

Work Demands and Resources, Stress Regulation and Quality of Pedagogical Work Among Professionals in Finnish Early Childhood Education Settings

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ABSTRACT: This study examined early childhood professionals' (ECPs) stress regulation and the demands and resources they encounter at work, and considered how these factors are associated with the quality of pedagogical work in daycare. The participants were 117 ECPs from 24 daycare centers in the Helsinki metropolitan area, Finland, with data collected using surveys, cortisol measurements, and observational assessments. The results indicated that the professionals generally found their work resources to be adequate and, on average, their stress regulation measured through cortisol activity showed a typical diurnal pattern. Highly important resources at work proved to be support from supervisors, which was associated with stress regulation and the quality of pedagogical work in teams. Although we found only minor associations between cortisol activity and job demands and resources, cortisol activity did relate to pedagogical work, particularly to teamwork; the higher the quality of the teamwork, the lower the ECPs morning cortisol values. Our multidisciplinary study highlights important findings regarding the resources and demands ECPs experience at work, and supports existing literature. In addition, the results demonstrate the importance of social support, especially the role of the supervisor, which proved to be one of the key factors positively enhancing well-being at work. These findings are applicable in planning interventions regarding work-related well-being among ECPs.

Keywords: stress, cortisol activity, job demands and resources, early childhood education, pedagogical work

Introduction

The early childhood education workers' role in creating a high-quality daycare environment is significant, given that they are professionals in their field and have the knowledge and skills to support children's development and learning. The work is demanding and challenging, but at best also rewarding. Previous studies (NICHD, 2000; Sims, Guilfoyle, & Parry 2006; Vandell & Wolfe, 2000) have provided a range of definitions of what high-quality early childhood education should involve, and the ways in which children benefit from it. Less is known about the conditions or prerequisites that early childhood professionals (ECPs) encounter at work, and how their work affects their stress regulation and well-being. Daycare centers require multi-professional teamwork (Nummenmaa & Karila, 2006) and in Finland, this involves early education teachers, special teachers, nursery nurses, and assistants with various educational backgrounds and pedagogical qualifications. All these early childhood professionals (ECPs)¹ work together, sharing the same focus of taking care of children's well-being. The ability of these professionals to deliver the best possible service to children depends in part on their working environment (Hall-Kenyon, Bullough, MacKay, & Marshall, 2014). An effective and supportive work environment is one in which adult workers and child participants both experience well-being (Roffey, 2012).

Demands and Resources in Work in Early Childhood Education

Working in early childhood settings exposes ECPs to high levels of stress (Zhai, Raver, & Li-Giring, 2011), but at the same time working with children can be both inspiring and motivating. Occupational well-being requires a balance between the negative outcomes associated with stress and the positive outcomes associated with a passion for the work. In this study, we approach occupational well-being from the perspective of job demands and resources (Bakker & Demerouti, 2012). This model is suitable for predicting and analyzing the nature of well-being at work and the potential consequences for individual employees and the entire working team as demonstrated by Baker and Demerouti (2014). The main assumption in this model is that in every occupation it is possible to divide

¹ In this study, hereafter the term "ECP" is used to describe any staff member working in day care, irrespective of their position or qualifications (i.e. this term includes teachers, special education teachers and nurses). Where it appropriate we differentiate these different positions using the terms teacher, special education teacher, nurse and assistant.

psychosocial and physical working conditions into demands and resources (Bakker & Demerouti, 2012; Bakker, Demerouti, & Verbeke, 2004). In the worst situation, work demands may cause stress and increase the risk of burnout, which will further weaken long-term well-being and health (Demerouti et al. 2001). This is likely to be the situation when meeting those demands requires high effort with insufficient recovery time or resources for the employee (Bakker & Demerouti, 2007). Work resource factors in turn have a strong motivational potential as they contribute to the rewarding nature of the work, which is reflected in increased work engagement (Schaufeli, Bakker, & van Rhenen, 2009). The innovative nature of this approach lies in its combination of positive and negative well-being processes (Hakanen, 2004). In this study we will apply the model to the multidimensional work in early childhood education that potentially has both demanding and rewarding aspects.

Research on occupational well-being has traditionally emphasized the negative characteristics of work and the workplace rather than studying what inspires and motivates employees at work (Demerouti, Nachreiner, Bakker, & Schaufeli, 2001; Hakanen, 2009; Schaufeli, Taris, & van Rhenen, 2008). In the early childhood education field this is particularly the case. As Pietarinen, Soini, and Pyhältö (2008) point out, the core of pedagogical work undertaken in early childhood –interactions with children – is not only rewarding but demanding and challenging. This taxing and mentally challenging interpersonal work involves dealing with a wide range of requirements, including those of children, parents, and society (Hakanen, 2009). In particular, professionals often face emotional challenges, such as managing children’s socio-emotional difficulties (including behavioral challenges and motivational problems) (Bakker, Demerouti, Hakanen, & Xanthopoulou, 2007; Hakanen, Bakker, & Schaufeli, 2006; Raver et al., 2009). Other challenges (positioned in the model as threats) may include a large workload, hectic days, and a poor physical working environment (Bakker & Demerouti, 2006; Schaufeli, Bakker, & van Rhenen, 2009). Difficulties experienced in working with other team members can challenge ECPs’ autonomy and increase the risk of work-related stress symptoms, as can a lack of social support from colleagues and supervisors (Schaufeli et al., 2009). Employees who feel inadequate in their work and have low self-esteem find work to be more demanding (Pierce & Gardner, 2004). This has a negative impact, not only on their performance at work but, perhaps more importantly, on their overall well-being (Bollini, Walker, Hamann, & Kestler, 2004).

Despite these negative impacts on well-being, early childhood personnel feel their work is meaningful and engaging (Estola, Erkkilä & Syrjälä 2003), and basic functions such as caring for and teaching children are considered to contribute to work satisfaction and joy (Rantala & Määttä, 2011). Certainly, in Finland, the creative and enjoyable nature of early childhood work appears to be experienced as beneficial by ECPs (Ylitapio-Mäntylä,

Uusiautti & Määttä, 2012) given that, compared to many other sectors, Finnish teachers are generally less inclined to look for new job opportunities (Finnish Institute of Occupational Health, 2010; Hakanen et al., 2006). One factor contributing to this stability in workforce is likely to arise from a cultural trust in the educational system and a high degree of teacher autonomy (Sahlberg, 2008). As a consequence teachers have considerable leeway in deciding the content of their work even though there are national guidelines for early childhood education.

Cortisol as a Biomarker of Stress

On the psychological level, overwhelming demands at work leading to poor work well-being may cause distress, anxiety, and emotional exhaustion that in the worst cases lead to burnout (Demerouti & Bakker, 2007). Physiologically, chronic and constant work overload may lead to ill health and many somatic disorders (Bollini et al., 2004). The physiological responses to workload can be assessed by measuring stress hormones in saliva. One widely used method involves assessing employees' cortisol levels, which are reliable, non-invasive biomarkers of psychological stress (Hellhammer, Wüst, & Kudielka, 2009).

The physiological stress response (HPA system) operates to mobilize the organisms' resources through up-regulation of the stress hormone, cortisol, to meet challenges when needed. Conversely the system down-regulates cortisol through a negative feedback loop when the challenge has been met (Bollini et al., 2004; Gunnar & Quevedo, 2007). Activation of the HPA system is required for optimal cognitive performance and adaptive behavior when encountering challenges as they occur in the workplace. However, if workers experience chronic stress the secretion of cortisol may be disturbed and negatively affect brain functions and behavior (Dmitrieva, Almeida, Dmitrieva, Loken, & Pieper, 2013; Groeneweld, Vermeer, van Ijzendoorn, & Linting, 2012). There are individual differences in cortisol secretion (Adam & Gunnar, 2001; Stone et al., 2001), but studies have confirmed that the fluctuation of cortisol follows certain circadian rhythms (Dmitrieva et al., 2013) and patterns of cortisol secretion are reasonably well established for usual human functioning.

Work-related responsibilities and tasks activate the stress regulation system in various ways. Individuals differ in their stress responsivity; some people may be more sensitive and more easily physiologically stressed than others (Langelaan, Bakker, van Doornen, & Schaufeli, 2006). Studies have shown that employees who reported greater work overload had higher levels of cortisol on awakening (De Vente, Olf, van Amsterdam, Kamphuis, & Emmelkamp, 2003; Schultz, Kirschbaum, Pruessner, & Hellhammer, 1998;

Steptoe, Cropley, Griffith, & Kirschbaum, 2000), while higher evening values are also connected with stress symptoms (Morgan, C., Cho, Hazlett, Coric, & Morgan, J., 2005). Although studies have produced conflicting results regarding the relationship between cortisol and work overload (Chandola, Heraclides, & Kumari, 2010), it seems that the greater the number of job stressors, the higher the cortisol awakening response (CAR) (Chida & Steptoe, 2009).

Nevertheless, number of studies focusing on the associations between satisfying aspects of work and stress regulation is scarce, and mainly studies conducted have been focused on the negative, demanding factors at work and how these may lead to burnout. The novel aim of our study is to emphasize the positive, rewarding aspects and investigate to what extent they are related to ECPs' stress regulation and further, to the quality of pedagogical work.

Quality of Pedagogical Work in the Daycare Groups

In many occupations, the quality of work or job performance may be rather easily defined, and productivity and efficacy of the work can be measured using certain standards. However, in early childhood education this is not an easy task. In ECE, we suggest that quality of work could be defined by examining the quality of learning opportunities that ECPs offer the children. The pedagogical work actualizes in pedagogical processes between children and ECPs; in the interaction with the physical and social environment.

The previous studies have shown how important high quality ECE is for children's development. A number of studies (Sheridan, 2009; Sims, et al. 2006; Suhonen, 2009; Vandell & Wolfe, 2000;) have highlighted the importance of the quality of early childhood education and demonstrated the positive impact of good quality on children's cognitive and socio-emotional development and well-being (Vandell & Wolfe, 2000). Factors contributing to the quality of early childhood education service delivery are often categorized into structural and process factors (Bigra et al, 2010). Structural factors include adult: child ratios, qualifications, group size, and space requirements. Process factors are those that are less easily measurable and include pedagogical approaches, cultural competency and relationships. Certain of these educational processes may be more significant in determining overall quality but ultimately it is essential that both structural and process factors including materials and resources are utilized in an appropriate manner to create a quality service (Sheridan, 2009).

One of the key process indicators of quality is that of adult-child interactions (linked to relationships). Studies show (NICHD, 1999; 2000) that for a child, meaningful learning and development occurs in an environment characterized by positive affective interaction

between the child and the adult. The aim of the interaction is to ensure the child's psychological well-being, and the ECP's competence is vital in this process. Qualified ECPs, with the knowledge and skills required to meet the needs of the child, can foster the child's social, emotional, and cognitive development (Clarke-Stewart, Vandell, Burchinal, O'Brien, & McCartney, 2002; NICHD, 1999; 2000; Philipson, Burchinal, Howes, & Cryer, 1997). Indeed, studies have shown that the ECPs' competence and educational level affect the quality of the pedagogy (Fontaine, Torre, Grafwallner, & Underhill, 2006; Sheridan, 2009), as better-qualified professionals are more sensitive to acting responsively with children, and take into account children's individual needs (Burchinal, Cryer, Clifford, & Howes, 2002; Lamb, 2000; Vandell & Wolfe, 2000). All in all, it is proved that ECPs are the key actors in creating pedagogically high quality environment.

Research questions and hypotheses

In this study, our aim is to investigate the work-related demands and resources that ECPs encounter and to identify to what extent these are associated with their stress regulation and the quality of pedagogical work they offer in day care centers. We emphasize the positive aspects of work, those are presented as resources in the theoretical model, and our novel aim is to investigate if these are associated with more balanced stress regulation. We are also interested in investigating diurnal cortisol activity among ECPs and in exploring if those ECPs potentially having deviant (e.g. low or high) amounts of cortisol during day differ in their experiences of work demands and resources. Further, we are investigating if there are differences in experienced job demands and resources among different professional groups who work together as ECPs (e.g. teachers, nurses, special education teachers).

Our research questions are:

- Q1. How are characteristics of ECPs (i.e. qualification, age) associated with their experienced resources and demands and their daily cortisol levels?
- H1. It is stated that the tasks and duties among ECPs are not clearly divided, and responsibilities are not optimal defined in Finnish ECE (Karila, 2008; Onnismaa & Kalliala, 2010), which may reflect on ECPs' work satisfaction. We hypothesise that this may be seen in a variation between different professions in, for example, experienced autonomy and potentially in diverse cortisol levels during working day.
- Q2. Are there diverse diurnal cortisol patterns and do ECPs demonstrating deviant daily amounts of cortisol differ in their reported job demands or resources?

- H2. We hypothesize that higher levels of cortisol in the morning, or atypical variations in diurnal cortisol activity, relate to perceived lower job resources and greater job demands, and that, conversely, a symmetric pattern indicates optimal cortisol activity related to balanced job demands and resources. Previous studies have shown that deviant daily cortisol levels may indicate unbalanced stress regulation and work-related stress (Groenveld et al., 2012; Nater, Rohleder, Schlotz, Ehlert, & Kirschbaum, 2007).
- Q3. What are the relationships between resources and demands on staff working in the daycare environment, quality of pedagogical work and staff cortisol levels?
- H3. We posit the job demands and resources ECPs encounter at work will impact on their stress regulation and on the quality of their pedagogical work, so that the unbalanced stress regulation indicated by deviant daily cortisol levels is associated with a lower quality of pedagogical work. Further, we posit that ECPs encountering higher work resources perform better at work by offering higher quality ECE.

Method

Context

In Finland, every child has a subjective right for early childhood education services delivered through ECE centers guided by national guidelines. These guidelines serve as a basis for the design of local curricula; nevertheless municipalities are fully responsible for the implementation and steering of the services (Identifying Author, 2012). ECE centers may contain regular groups of children, and/or integrated special groups (seven children without and five children with special educational needs). If the child needs intensified support, early special education can be organized in segregated special groups. ECE teams are multi-professional, and there are some variations in composition in different towns. In the Helsinki metropolitan area there is at least one ECE teacher in every group, who is responsible for pedagogy and planning for activities. These teachers must hold a lower university degree or bachelor's degree in the social sciences (Heinämäki, 2008). Additionally, there are day care nurses (and in some cases assistants) who also must have a lower educational degree from a vocational school. Nearly all of these degrees include some studies in early childhood education and care. This training focuses more on nursing and caring of the children whereas the degree held by the teachers focuses on early childhood education. Special education teachers have received an additional degree in early childhood special education. In integrated special groups, the minimum requirement is two special education teachers, one nursery nurse and assistant.

Participants

The study formed part of the LASSO (Children Stress Regulation and Learning) research project at the University of Helsinki's Department of Teacher Education (see Alijoki, et al. 2013; Nislin, et al. 2015; Sajaniemi, et al. 2014). We collected the data in February-March 2009, with the participating daycare centers recruited from two areas in two towns in the Helsinki metropolitan area that were already participating in our intervention study. All daycare centers in the areas (n = 80) had the chance to voluntarily participate in the study. We received ethical approval for the study from the Ethics Committee on Human Studies of the University of Helsinki.

Twenty-four daycare centers provided research consents, together with 117 ECPs. The daycare centers were located in socio-economic middle-class areas. The study involved regular daycare groups (n = 28) and integrated special groups (n = 6) catering for children aged three to six. Child-adult ratios were 7:1 for regular daycare groups and 4:1 for integrated special groups as required by legislation, and ECE teams consisted of a range of professionals, including teachers (37,7%), special teachers (8,5%), daycare nurses (29,2%), assistants (19,4%) and other (e.g. supervisor) (4,7%). The job title refers to the specific area of responsibility maintained by the professional during the data collection period. ECPs ranged in age from 21 to 60 years (M = 43.5, SD = 10.1), and 97% were female – a figure in line with the overall gender ratio in early childhood education (as identified by Taguma, Litjens, & Makowiecki, 2012) – and 89.2% were qualified to work in early childhood education settings. In study population, 11,9 % of the ECPs had basic level education, 52,2 % bachelor degree and 29,9 % of them had higher education (e.g. master degree). ECPs' period of employment ranged between 0,5 to 42 years (M=16,9, Sd=10,9).

Measures

Data collection

ECPs' experienced job demands and resources were assessed using surveys (specifically the Day Care Barometer Survey [2002] coupled with a questionnaire to collect demographic information and information on demands and resources at work) and ECPs' cortisol levels during one working day were measured with salivary cortisol samples. Quality of pedagogical work in day care groups was determined through observation (specifically the Learning Environment Assessment Scale- Strain & Joseph, 2004). These measures and data collection procedure are presented in detail below.

1: *Demographic/Demands and Resources Questionnaire*: This was developed to collect background data. This data included age, education level, occupation and health-related questions. The questionnaire also included twenty items from the Educational Barometer Survey (2002), developed by the Centre for Educational Assessment (University of Helsinki). Twenty chosen items formed four scales: emotional pressure, social support, supervisor support and job autonomy, which were drawn from the Job Demands and Resources model (Bakker & Demerouti, 2006; 2012). Participants were asked to rate their work and working environment (demands and resources) using a five-point Likert scale (1 = never, 5 = very often). Items framework for classifying the items into four different subscales along with the reliability estimates (Cronbach's alpha and Pearson's r):

1. emotional pressure (ten items) contained items that considered the socio-emotional challenges encountered at work (.92)
2. social support (six items) considered issues such as a supportive work environment, collegial discussion, and positive feedback (.83)
3. supervisor support (two items) referred to social support from supervisors (r= .64)
4. autonomy (two items) related to ECE professionals' experiences of affecting their own work and course of action (r= .51)

2: *Salivary cortisol*. Due to the diurnal fluctuation of cortisol levels in humans, we collected five samples during one working day from each subject using a procedure adopted in previous studies (see Sajaniemi et al., 2011; 2012; 2014). All of the participants had written instructions for taking saliva samples, and we guided participants not to drink, eat, or smoke before collecting the samples. The medical status of the participants revealed there were no regular medication considerations that would invalidate cortisol values. Samples were collected at the following times: (1) on waking up; (2) half an hour after waking; (3) an hour after waking; (4) in the afternoon between 14:00 and 15:00; and (5) before going to sleep. Samples 1, 2, 3 and 5 were taken at home, and sample 4 at work. The participants mouthed two-inch cotton wads until wet, and these were then placed in Salivette tubes (produced by Sarstedt, in Nümbrecht) according to written instructions and stored in a refrigerator until they could be delivered to the laboratory responsible for salivary cortisol measurements at the Finnish Institute of Occupational Health in Helsinki. Here, the saliva was separated from the cotton wad by centrifugation (1000 g for 5 min) and stored at a temperature of -20°C until measurements could be taken.

3: *Quality of pedagogical work*. We assessed the quality of the pedagogical work using the Learning Environment Assessment Scale (Strain & Joseph, 2004). This tool was originally developed for use in special early childhood education groups and we argue that the same

factors are relevant in regular education groups. It requires a trained observer to spend time in the service to complete the rating. The observers (n=7) were employed as consultative special teachers in daycare and undertook observations for this study during their visits to the daycare services. Training was provided in the use of the rating scale prior to the observations. Consultative special teachers visited the classrooms two to three times (morning hours, with at least a minimum of 8 hours in every classroom) to complete the observations and ratings.

The assessment involved an estimate of the pedagogical work ECPs delivered in groups, with the five observable dimensions being classroom arrangements (10 items), schedules and transitions (11 items), classroom activities (11 items), teamwork (7 items), and behavior plans (6 items). Under classroom arrangements, the focus was on how ECPs had arranged the learning environment to promote children's learning, including the materials available to the children and whether they were appropriate for all skill levels. In essence, classroom arrangements reflected the physical aspects of the learning environment, and how the ECPs organized it. Schedules and transitions indicated, for example, the stability and predictability of the schedules during the daycare day, and ECPs' sensitivity when supervising the children. Classroom activities focused on ECPs' practices when supervising children during the different activities, and how they modified the composition of the larger group when small-group work was required. Teamwork involved items measuring, for example, the teachers' cooperation, the integration of individualized goals into daily activities, and the ECPs' shared classroom philosophy, while behavior plans pointed to specific behavior plans, observation, and documentation of the children's development that ECPs shared in team meetings. The scale required a rating made using a three-point Likert scale, with low scores indicating poor quality. The internal consistency (Cronbach's α) of all the scales was tested; the results showed that there was good internal consistency, ranging between .67 and .81.

Statistical Analysis

First, we obtained descriptive statistics for the job demands and resources variables, salivary cortisol measures and the pedagogical work. To investigate differences between different groupings such as professions (teachers, daycare nurses, assistants and special teachers) we conducted Kruskal-Wallis test along with Mann-Whitney U-tests with Bonferroni correction (dividing p level with number of conducted comparisons). Cortisol measures were highly peaked and positively skewed because of the outliers and extreme values in the data. The laboratory analysis of cortisol at the Finnish Institute of Occupational Health verified the accuracy of all the measurements, but to avoid the violation of test assumptions caused by the skewness, we inspected all cortisol values for

outliers, which we converted equal to the most extreme values (ranging between -4 SD and +4 SD from the mean values) measured in a process recommended by Nicolson (2008). We computed missing values with the EM algorithm in cases where there were only two values missing in the series, and computed area under curve (AUCg) to measure the overall diurnal level of cortisol; AUC is a widely used method to detect changes in physiological and endocrinological variables measured at different points over time, in this case during the working day (see Pruessener, Kirschbaum, Meinlschmid, & Hellhammer, 2003). Further, we grouped participants AUCg-values into three groups (low = -1 Z-value), moderate, and high = + 1 Z-value) using Z-values, to illustrate different profiles.

In addition, we conducted correlation analyses to test the connections between cortisol levels, job demands and resources, and pedagogical work, and analyzed the daily trajectories of the raw cortisol values (morning, afternoon, and evening) and how these related to the ECPs' background characteristics. We analyzed the perceived teamwork of daycare personnel by means of the latent growth curve model (LGM) on the construct level, using structural equation modeling (SEM) techniques (Byrne, 2010). We log-transformed the salivary cortisol and AA values used in the analysis ($\ln(x-1)$); (Tabachnick and Fidell 2013). Reader should note that due to missing data on certain variables number of valid subjects varies between performed analyses. We used the SPSS and Amos 20.0 software to perform the statistical analyses.

Results

In the beginning of this section we provide descriptive of each measurement and to answer our first study question, examine how each of these measures is associated with characteristics of the ECPs. After this we respond to our study questions 2 and 3 respectively.

Demands and resources in ECE work

In examining the components of the Demands and Resources part of the questionnaire we found there were no significant differences in experienced job demands and resources according to ECPs' age, days of illness, use of medication or educational level. Table 1 shows the results for job demands and resources reported participants both in total and by occupational groups.

TABLE 1 ECPs' experiences of job demands and resources

<i>Measure</i>	<i>Total</i>		<i>Teacher</i>		<i>STeacher</i>		<i>Nurse</i>		<i>Assistant</i>	
	<i>M</i>	<i>Sd</i>	<i>M</i>	<i>Sd</i>	<i>M</i>	<i>Sd</i>	<i>M</i>	<i>Sd</i>	<i>M</i>	<i>Sd</i>
<i>Autonomy</i>	3,3	0,8	3,1	0,8	2,7	0,7	3,6	0,6	3,5	0,8
<i>Emotional Pressure</i>	2,6	0,7	2,6	0,8	2,5	0,6	2,5	0,7	2,5	0,7
<i>Supervisor Support</i>	4,1	0,8	3,9	0,9	4,2	0,6	4,2	0,9	4,2	0,5
<i>Social Support</i>	4	0,5	3,9	0,6	4,2	0,4	4,1	0,7	4	0,5
<i>N</i>	73		30		9		20		13	

Work was experienced as largely autonomous, and participants reported they had some degree of control over the content of their work and are able to decide on the work to be carried out. We found a statistically significant variation between different occupational groups (teachers, special teachers, daycare nurses, assistants) in the perceived degrees of autonomy ($\chi^2(3) = 14,3, p = .003$). We conducted post-hoc test using the Mann-Whitney test with Bonferroni correction ($.05 / 4 = .0125$) to establish which of the groups varied significantly, and discovered a difference between teachers and daycare nurses $U(3) = 169, p < .01$ and between special teachers and assistants $U(3) = 31.5, p < .01$; nurses and assistants experienced more autonomy. The different professions did not differ from each other in any other dimensions of job demands and resources. Overall, social support presented as one of the main positive features of the work. The results indicated that the ECPs had a largely positive relationship with their supervisor; ECPs generally got along well with their supervisors, and felt their supervisors appreciated them. Further, we investigated to what extent ECPs experience their work as emotionally demanding. We found that generally, ECPs did not consider work particularly mentally demanding. Nevertheless, there were ECPs who considered themselves mentally strained, and stated that their work was emotionally challenging.

When examining relationships between scales of job resources and demands the following associations were found. High levels of supervisor support were correlated with lower levels of emotional pressure suggesting that support from the supervisor appeared to have a positive association with less pressure ($r = -.28, p < .05$). Additionally, supervisor

support was positively correlated with social support from colleagues ($r = .3, p < .01$), whilst the less autonomy ECPs reported; the more they demonstrated emotional pressure ($r = .63, p < .01$).

ECPs` Cortisol Activity

To answer the study question 2 we investigated ECPs diurnal cortisol levels. On average, the ECPs' cortisol patterns were symmetrical and typical (see Table 2, column total). When examining relationships between ECPs' characteristics and raw/standardized cortisol values from separate measurement points we found that there were no significant differences according to ECPs' age, days of illness, use of medication, educational level and occupational group.

We grouped participants' AUC-values into three groups using Z-values, to illustrate different profiles. We formed groups who had low (-1 Z-value), moderate, and high (+ 1 Z-value) cortisol reactivity- to detect atypical diurnal patterns that may indicate unstable stress regulation. Descriptive statistics for the full sample and low, moderate and high AUCg-values groups and pairwise comparisons between different groups in different measurement points are presented in Table 2.

We compared the AUC-values to separate measurement points. The Low ECP group ($n = 8$) showed a flat diurnal pattern; their morning peak after awakening was weak, and the values remained low throughout the day. Interestingly, cortisol levels of the High ECP group increased instead of decreased in the evening ($n = 10$), and their values were significantly higher at every measurement point. The difference in cortisol values between groups was statistically significant in every measurement point (1. $\chi^2 (2) = 8, 3, p=.02$, 2. $\chi^2 (2)=28, 7, p<.001$, 3. $\chi^2 (2)=37, 7, p<.001$, 4. $\chi^2 (2)=27, 8, p<.001$, 5 $\chi^2 (2)=26, 4, p<.001$). Profiles are presented in Figure 1 and pairwise comparisons are presented in Table 2.

TABLE 2 Descriptive statistics of salivary cortisol measurements for the full sample and for the groups based on AUCg-values.

Measurement	Total		1Low (n=8)		2Moderate (n=84)		3High (n=10)		Pairwise comparisons
	M	Sd	M	Sd	M	Sd	M	Sd	
SaCor 1	17,2	9,7	14	6,5	16,2 7,9		29,1	9,3	1=2,1<3*,2<3*
SaCor 2	28,7	13,4	15,7	5,4	27,6 10,1		53,6	5,2	1<2**,1<3***,2<3***
SaCor 3	22,9	11,3	8,3	2,2	22,3 0,9		44	13,2	1<2***,1<3***,2<3***
SaCor 4	5,6	3,2	2,5	0,8	5,1 2,1		10,9	4,3	1<2***,1<3***,2<3***
SaCor 5	3,2	3,6	1,4	0,4	2,4 1,7		11,3	5,6	1=2,1<3***,2<3***

p<.05*, p<.01**, p<.001***

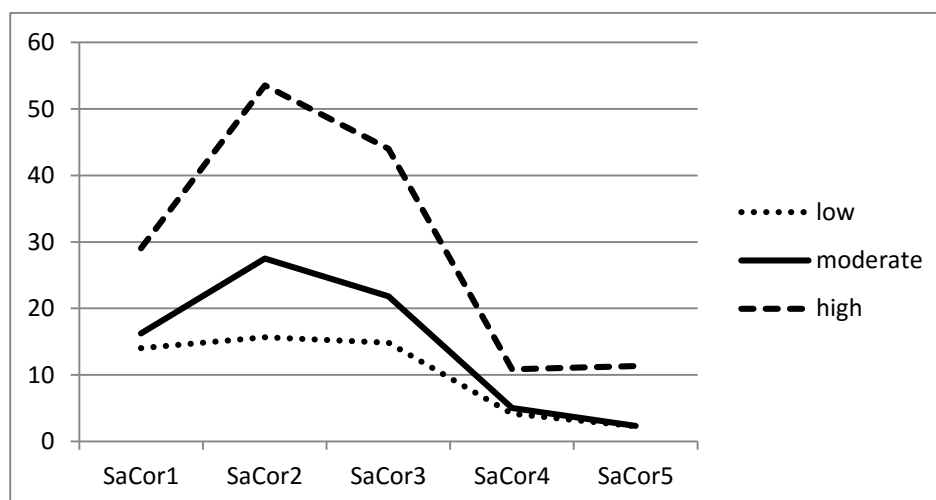


FIGURE 1 ECPs' cortisol levels in five measurement points grouped in to low, moderate and high groups based on AUCg values (nmol/l).

To answer the second part of the study question 2 we conducted Kruskal-Wallis test to investigate if the low, moderate and high AUCg groups differed in experienced job demands and resources, but there were no statistically significant variation ($p>.05$).

Quality of Pedagogical Work

The overall mean score for pedagogical work was 2.4 on a 3-point scale indicating generally high quality across all five factors measured ($M = 2.4$, $SD = 0.26$). On average the

quality of classroom management was lower than other quality measures and classroom activities demonstrated the highest level of quality. Table 3 shows the descriptives of the quality assessment.

TABLE 3 Quality of pedagogical work (N=35)

	Min	Max	Mean	Sd
Classroom arrangements	1,1	2,8	2,31	0,38
Schedules and transition	1,64	3	2,32	0,35
Classroom activities	1,82	3	2,56	0,31
Team work	1,57	3	2,38	0,38
Behavior plans	1,67	3	2,42	0,34

The ranges between minimum and maximum values show there was remarkable variation within each scale. This indicates that even though the quality was good on average, it was not stable and nor was it uniformly high across the day care groups.

Correlations between Job Demands and Resources, Stress, and Quality of Pedagogical Work

To answer to the third study question we performed correlational analysis between resources and demands on staff working in the daycare environment and the pedagogical quality of daycare service delivery. Correlation analysis of job demands and resources and service quality revealed close connections. The poorer the quality of teamwork, the more ECPs felt emotional pressures ($r = -.25, p < .05$). In teams where the classroom activities were not well-planned ($r = -.24, p < .05$) and where behavior plans were poorly developed ($r = -.32, p < .05$) emotional pressure was higher. Likewise, supervisor support seemed to relate positively to better quality teamwork ($r = .23, p < .05$), classroom activities ($r = .27, p < .05$), and behavioral plans ($r = .34, p < .05$). In the groups where activities ($r = .24, p < .05$) were better organized and the teamwork ($r = .25, p < .05$) was good, the ECPs felt greater autonomy.

Finally, to investigate more detailed the associations between the variables we constructed a latent growth model. After deleting non significant variables in the model, we developed a model to determine whether ECPs' educational level and quality of teamwork had an effect on their initial cortisol level and its change during the day by using three cortisol measurement points (morning, afternoon, and evening). We chose to only use 3 of the 5-cortisol measurement points because the chosen points provide a linear

pattern of decreasing cortisol values across the day. When using logarithmically transformed cortisol values the mean intercept value (mean morning cortisol value) was 3.02 and the mean slope value was -2.26 indicating the average decline in cortisol values. The estimated model, which is depicted in Figure 4, fitted the data well $\chi^2(4) = 5.510$, $p = .239$, CFI = .96, RMSEA = .049. The results showed first that the higher the morning cortisol values, the more pronounced the change (i.e. decrease) ($\beta = -.55$) during the day, and second that both the educational competence level of the daycare personnel ($\beta = -.33$) and teamwork ($\beta = -.32$) predicted lower morning values, and related to each other $r = .43$.

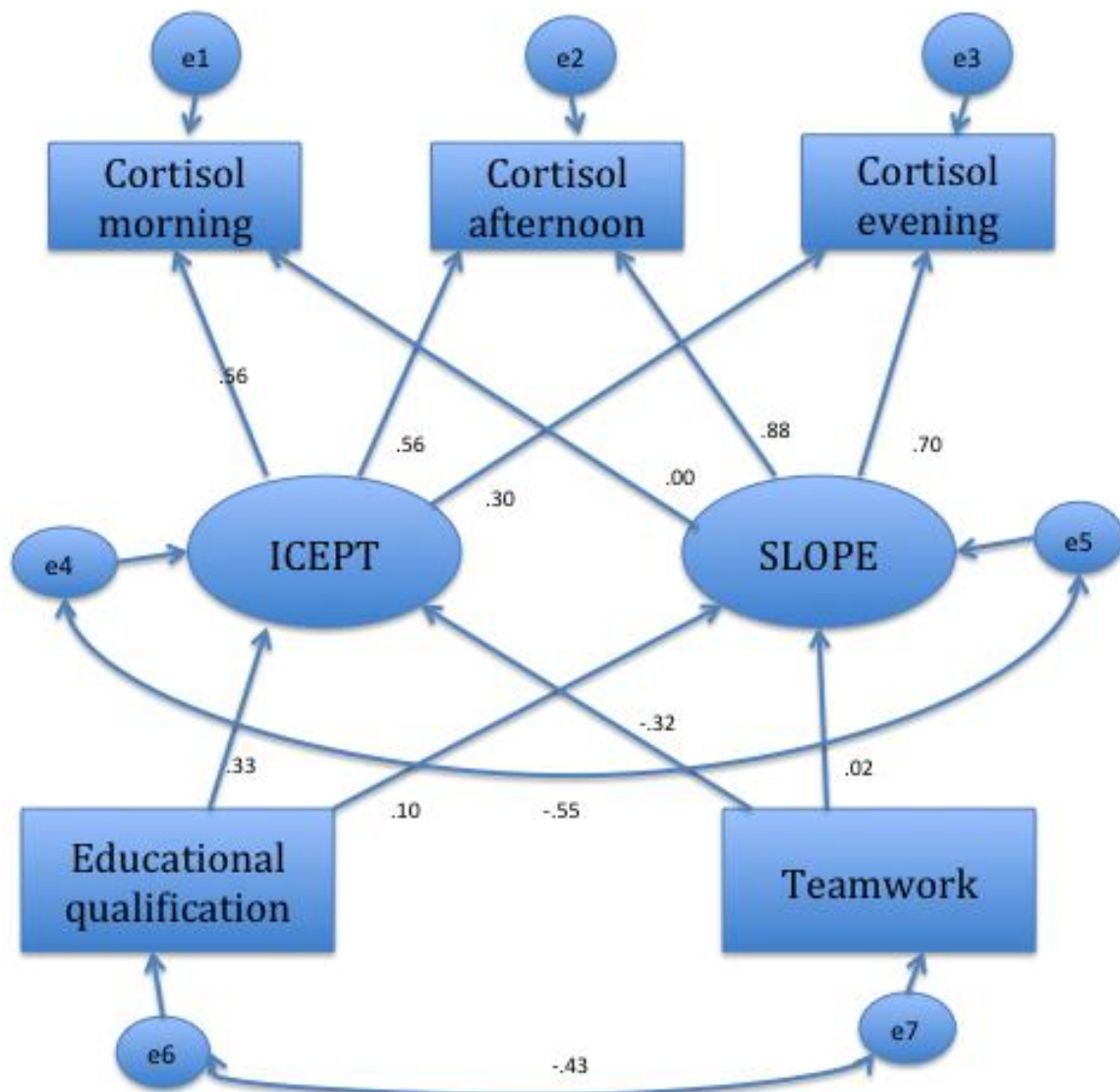


FIGURE 2 Initial level cortisol and its change using educational qualification and teamwork of day care personnel as predictors

The model shows better-qualified ECPs, and professionals demonstrating better quality teamwork, had lower cortisol values in the morning. Teamwork did not correlate with overall changes in cortisol during the working day; instead, the quality of teamwork related to the morning values only.

Discussion

The aim of this study was to investigate the extent to which ECPs in daycare centers experience job demands and resources, and how these relate to their stress regulation and the quality of their pedagogical practice. The results indicated that, in the ECPs' experience, their workplace resources were adequate, and on average their stress regulation was balanced. We found associations between pedagogical work and experienced job resources, and additionally there was an inverse relationship between pedagogical work and ECPs daily cortisol levels.

Most of the ECPs felt they had some level of autonomy over their working day. Previous studies have shown that autonomy is a significant job resource (Demerouti et al., 2001), as opportunities to make decisions about the work may further increase ECPs' motivation and work engagement. In our study, autonomy correlated with the ECPs' profession; the results showed that teachers and special teachers considered themselves to be less autonomous in their work than daycare nurses and assistants. The lack of autonomy reported by teachers and special teachers is a concern given that role ambiguity and confusion over sharing responsibilities in the team may challenge well-being (Klassen & Chiu, 2010). In the field of early childhood education, there is particular concern that a shared working culture is somewhat lacking and the competences and knowledge of different occupational groups working in the sector are not exploited effectively (Nummenmaa & Karila, 2006; Onnismäa & Kalliala, 2010). Defining the roles of each of the different groups working in early childhood settings more clearly may help these workers to feel more in control of their work (more autonomous) and ultimately impact on their well-being.

Our results revealed that a general positive experience of social support, especially support from supervisors, had a significant association to better resources at work and to higher-quality pedagogical work in daycare groups. There is an inverse relationship between autonomy and social support; and whilst autonomy has a positive impact on well-being, too much autonomy can be experienced as a lack of social support, with a consequent negative impact on well-being (Hakanen et al., 2006). Social support is

particularly important in reducing the load imposed by the demanding aspects of the job (Bakker et al., 2004; Schaufeli et al., 2009) and being left alone to work out problems can negatively impact on well-being. It is important that ECPs feel appreciated and respected by both colleagues and supervisors, particularly when they encounter challenges. The autonomy to make decisions about when to seek support, and being able to trust that support will be available when needed, are clearly key components of worker well-being.

Working in the field of education and welfare is often reported as stressful and challenging, (e.g. Klassen, 2012; Hakanen et al., 2006; Hakanen, 2009) so in this study it was heartening that the participants' experience of resources at work was positive. However, despite the fact that most of the ECPs in this study considered their work resources to be good, some participants were not so positive. We should take these cases seriously, as job resources are an important factor in well-being, especially when the demands are high. A combination of lack of resources and high job demands may lead to high levels of emotional pressure and finally to exhaustion and burnout (Bakker et al., 2007; Zhai et al., 2011). Better resources may reduce the influence of demands (Bakker et al., 2004), as, for example in this study, better supervisor support was shown to be associated with less emotional pressure.

A further aim was to investigate the extent to which ECPs cortisol levels altered during the working day, and how this related to quality of pedagogy in the groups. Although, on average, cortisol levels followed the typical diurnal pattern meaning that cortisol concentrations were higher early in the morning, declined rapidly across the morning, and slightly decreased through the afternoon to the evening (as identified by Wilcox, Granger, Szanton, & Clark, 2014; Dmitrieva et al., 2013), there were participants whose cortisol levels were atypical: either heightened or flattened. For example, a higher morning cortisol awakening response (Fekedulengn et al., 2012) or flatter cortisol levels (Liao, Brunner, & Kumari, 2013) have been linked to higher levels of experienced work-related stress. Previous studies have suggested that high morning values are connected to work overload (Nater, Rohleder, Schlotz, Ehlert, & Kirschbaum, 2007; Groenveld et al., 2012), while others have shown high evening values are indicators of vulnerability to work-related stress (Morgan et al., 2002). Our results suggest that there are ECPs who are potentially vulnerable to workplace stress and its consequences based on these atypical cortisol patterns. However our study's results are descriptive by nature, and therefore require careful interpretation.

The most interesting finding in this study was the demonstration of correlations between cortisol activity and pedagogical work in the groups: in particular we found that the lower the quality of teamwork, the higher the morning cortisol values. Better quality cooperation and a shared working culture and additionally the higher educational

qualification were associated with ECPs lower morning cortisol values. Other research in early childhood education settings also demonstrates a link between quality and worker stress (Sims, 2007). We posit that better quality teamwork provides the social support needed to reduce worker stress levels and this contention is supported by research that indicates a strong link between levels of social support and stress (Heinrichs et al, 2003).

There were also connections between ECPs educational qualifications and cortisol activity, which indicate that less-qualified educators might experience more work-related stress. In contrast the Sims (2007) study in Australia found that older ECPs had higher stress levels. The Australian study did not find an association between qualifications and cortisol levels but this may be because the variation in qualifications in Australia was, at the time of data collection, quite small. It is possible that both older and less well-qualified ECPs experience stress because they may not have the knowledge needed to perform their job confidently. Certainly in Australia changes to mandated quality assurance processes mean that the job role of early educators has changed dramatically over the past decade and this can certainly be stressful for those whose training was undertaken many years ago.

Finally, this study has some limitations that should be taken into considerations when interpreting the results. The participants in this study represented a somewhat selective sample because the daycare centers involved were already participants in our ongoing intervention study. This suggests that participants were motivated and inspired to improve the quality of their work, and thus may not be representative of other daycare staff. Additionally, the sample size in our study was rather small, and hence generalisability is limited. It is also possible that employees are not always aware if they are loaded at the psychological level, despite experiencing strain at the physiological or endocrinological level. Nevertheless, one shortcoming in our study is the fact, that we did not utilize self-report surveys concerning work engagement or burnout and combined this information with the physiological measurements. This kind of study design could offer more in depth understanding about ECPs overall work-related well-being. Our ability to collect saliva was limited to one day and we were unable to extend the collection period because we had only permission from Ethical committee for collection on one day. There is significant intrapersonal variation in cortisol levels on separate days (Kudielka, Gierens, Hellhammer, Wüst, & Schlotz, 2012), and collecting samples on one day only meant we could not account for this. However, despite this limitation, we suggest that data collected over one day remains valid and useful, and it gives us certain figure of diurnal variation in stress reactivity and particular preliminary information, as to what extent experienced job demands and resources are associated. Certainly the ability to make comparisons between cortisol levels on working and non-working days would be useful. Additionally, in assessments of pedagogical work it would have been beneficial to

calculate inter-rater reliability, and we are aware that this is one lack in the study. However, to enhance the reliability of the measurement we trained the raters to use same criteria in observing and assessing the pedagogical work. In addition, the raters were instructed to follow the similar timetable during the observation days.

In examining work-related stress and the factors that impact on it, future studies could aim to provide more in-depth insights into the interaction of the individual and environment given our findings of relationships between pedagogical quality, resources and demands and workplace stress. Likewise, the positive characteristics should be emphasized and investigated to uncover the extent to which work-related well-being develops. Well-being at work is not simply the absence of illness; instead, it may positively spread among people working together and lead the whole working community to flourish. Subsequent studies are required to investigate the developmental pathways of well-being at work, and how the teamwork that is here revealed to be an enhancing resource could boost the well-being of the entire working team.

Our study has implications for both policy and practice. First, it is important to recognize the balance needed between autonomy and social support (both supervisor support and teamwork support), particularly in the challenging work environments typical in daycare. Practitioners can improve the quality of the ECE they deliver when they work together and support each other but still maintain a clear understanding of their roles and feel a degree of autonomy to enact those roles. This balance of autonomy with social support not only facilitates better pedagogical quality, it also improves individual well-being. Opportunities to develop cohesive teams need to be a recognized and valued component of early childhood education work. At the policy level, clear identification of the various roles within ECE work is clearly important, along with clear expectations of work performance and the ability to operate independently within those roles. Whilst there is yet much research needed to clearly explicate the complex inter-relationships between work demands and resources, work stress and pedagogical quality, we argue that our study provides a useful foundation for understanding these complexities in the context of Finnish early childhood education work.

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