PGME, the learning environment and resident well-being. Residents appreciated the introduction of several core components of CBME, namely: the more explicit assessment (e.g. using mini-CEX and OSATS) and enhanced supervisory support (probably due to mandatory faculty development). Another core component of CBME, a digital portfolio, can be a successful instrument for coaching, reflection, planning, assessment and for documenting growth towards competence. However, its success depends on the content, the way its use is supervised and coached and the way supervisors interpret the documented assessments. We used the JD-R model as a theoretical lens to interpret our results concerning resident well-being. Important job resources for residents were: sufficient learning opportunities, autonomy, and receiving meaningful constructive feedback. The exchange of constructive bidirectional feedback is stimulated in a professional culture of growth. Motivation enhances both resident performance and well-being. According to self-determination theory, competence (the goal of CBME), autonomy and relatedness drive motivation. Autonomy can be supported by the process of self-directed learning, which can be operationalized by the use of entrustable professional

activity (EPA)-based assessment. Our results revealed that professional relatedness between supervisor and resident both foster resident well-being and help residents stay motivated. Creating relatedness can be achieved through supervisors that invest in a coaching, non-hierarchical supportive way of supervising residents. The aforementioned job resources can become job demands when they are absent. We recommend that supervisors be aware of their crucial role in nourishing the well-being of their residents, because resident well-being indirectly affects patient care. This is a great responsibility for supervisors. Therefore, faculty development initiatives should not only aim at improving teaching and supervisory skills but also at developing a coaching role. Additionally, we propose that hospital-wide education committees could facilitate the process of quality improvement in PGME by using Plan-Do-Check-Act cycles. We conclude by stating that the ultimate goal of modernizing PGME and creating a supportive learning environment that promotes resident well-being, is the ongoing improvement of patient care.





# Chapter 13

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Dutch summary

Nederlandse samenvatting

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In hoofdstuk 1 introduceerden we de onderwerpen en de doelen van dit proefschrift. Dit proefschrift gaat over de modernisering van de medische vervolgopleiding, de impact van dit moderniseringsproces op de leeromgeving en de rol die de leeromgeving speelt in het bepalen van het mentale welzijn van arts-assistenten in opleiding tot medisch specialist (aios). Onze doelen waren om (1) te onderzoeken hoe de introductie van het competentiegerichte opleiden in de vervolgopleiding de kwaliteit van de leeromgeving beïnvloedt en (2) wat de relatie is tussen de kwaliteit van de leeromgeving en het mentale welzijn van aios.

In hoofdstuk 2 onderzochten we de impact van de introductie van enkele kernelementen van het competentiegerichte opleiden op de door aios ervaren kwaliteit van de leeromgeving. Competentiegericht opleiden is een benadering van opleiden waarbij degene die opgeleid wordt centraal staat. In de medische vervolgopleiding betekent dit dat de focus ligt op het verwerven van competenties, in plaats van een aios en vooraf bepaalde vaste tijd laten doorbrengen in een opleidingsprogramma. Kernelementen van een dergelijk opleidingsprogramma betreffen onder andere: toepassen van gestructureerde formatieve feedback, een toename van de mate van supervisie en de introductie van een digitaal portfolio. De modernisering van de medische vervolgopleidingen gaat gepaard met aanzienlijke kosten en inspanningen van aios, opleiders, onderwijskundigen en centrale opleidingscommissies. Hierbij rijst de vraag of competentiegericht opleiden wel echt tot een verbetering van de vervolgopleiding heeft geleid. Aangezien de kwaliteit van een opleiding vrijwel onmogelijk meten is, gebruikten we in onze studie (hoofdstuk 2) de leeromgeving als maatstaf voor de kwaliteit van de opleiding. De leeromgeving is een complex construct dat de sociale interacties, de organisatorische cultuur en structuur en de fysieke en virtuele ruimtes omvat, die de ervaringen, percepties en het leren van degene die leert omgeven en vormen. Het evalueren van de percepties die aios hebben van de leeromgeving worden gezien als de nuttigste en meest valide methode om de kwaliteit van de leeromgeving te meten. Wij voerden jaarlijkse enquêtes uit onder Nederlandse aios orthopedie in een nationale



dynamische cohortstudie. Hierbij maakten we gebruik van de Dutch Residency Educational Climate Test (D-RECT). Dit is een goed gevalideerd en frequent gebruikt instrument om de kwaliteit van de leeromgeving te meten. We vergeleken D-RECT-scores van voor (2009 en 2010) met D-RECT-scores van na (2013 en 2014) de introductie van de kernelementen van het competentiegerichte opleiden bij de opleiding orthopedie in Nederland. Na de introductie van deze kernelementen ervoeren aios een hogere kwaliteit van supervisie en van coaching en toetsing, maar de door de aios gepercipieerde algehele kwaliteit van de leeromgeving veranderde niet. Deze bevindingen reflecteren mogelijk het positieve effect van didactische trainingen die opleiders verplicht moesten volgen in het kader van de introductie van het competentiegerichte opleiden in Nederland, deze trainingen hadden namelijk een vergelijkbaar positief effect op de kwaliteit van supervisie in andere landen. Onze resultaten ondersteunen ook de sleutelrol die opleiders spelen in het creëren van een gunstige leeromgeving.

Een van de kernelementen van het competentiegerichte opleiden is het gebruik van een digitaal portfolio. In de medische vervolgopleiding worden portfolio's gebruikt om de groei van de aios naar zelfstandig functionerend medisch specialist te documenteren, om zelfreflectie en coaching te ondersteunen en als een hulpmiddel bij het plannen van opleidingsactiviteiten. Om tot een betrouwbare beoordeling te komen van het professionele functioneren van een aios moet een voldoende aantal toetsen (bijvoorbeeld korte praktijkbeoordelingen (KPB's) en orthopedische standaardbehandelingen (OSB's)) worden gedocumenteerd in het portfolio. In hoofdstuk 3 beschreven we de resultaten van een studie waarin we onderzochten hoe trouw aios waren in het bijhouden van hun portfolio. Over een periode van 4 jaar registreerden we de aantallen OSB's, KPB's, 'critically appraised topics' (CAT's) en 360-graden-feedbackrondes die in de portfolio's van de aios waren vastgelegd op het moment dat ze hun opleiding afrondden. We vergeleken het geregistreerde aantal met aantal dat aios minimaal moeten documenteren volgens het opleidingsplan. We vonden dat slechts een derde van het minimale aantal

vereiste toetsen was vastgelegd in de portfolio's van deze aios. Onze resultaten suggereren een discrepantie tussen de minimale vereisten die vastgelegd zijn in het nationale opleidingsplan van de orthopedie en de dagelijkse praktijk van de orthopedische vervolgopleiding. Deze bevindingen zijn in overeenstemming met eerder onderzoek dat aantoonde dat portfolio's het opleiden ondersteunen, maar dat het succes van portfolio's afhankelijk is van de inhoud, de manier waarop het gesuperviseerd wordt en de manier waarop opleiders de gedocumenteerde gegevens in het portfolio toetsen.

In hoofdstuk 4 tot en met 9 onderzochten we hoe de leeromgeving het mentale welzijn van aios beïnvloedt. In de medisch onderwijskundige literatuur worden aanzienlijke zorgen uitgesproken over de toegenomen prevalentie van burn-out onder aios. Burn-out is een werk-gerelateerd syndroom dat drie dimensies omvat: emotionele uitputting, depersonalisatie en verminderde persoonlijke bekwaamheid. Een veelgebruikt theoretisch model om burn-out te begrijpen is het zogenaamde 'job-demands and resources' (JD-R-model). In dit model wordt aangenomen dat een onbalans in hulpbronnen (job resources) en werkeisen (job demands) kan leiden tot burn-out. Burn-out onder aios is een relevant onderwerp, omdat een optimaal mentaal welzijn van aios een voorwaarde is voor het leveren van goede patiëntenzorg door de betreffende aios. Burn-out onder aios is geassocieerd met een hoger risico op medische fouten en incidenten betreffende patiëntveiligheid. De meeste onderzoekers betrokken bij burn-outonderzoek zijn het erover eens dat burn-out geen probleem is van het individu, maar dat burn-out voortkomt uit problemen die gerelateerd zijn aan de werkomgeving. De werkomgeving komt overeen met de leeromgeving als het de medische vervolgopleiding betreft. Om die reden was onze hypothese dat de leeromgeving een cruciale rol speelt in het bepalen van het werk-gerelateerde mentale welzijn van aios. In hoofdstuk 4 presenteren we de resultaten van een nationale cross-sectionele vragenlijststudie onder Nederlandse orthopedisch aios, waarbij we de associatie tussen leeromgeving, symptomen van burn-out en kwaliteit van leven onderzochten. We evalueerden de leeromgeving

met de D-RECT, symptomen van burn-out met twee items uit de Utrechtse Burn-out Schaal (UBOS-C) en kwaliteit van leven met twee gevalideerde items (linear analogue self-assessments). Aios orthopedie die een hogere score gaven voor de kwaliteit van hun leeromgeving hadden minder symptomen van burn-out en een betere kwaliteit van leven. Deze bevindingen leidden tot onze conclusie dat een gunstige leeromgeving het mentale welzijn van Nederlandse orthopedische aios ondersteund.

In hoofdstuk 5 beschreven we de resultaten van onze studie die de rol van de leeromgeving in het bepalen van het mentale welzijn van aios verder exploreert. Ons doel was om aan te tonen dat de associatie tussen leeromgeving en mentaal welzijn onder aios niet enkel bij de orthopedie (hoofdstuk 4) bestaat maar ook bij alle andere medische vervolgopleidingen in Nederland. In deze studie gebruikten we een ander instrument om de kwaliteit van de leeromgeving te meten: de Scan of Postgraduate Educational Environment Domains (SPEED). Dit is een gevalideerd instrument om de kwaliteit van de leeromgeving te meten en heeft als voordeel dat het een kortere vragenlijst betreft dan de D-RECT en dat het gebaseerd is op een solide theoretisch kader. We evalueerden burn-out met behulp van de UBOS-C. In dit nationale cohort van Nederlandse aios van 33 verschillende specialismen voldeed 15% aan de standaard criteria van burn-out. We vonden een sterke en statistisch significante omgekeerde associatie tussen SPEED-scores en burn-out, welke significant bleef na correctie voor demografische (leeftijd, geslacht en burgerlijke staat) en werk-gerelateerde factoren (opleidingsjaar, type opleidingsziekenhuis, type specialisme). We concludeerden dat de associatie die we beschreven in hoofdstuk 4 onder orthopedische aios, ook bestaat bij aios van alle andere Nederlandse vervolgopleidingen.

Aangezien persoonlijke factoren het mentale welzijn van aios ook kunnen beïnvloeden, onderzochten we in welke mate persoonlijkheidskenmerken bijdragen aan de ontwikkeling van burn-out onder aios in de studie beschreven in hoofdstuk

6. Voor deze studie maakten we gebruik van dezelfde groep Nederlandse aios als beschreven in hoofdstuk 5. We evalueerden persoonlijkheid met de gevalideerde Nederlandstalige 'Big Five Inventory' die uit 44 items bestaat. Onder deelnemende aios stelden we vast dat neuroticiteit significant, maar zwak, geassocieerd was met burn-out. Extraversie was significant geassocieerd met minder burn-out, maar enkel bij aios die in opleiding waren voor een snijdend specialisme. We concludeerden dat, hoewel persoonlijkheidskenmerken een rol spelen bij het optreden van burn-out onder aios, de effect grootte relatief klein was en dat het positieve effect van een enkel persoonlijkheidskenmerk (extraversie als beschermende factor) enkel gevonden werd bij aios van snijdende specialismen. Bij elkaar genomen ondersteunen deze bevindingen de eerdere conclusies genoemd in hoofdstuk 4 en 5, namelijk dat de kwaliteit van de leeromgeving bepalend is in het optreden van burn-out onder aios.

Om de robuustheid van de associatie tussen leeromgeving en meentaal welzijn van aios verder te beoordelen, ondernamen we een studie (hoofdstuk 7) onder aios in een ander land: België. We evalueerden de leeromgeving (met de gereviseerde versie van de D-RECT) en burn-out (met de UBOS-C) onder aios die werkzaam waren in een academisch ziekenhuis in België (UZ Leuven). In deze studie vonden we dat een verbazingwekkende 42% van de deelnemende aios leden aan burn-out. Met deze bevindingen generaliseerden we de bevindingen beschreven in hoofdstuk 4 en 5: de associatie tussen leeromgeving en burn-out onder aios bestaat derhalve niet alleen in Nederland maar ook in België. We vonden in deze studie opnieuw een significante omgekeerde associatie tussen de kwaliteit van de leeromgeving (D-RECT scores) en burn-out (UBOS-C scores). Deze associatie bleef significant nadat we gecorrigeerd hadden voor het aantal gewerkte uren per week, kwaliteit van leven en tevredenheid over de werk-privé balans. Daarnaast was het percentage aios met burn-out onder Belgische aios veel hoger dan onder Nederlandse aios (hoofdstuk 5) en gaven Belgische aios een aanzienlijk lagere score gegeven voor de kwaliteit van de leeromgeving in vergelijking met hun Nederlandse collega's (hoofdstuk 4).

In de hoofdstukken 4 tot en met 7 identificeerden we een sterke, consistente, dosisafhankelijke omgekeerde associatie tussen de ervaren kwaliteit van de leeromgeving en burn-out onder aios. De positieve tegenpool van burn-out is bevlogenheid, dat gedefinieerd is als een positieve psychologische toestand van opperste voldoening welke gekenmerkt wordt door vitaliteit, toewijding en absorptie. Bevlogen aios vermeldden dat ze beter presteren op professioneel vlak en minder medische fouten maken. In hoofdstuk 8 beschreven we onze studie waarin we evalueerden welke aspecten van de leeromgeving het sterkst geassocieerd waren met bevlogenheid en welke met burn-out onder aios. We maakten hierbij gebruik van dezelfde groep Belgische aios als in onze studie die we beschreven in hoofdstuk 7. We gebruikten de korte versie van de Utrecht Work Engagement Scale (UWES-9) om bevlogenheid te bepalen. We vonden dat het domein van de leeromgeving ‘coaching en toetsing’ in sterke mate positief gerelateerd was aan ‘bevlogenheid’ en aan ‘persoonlijke bekwaamheid’ en negatief gerelateerd was aan ‘emotionele uitputting’. Het domein ‘rol formele opleider’ was negatief gerelateerd aan ‘emotionele uitputting’ en het domein ‘gepland onderwijs’ was negatief gerelateerd aan ‘depersonalisatie’. We concludeerden dat onze bevindingen de cruciale rol die opleiders hebben verder onderstrepen, zowel in het stimuleren van bevlogenheid als in het voorkomen van burn-out onder aios.

In hoofdstuk 7 beschreven we dat Belgische aios, vergeleken met Nederlandse, een aanzienlijk hoger risico op burn-out lopen en dat ze een veel lagere score gaven voor de kwaliteit van de leeromgeving. Deze bevindingen gaven aanleiding tot onze kwalitatieve studie, beschreven in hoofdstuk 9, waarin we exploreerden welke verschillen (tussen België en Nederland) in de leeromgeving door deelnemende aios werden ervaren als verantwoordelijk voor de eerdergenoemde verschillen in burn-out risico en kwaliteit van de leeromgeving. We interviewden 12 aios die een deel van hun opleiding in België volgden en een deel in Nederland. We redeneren dat deze aios in een unieke positie verkeerden waarbij ze in staat waren beide

leeromgevingen (de Belgische en de Nederlandse) te vergelijken. Dit gaf ze de mogelijkheid om cruciale informatie te verstrekken over hoe de verschillen in de leeromgeving het risico op burn-out beïnvloeden en daarnaast inzicht konden geven in welke factoren de verbetering van de kwaliteit van de leeromgeving faciliteren dan wel tegenwerken. Analyse van de transcripten van de interviews toonde aan dat de opleider een sleutelrol speelt bij het creëren van een gunstige leeromgeving welke het mentale welzijn van aios ondersteunt. Aios hadden sterk het gevoel dat opleiders die een positief rolmodel waren, het leerproces van de aios faciliteerden door middel van coaching op de werkplek. Belangrijk daarbij werd gevonden dat hun begeleiding afgestemd was op hun leerdoelen, zodat het hun mentale welzijn ondersteunde. Ze gaven ook aan de het geven van zinvolle feedback essentieel was bij de totstandkoming van een wederkerige opleider-aios-relatie. Verder noemden ze ook nog dat medebepalend waren voor hun mentale welzijn: autonomie en in staat zijn om kansen om te kunnen groeien naar onafhankelijkheid en zware werklasten goed uit te kunnen balanceren. We concludeerden dat het mentale welzijn van aios aanzienlijk gestimuleerd wordt door opleiders die een positief rolmodel zijn, wat ze kunnen bereiken door hun aios te coachen, van zinvolle feedback te voorzien en de groei van aios naar autonomie te ondersteunen.

Hoofdstuk 10 behandelde de impact van de recente COVID-19-pandemie op het mentale welzijn van aios die betrokken waren bij de medische zorg voor COVID-19-patienten. We evalueerden het risico op burn-out, kwaliteit van leven en angst om zelf besmet te raken onder 207 Nederlandse aios gedurende de piek van de COVID-19-pandemie (maart en april 2020). Om burn-out te beoordelen gebruikten we de UBOS-C. Kwaliteit van leven, werk-privé balans werden beoordeeld met behulp van gevalideerde items. In totaal vulden 121 (58,5%) van de aios de vragenlijst volledig in. Twee (1,7%) voldeden aan de standaard criteria van burn-out. We vonden symptomen van burn-out (emotionele uitputting, depersonalisatie en verminderde persoonlijke bekwaamheid) niet vaker bij aios die werkzaam waren op COVID-19-afdelingen in vergelijking met aios die niet betrokken waren bij COVID-19-zorg.

Bovendien vonden we geen verschillen in de ervaren kwaliteit van leven, werk-privé balans en angst om zelf besmet te raken tussen de twee groepen. Echter, aios die zorgden voor COVID-19-patienten op de intensive care voelden zich ten tijde van de pandemie meer opgebrand dan voor de pandemie. Ondanks de enorme impact van de COVID-19-pandemie op de gezondheidszorg in het algemeen, vonden we geen hoger risico op burn-out onder aios die direct betrokken waren bij de COVID-19-zorg. We merkten op dat een peer-supportprogramma, de pandemie als een kans om te leren en de teamspirit en waardering tijdens de acute fases van de crisis mogelijke verklaringen kunnen zijn.

In hoofdstuk 11 reflecteerden we op onze bevindingen en gaven we nieuwe perspectieven op de modernisering van de medische vervolgopleiding, de leeromgeving en het mentale welzijn van aios. Aios waardeerden de introductie van enkele kernelementen van het competentiegerichte opleiden namelijk: de meer expliciete toetsing (met behulp van KPB's, OSATS en OSB's) en de verbeterde supervisie (waarschijnlijk door verplichte didactische cursussen voor opleiders). Een ander kernelement van het competentiegerichte opleiden, het digitale portfolio, kan een succesvol instrument zijn voor coaching, reflectie, planning, toetsing en voor het documenteren van groei van de aios naar een onafhankelijk functionerend medisch specialist. Echter, het succes van een portfolio berust op de inhoud, de manier waarop het gesuperviseerd en gecoacht wordt en de manier waarop opleiders de gedocumenteerde toetsen en beoordelingen interpreteren. We gebruikten het JD-R-model als een theoretisch kader om onze resultaten betreffende het mentale welzijn van aios te interpreteren. Belangrijke hulpbronnen voor aios waren: voldoende kansen om te leren, autonomie en het ontvangen van zinvolle constructieve feedback. De uitwisseling van constructieve bidirectionele feedback wordt gestimuleerd in een zogenaamde professionele cultuur van groei. Motivatie verbetert zowel de prestaties van aios als hun mentale welzijn. Volgens zelfdeterminatietheorie wordt motivatie gedreven door competentie (het doel van competentiegericht opleiden), autonomie en verbondenheid. Autonomie kan ondersteund worden

door het proces van 'self-directed learning', wat geoperationaliseerd kan worden door het gebruik van de op 'entrustable professional activity' (EPA)-gebaseerde toetsing. Onze resultaten laten zien dat professionele verbondenheid tussen opleider en aios zowel het mentale welzijn als de motivatie van de aios kan bevorderen. Het creëren van verbondenheid kan bereikt worden door opleiders die investeren in een coachende, niet hiërarchische manier van opleiden. De eerdergenoemde hulpbronnen (job resources) kunnen werkeisen (job demands) worden als ze afwezig zijn. Wij adviseerden dat opleiders zich bewust zouden moeten zijn van hun cruciale rol in het bevorderen van het mentale welzijn van hun aios, omdat dit welzijn indirect de kwaliteit van de patiëntenzorg kan beïnvloeden. Dit is een grote verantwoordelijkheid voor opleiders. Daarom zouden trainingen voor opleiders niet alleen gericht moeten zijn op het verbeteren van de didactische kwaliteiten van opleiders maar ook op het ontwikkelen van hun rol als coach. Bovendien stelden we voor dat centrale opleidingscommissies het proces van kwaliteitsverbetering in de medische vervolgopleiding zouden kunnen faciliteren doormiddel van het gebruik van 'Plan-Do-Check-Act' cycli. Onze slotconclusie was dat het ultieme doel van de modernisering van de medische vervolgopleiding en het creëren van een gunstige leeromgeving dat het mentale welzijn van aios bevordert de voortdurende verbetering van de patiëntenzorg is.







# Part V

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Addendum

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Acknowledgments

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\*Jovanotti. (2008). Mezzogiorno.

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## Curriculum Vitae

Stefan van Vendeloo was born on July the 12<sup>th</sup> 1984. After high school (Rijksscholengemeenschap Steenwijk), he started medical school at the University of Groningen in 2002. In January 2009 he obtained his medical degree “cum laude”. During his internships, orthopedic surgery grabbed his interest, which made him apply for his first job: medical researcher (department of orthopedic surgery, Isala hospital, Zwolle). His supervisor dr Kees Verheyen introduced him to



prof dr Paul Brand. They shared a mutual interest in postgraduate medical education. Their first meetings instigated the research projects that have eventually resulted in this thesis.

In January 2010 he started his orthopedic residency training with 2 years of training in general surgery (Isala hospital, Zwolle: supervisor dr Robert Pierik). Thereafter he continued his training with 4 years of training in orthopedic surgery (Isala hospital, Zwolle, supervisor dr Kees Verheyen; University Medical Center Groningen, supervisor prof dr Sjoerd Bulstra; Medisch Spectrum Twente, Enschede, supervisor dr Elgun Zeegers). During his training he continued conducting research and presented his papers at multiple national and international conferences. By the end of his training in 2016, he participated in the EFORT Travelling Fellowship in Austria.

After he finished his residency training he chose to broaden his horizon by starting as a fellow on the traumatology department at the University Hospitals Leuven in Belgium (supervisor prof dr Stefaan Nijs). This fellowship gave him the chance to deepen his knowledge in traumatology and was also a unique opportunity to add several international research papers to his thesis.

Upon his return in the Netherlands in 2017 he commenced as the first Dutch orthopedic traumatology fellow in Isala hospital, Zwolle. After this fellowship he started as a consultant orthopedic surgeon at Leiden University Medical Center.

In the spring of 2020 his career took a new turn: he started as a consultant orthopedic surgeon and certified traumatologist at the Saxenburgh Medical Center in Hardenberg. Stefan currently lives in Hardenberg with his wonderful wife Marleen and their two sons Floris and Pepijn. In his spare time, he can be found running, cycling or embarking on a new adventure with his two sons in the seemingly endless nature surrounding his hometown.



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