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Employee Age and Company Performance: An Integrated Model of Aging and Human Resource Management Practices

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Abstract:	<p>This study investigated the relationships among company average age, company work ability and company performance by examining (a) the effects of employee average use of selection, optimization, and compensation (SOC) personal strategies and high involvement work practices (HIWPs) on employee work ability, (b) the buffering effects of both employee average use of SOC and HIWPs on the negative relationship between company-level average age of employees and employee work ability, and (c) the link between company average age and company performance as mediated by company work ability. Analysis was conducted on data from 70 Finnish companies in the retail and metal industries and their 889 employees. Results showed that company average age was negatively related to company work ability, which in turn was positively related to company performance assessed by company managers. HIWPs were positively related to company work ability. Employee average use of SOC strategies buffered the negative effect of company average age on company work ability. Theoretical and practical implications of these findings are discussed.</p>

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7 **Employee Age and Company Performance: An Integrated Model of Aging and Human**
8 **Resource Management Practices**
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ABSTRACT

This study investigated the relationships among company average age, company work ability and company performance by examining (a) the effects of employee average use of selection, optimization, and compensation (SOC) personal strategies and high involvement work practices (HIWPs) on employee work ability, (b) the buffering effects of both employee average use of SOC and HIWPs on the negative relationship between company-level average age of employees and employee work ability, and (c) the link between company average age and company performance as mediated by company work ability. Analysis was conducted on data from 70 Finnish companies in the retail and metal industries and their 889 employees. Results showed that company average age was negatively related to company work ability, which in turn was positively related to company performance assessed by company managers. HIWPs were positively related to company work ability. Employee average use of SOC strategies buffered the negative effect of company average age on company work ability. Theoretical and practical implications of these findings are discussed.

Keywords: work ability, selection, optimization and compensation (SOC), aging, high involvement work practices, company performance

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**EMPLOYEE AGE AND COMPANY PERFORMANCE: AN INTEGRATED
MODEL OF AGING AND HUMAN RESOURCE MANAGEMENT PRACTICES**

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The populations in Western Europe, East Asia and North America are continually aging due to low fertility rates and high life expectancies (Walker & Maltby, 2012). Multi-layered challenges, such as the increasing of the dependency ratio (ratio which gives the numbers of persons unemployed or outside the labor force per one employed persons), have raised concerns regarding labor force participation rates and subsequent changes in potential economic growth in a number of countries (Ilmarinen, 2006; Organization for Economic Co-operation and Development, OECD, 2013). Given this labor force aging trend, the need for more theoretical development in aging-related human resource management (HRM) research becomes quite evident. Furthermore, identifying HRM practices that can help support aging employees and ensure that employees as a collective are capable of maintaining their job performance is important for practitioners (James & Pitt-Catsouphes, 2016).

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Individual-level research suggests that age is inversely related to employee's memory capacity, goal orientation and training performance (Ng & Feldman, 2008). Another line of research on employee aging and performance suggests that formal company practices may influence employees' activities at work (Ilmarinen, 2006, 2009). Specifically, it was shown that employees' perceived capacity for work can be promoted by certain company practices, such as providing training, development, and learning opportunities to employees (e.g., Ilmarinen & Tuomi, 2004). These practices are important components of high involvement work practices (HIWPs), defined by Guthrie (2001) and Lawler (1988) as a system of HRM practices designed to enhance employees' levels of knowledge, skills, motivation, and information about job

AGE, WORK ABILITY AND COMPANY PERFORMANCE

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performance. Thus, it is possible that HIWPs may help employees buffer resource loss due to aging and thus attenuate the negative effect of age on employees.

However, aging may not influence all older employees equally. According to the selective optimization with compensation (SOC)¹ model by P. Baltes and M. Baltes (1990), a set of strategies, including selection, optimization, and compensation, can be used to counteract resource loss brought about by aging. As presented by B. Baltes and Heydens-Gahir (2003), at the core of this model is the coordinated and combined development and adaptive use of three classes of behaviors: (a) forming and setting of goals, (b) optimization and use of goal-relevant means, and (c) the availability and use of compensatory means to maintain goal attainment when previously available means are no longer available (P. Baltes, 1993; P. Baltes & M. Baltes, 1990; Freund & P. Baltes, 2002). Researchers have found that successful, simultaneous use of SOC strategies may increase employees' resources, help maintain functioning in the face of challenges, and help control impending losses in resources in working life (B. Baltes & Heydens-Gahir, 2003; Yeung & Fung, 2009).

Despite the potential beneficial effects of SOC in maintaining aging employees' productivity at work (Riedel, Müller, & Ebner, 2015), there is not sufficient theorizing, nor practical knowledge about (a) whether the level of SOC use of a group of employees is beneficial or (b) whether SOC use may counter the negative effect of age on employees (Moghimi, Zacher, Scheibe, & Van Yperen, 2016). As such, in this research, we integrate the aging literature with HRM literature to examine employee average use of SOC strategies and HIWPs as company-level moderators on the company-level relationship between age and performance. In addition to integrating these two literatures, examining employee average use of SOC and HIWPs can provide important practical implications for interventions targeting at a group of employees as a

AGE, WORK ABILITY AND COMPANY PERFORMANCE

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3 whole, as previous practices have mainly focused on individual employee's use of SOC as a
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5 buffering factor.
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8 Another important issue to be clarified is *why age matters* to performance at the company
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10 level. A recent study, using data from the Health and Retirement Study, found that the concept of
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12 *work ability*, which refers to the perceived balance between employees' personal resources and
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14 work demands (Ilmarinen, 2006, 2009; Tuomi et al., 1997), can act as a mediator in the
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16 relationships between health and labor force outcomes (McGonagle, Fisher, Barnes-Farrel, &
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18 Grosch, 2015). In their study, a conceptual model of antecedents and outcomes of perceived
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20 work ability was tested using three independent samples of U.S. working adults. However, the
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22 inconsistent findings of this study regarding the relation between perceived work ability and age
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24 highlight the need for additional research (McGonagle et al., 2015). Other existing research has
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26 repeatedly demonstrated that age is one of the most important and robust predictors of employee
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28 work ability (Alavinia, de Boer, van Duivenbooden, Frings-Dresen, & Burdorf, 2009; van den
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30 Berg, Elders, de Zwart, & Burdorf, 2009). This is not surprising, given that aging is a process
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32 accompanied by a decline in important physical and mental resources (Jex, Wang, & Zarubin,
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34 2007; Wang, Olsen, & Shultz, 2013). As older employees may possess fewer resources to meet
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36 their work demands, the aging process can negatively impact their work ability (Ilmarinen,
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38 2006).
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45 Work ability has been used as a tool by occupational health professionals to diagnose and
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47 ensure that employee work requirements are reasonable, which can help reduce risks associated
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49 with work-related illness, disease, and injury (Kuoppala, Lamminpää, & Husman, 2008).
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51 Empirical studies have linked work ability to several important work-related outcomes, such as
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53 spells of employee sickness, absence, and early retirement from employment (Ahlstrom,
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AGE, WORK ABILITY AND COMPANY PERFORMANCE

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3 Grimby-Ekman, Hagberg, & Dellve, 2010; Alavinia et al., 2009). Despite the cumulating
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5 empirical evidence (e.g., Ahlstrom et al., 2010; Alavinia et al., 2009; van den Berg et al., 2009;
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8 M. B. von Bonsdorff, Seitsamo, Ilmarinen, Nygård, M. E. von Bonsdorff, & Rantanen, 2010;
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10 McGonagle et al., 2015; Weigl, Müller, Hornung, Zacher, & Angerer, 2013; Jopp & Smith,
11
12 2006), the concept of work ability has been traditionally studied as an individual-level construct.
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15 It has not been conceptualized at the company level or been integrated with strategic human
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17 resource management (SHRM) research which is interested in the impact of HRM practices on
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19 human capital resources (Ployhart & Moliterno, 2011).
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22 Studying work ability at the company level is important for several reasons. First, in
23
24 order to better integrate aging research with the SHRM research, the structure and function of
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26 aging-related human capital component should be studied at the unit level. The SHRM literature
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28 has largely focused on the macro-level relationships between HRM practices and company
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30 performance measures (Wright & Boswell, 2002), with relatively less attention paid to
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32 characteristics of individuals in the company. Including company-level work ability could help
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34 bring the employees' characteristics, such as age (Guest, 2002; McGonagle et al., 2015), into
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36 research about HRM practices-company performance relationship. Second, conceptualizing work
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38 ability at the company level may yield a more theoretically complete picture of the foundation of
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40 company human capital, and help explain how unit-level human capital resources are influenced
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42 by contextual factors (Ployhart & Moliterno, 2011). Finally, compared to age, work ability can
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44 be a more proximal factor that impacts company performance. Understanding the role of work
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46 ability at the company level, especially how it relates to company performance, may help us
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48 understand the mechanism underlying the effect of aging workforce on company-level
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50 performance outcomes. As we detail later, we draw on the multilevel perspective (Chan, 1998;
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AGE, WORK ABILITY AND COMPANY PERFORMANCE

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Ployhart & Moliterno, 2011) and use the additive model of composition to conceptualize company-level work ability as a company-level human capital element that emerges from individual employees' work ability.

Considering these issues, the purpose of this study is to examine perceived work ability at the company level as a possible mediator of the joint impact of company average age, employee average use of SOC, and HIWPs on company performance. This research draws on several streams of literatures to propose a theoretical model at the company level (illustrated in Figure 1). Specifically, we draw on the aging and SOC literature (B. Baltes & Heydens-Gahir, 2003; P. Baltes, 1993; P. Baltes & M. Baltes, 1990; Freund & P. Baltes, 1998, 2002) to explicate the influence of employees' average use of SOC strategies on the relationship between age and work ability. This body of literature explains how adaptive behaviors initiated by employees help counter the negative influence of age on work ability. We also apply the multilevel perspective on human capital resources (Kozlowski & Klein, 2000; Ployhart & Moliterno, 2011) to examine the relationship between company average age and company work ability. We further draw on the HIWPs literature (Becker & Huselid, 1998; Boxall & Macky, 2009; Guthrie, 2001; Lepak, Liao, Chung, & Harden, 2006; Leana & Florkowski, 1992) to examine the effect of formal HRM practices on the relationship between company average age and company performance. Integrating these different streams of literatures allows the current study to advance the understanding about company-level relationship between age and work ability, as well as the moderating effects of HIWPs and employee average use of SOC on this relationship.

Insert Figure 1. about here

This study makes several contributions to the literature. First, using data from Finnish metal industry and retail trade industry, we contribute to the SHRM and occupational health literatures by moving work ability to the company level. Second, we contribute to the aging literature by examining the effect of SOC on work ability and the buffering effect of SOC on the negative relationship between age and work ability at the company level. In this way, we move theory regarding age and use of SOC behaviors to the company level. Third, we examine whether HIWPs can improve employees' average work ability, which helps integrate the HRM literature and aging literature to advance our understanding of how HRM practices may counter the effect of an aging workforce on companies. Fourth, we examine employee work ability at the company level as a mediator that links employee average age to company performance. As such, the current study offers an important theoretical mechanism for the effect of company workforce age on company-level outcomes.

THEORETICAL FRAMEWORK AND HYPOTHESES

Individual and Company Work ability

Work ability has traditionally been studied as an individual state. In this section, we first review the concept of work ability in the individual-level research and then define company-level work ability. The concept of perceived work ability were developed at the Finnish Institute of Occupational Health in the 1980's to study employees' capacities to work, especially among the aging workforce in several European countries (Ilmarinen, 2009; van den Berg et al., 2009). In particular, work ability is defined and measured as the compatibility between employees' personal resources and work demands (Ilmarinen, 2006, 2009; van den Berg et al., 2009). Theories on work ability argue that an employee's functional capacity, which consists of physical, mental, and social aspects, can be considered the base for work ability (Rutenfranz,

AGE, WORK ABILITY AND COMPANY PERFORMANCE

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3 1985). According to Ilmarinen (2006, 2009), work ability is built upon an employee's physical,
4 mental, and social resources, in the form of health, knowledge, skills, values, attitudes, and
5 motivation. In empirical individual-level studies, age, the presence of major diseases, lifestyle
6 factors (e.g., smoking, obesity, and lack of leisure time and exercise), psychosocial factors, and
7 work design factors have been associated with individual work ability (Alavinia et al., 2009;
8 Ilmarinen & Tuomi, 2004; Palermo, Fuller-Tyszkiewicz, Walker, & Appannah, 2013; van den
9 Berg et al., 2009).

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20 The Work Ability Index (WAI) (Tuomi, Ilmarinen, Jahkola, Katajarinne, & Tulkki, 2002)
21 is the most widely used measure of work ability and has accumulated a considerable amount of
22 validity evidence (van den Berg et al., 2009). The WAI consists of seven types of items,
23 including assessments of current and anticipated future work ability, sickness absences, the
24 number of physician-diagnosed illnesses, and psychological resources (Ilmarinen et al., 1991).
25 As a well-accepted instrument to measure work ability, it is available in more than 20 languages
26 (van den Berg et al., 2009). The WAI has been validated against clinical data. Previous studies
27 have found strong correlations between clinical and biological assessments (cardiorespiratory,
28 musculoskeletal, and psychological measures) of health status and the WAI scores (e.g.,
29 Eskelinen, et al., 1991). Work ability measured with the WAI is related to disability to work and
30 risk for mortality (Tuomi et al., 1997; M. B. von Bonsdorff et al., 2010). Furthermore, the test-
31 retest reliability of the WAI has been established in a study that used a test-retest design with a
32 four-week interval between measurements (de Zwart, Frings-Dresen, & Duivenbooden, 2002).
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50 Work ability has not been previously studied at the company level. In the current study,
51 based on the multilevel perspective on human capital (Kozlowski & Klein, 2000; Ployhart &
52 Moliterno, 2011), we conceptualize company work ability as a component of company human
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capital that emerges from individual employees' work ability. Ployhart and Moliterno (2011) conceptualize human capital as collective resources created from individual employees' knowledge, skills, abilities, and other characteristics (KSAOs). They argue that the origins of company-level human capital resources are in the KSAOs of the employees within the company. They also explain that company-level human capital resources and KSAOs of individual employees are partially isomorphic, such that company-level human capital resources retain certain characteristics of their individual-level counterparts and capture company-level contextual influences (e.g., HRM practices) that cannot be captured by individual-level constructs (Bliese, 2000). Their model also suggests that when the human capital resource emergence process can be captured by a composition model, additive aggregation can be used to indicate company-level resources.

Based on Ployhart and Moliterno's (2011) theory, company work ability can be considered as a construct that resides at the company level, originating from individual employees' work ability and reflecting higher-level contextual influences. It is a company-level characteristic that indicates the aggregated level of work ability among employees in the same company. Following Ployhart and Moliterno's suggestion, given that company work ability emerges from a composition (instead of compilation) process which allows company work ability to retain the same properties as individual work ability, company work ability can be formed from individuals' work ability following the additive model of composition (Chan, 1998)². Consequently, company work ability is a summary of individual employees' work ability, regardless of the distribution of work ability among individual employees. As such, company work ability is similar to individual work ability in terms of describing the amount of personal as well as job-related resources available for employees to handle job responsibilities. Nevertheless,

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3 as a higher-level construct, company work ability can capture the contextual influences from
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5 company-level factors (e.g., HRM practices) that cannot be captured by individual work ability.
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8 As we detail below, we examine both personal (i.e., age) as well as organizational (i.e., HIWPs)
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10 contextual influences on company-level employee work ability.
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12 **Individual and Employee Average Use of SOC**

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15 The SOC model describes strategies used by individuals to adapt to developmental
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17 changes (P. Baltes, 1993; P. Baltes & M. Baltes, 1990; Freund & P. Baltes, 1998, 2002). The
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19 model assumes that the use of four interrelated behavioral strategies (i.e., elective selection, loss-
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21 based selection, optimization, and compensation) may help individuals adapt successfully to
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23 aging by (a) increasing personal resources, (b) helping maintain functioning in the face of age-
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25 related challenges, and (c) regulating the approaching resources loss (B. Baltes & Heydens-
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27 Gahir, 2003; Freund & P. Baltes, 1998, 2002; Zacher & Frese, 2011). Specifically, the SOC
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29 model defines *selection* as behavioral strategies that focus on the selection of goals. Selection
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31 strategies include two types: elective selection (selecting from a pool of alternative goals or
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33 domains of functioning) and loss-based selection (selecting in response to loss of external or
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35 internal resources, e.g. reconstruction of one's goal hierarchy). *Optimization* refers to behaviors
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37 related to allocation and refinement of personal resources (e.g., practicing, modeling successful
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39 others, and investing more time and effort into goal pursuit) to achieve important goals. The final
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41 component, *compensation* refers to obtaining and using alternative means (e.g., relying on
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43 external help or modifying work tasks) to reach goals and to maintain one's functioning when
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45 faced with resource losses. In sum, the synchronized use of these SOC behaviors can facilitate
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47 successful aging by a more focused allocation of available resources (P. Baltes & M. Baltes,
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1990; B. Baltes & Heydens-Gahir, 2003; Jopp & Smith, 2006; Young, B. Baltes, & Pratt, 2007; Zacher & Frese, 2011).

In the current study, employee average use of SOC strategies is defined as a company-level construct that describes the average level of SOC use among employees in the same company. Considering that SOC describes adaptive strategies utilized by individual employees, company-level employee average use of SOC is formed from its individual-level counterpart via the additive model of composition (Chan, 1998). This way, employee average use of SOC retains the same structure and function as its individual-level counterpart (Chan, 1998). It should be noted that we do not assume employees in the same company necessarily share the same level of SOC use, given that SOC is partly driven by factors outside of work context (e.g., personality characteristics and affective traits; Bajor & Baltes, 2003; Zacher & Frese, 2011). Therefore, employee average use of SOC is not defined by the direct consensus model of composition. This choice of composition model is based on the concern that employees' use of SOC might differ from one employee to another due to differences in their personal situations (e.g., life goals; Wiese, Freund, & P. B. Baltes, 2002) and specific job tasks (e.g., task complexity; Yeung & Fung, 2009). Conceptualizing employee average use of SOC via an additive model of composition also allows this concept to describe the average level of employees' personal experience with aging, which is different from HIWPs (i.e., shared company-level practices targeted at employees as a whole).

Hypotheses Development

Company average age, employee average use of SOC strategies and company work ability. Company average age indicates the extent to which the workforce in the company is aging (Avery, McKay, & Wilson, 2007). It describes employees' overall physical and

AGE, WORK ABILITY AND COMPANY PERFORMANCE

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3 psychological resources in the company. Company-level demographic composition in age has
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5 been linked to several individual-level work outcomes. For example, Avery et al. (2007) found
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7 that similarity or dissimilarity in employee age was related to employees' work-related attitudes
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9 and behaviors.
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12 We expect that at the company level, a workforce that has higher average age has more
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14 resource loss than resource gain among its members, and thus has lower work ability as a group.
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16 This is because while aging does not necessarily affect certain types of resources (e.g. expertise,
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18 Masunaga & Horn, 2001), losses are likely to be prevalent in physical resources (Ilmarinen,
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20 2006; Jex et al., 2007) as well as certain types of cognitive resources (e.g., working memory;
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22 Masunaga & Horn, 2001) that are essential to performing work-related tasks (e.g., Jex et al.,
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24 2007; Wang et al., 2013). Therefore, we expect that company work ability aggregated from a
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26 group of older individual members is likely to be lower than those aggregated from a group of
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28 younger members.
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34 *Hypothesis 1: Company average age is negatively related to company work ability.*
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36 A company with high employee average use of SOC may adapt better to the loss
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38 associated with physical and cognitive aging of its members, because the coordinated use of all
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40 four SOC strategies by its members can help counter the negative effects of age on physical and
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42 cognitive functions (P. Baltes & M. Baltes, 1990; Freund & P. Baltes, 2002). In contrast, a group
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44 consisting of employees with lower average use of SOC strategies may fail to carry out some
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46 critical work functions, due to maladaptation among aging members (Freund & P. Baltes, 2002).
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48 Further, similar to individual use of SOC, we argue that employee average use of SOC can also
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50 directly benefit company work ability by providing flexibility in how group members use
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52 resources, especially when adapting to impending changes in the work environment (P. Baltes &
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M. Baltes, 1990). In terms of maintaining work ability, use of SOC strategies allows individuals to cope better with their job demands or losses in resources (Ilmarinen, 2009), such as physical strength or the ability to process information (Freund & P. Baltes, 2002; Weigl et al. 2013).

For example, employees can benefit from the use of SOC strategies by choosing to focus on tasks that they find interesting and inspiring, instead of setting goals that they cannot accomplish anymore (B. Baltes & Rudolph, 2012). Employees may also benefit from using SOC strategies such as re-scheduling, re-focusing energy, learning necessary new skills, developing existing skills further, or utilizing substitute skills to ensure that they successfully meet work demands (B. Baltes & Rudolph, 2012). Therefore, we expect that employee average use of SOC strategies is positively associated with company work ability and it buffers the negative effect of company average age on company work ability.

Hypothesis 2: Employee average use of SOC strategies is positively related to company work ability.

Hypothesis 3: Employee average use of SOC strategies moderates the relationship between company average age and company work ability, such that the negative relationship becomes weaker when employee average use of SOC strategies is higher (vs. lower).

Company average age, HIWPs and company work ability. High involvement work practices (HIWPs) can be defined as a system of HRM practices that enhances the levels of employees' skills, motivation, information, and empowerment (Guthrie, 2001; Boxall & Macky, 2009). These employee-centered management practices are designed to encourage greater flexibility, proactivity, and collaboration within organizations (Edgar, 2003). Lawler (1988) identified four principles for building a high-involvement work system, i.e., to provide employees with (1) information about the performance of the organization, (2) rewards based on

AGE, WORK ABILITY AND COMPANY PERFORMANCE

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3 their performance, (3) knowledge that enables employees to understand and contribute to
4 organizational performance, and (4) power to make decisions that influence organizational
5 direction and performance. Previous studies indicate that such management practices are
6 positively related to organizational productivity (Guthrie, Flood, Liu, & MacCurtain, 2009;
7 Huselid, 1995; Lepak et al., 2006), employee retention (Guthrie, 2001; Huselid, 1995), job
8 satisfaction, and affective commitment (Boxall & Macky, 2009).

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18 Previous studies have found that job autonomy, which is a basic element of HIWPs, is
19 closely associated with work ability (Feldt, Hyvönen, Mäkikangas, Kinnunen, & Kokko, 2009;
20 Weigl, et al., 2013), as job autonomy enables employees to identify and use optimal strategies
21 for removing constraints encountered at work and provides opportunities for employees to better
22 channel their resources to meet work demands. Although some HIWPs may not have been
23 developed exclusively to enhance the work abilities of employees, the principles of HIWPs are
24 aligned with practices that aim to maintain and promote work ability among employees in the
25 company as a whole. At their core, HIWPs are designed to enhance employees' ability and
26 motivation to effectively perform their jobs and thus contribute to the company's strategic goals
27 as well as maintain employees' well-being (Becker & Huselid, 1998; Boxall & Macky, 2009;
28 Lepak et al., 2006). More specifically, HIWPs elements such as investing in training
29 opportunities, improving employee participation, introducing group incentives, and increasing
30 job security not only develop individual ability, motivation and opportunity to contribute to
31 productively, but can also be used as work ability improvement methods (Ilmarinen, 2006,
32 2009). Therefore, HIWPs are likely to benefit a group in terms of maintaining or improving
33 employee work ability.

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We also expect that HIWPs buffer the negative relationship between company average age and company work ability. Given that companies with high average age are at a greater risk of resource losses (Ilmarinen, 2006; Jex et al., 2007) than companies with low average age, it is essential to focus on different ways to minimize the impact of those resource losses. Previous research (Butts, Vandenberg, DeJoy, Schaffer, & Wilson, 2009) has shown that HIWPs can help a group of employees protect against resource loss, and compensate for and recover from resource loss by providing employees with skills, information, motivation, and decision latitude. Based on the conceptualization of HIWPs (Guthrie, 2001), employees working in companies with high HIWPs are collectively encouraged to take initiative, in order to adapt to and manage changes that may influence their work. For example, HIWPs include feedback and rewards systems, which can direct and correct the direction of the groups' efforts. Furthermore, HIWPs empower employees and allow them to improve their skills, which help employees improve work methods while reaching goals. HIWPs also allow employees to learn new skills and come up with new ways of doing their job, which help them to develop alternative ways of getting work done. As such, it is likely that HIWPs would help employees cope with resource loss, due to aging, that might impact their ability to perform their work. Thus, we expect that the decrease in work ability due to aging will be less severe in companies that implement high HIWPs than in companies with low HIWPs.

Hypothesis 4: HIWPs are positively related to company work ability.

Hypothesis 5: HIWPs moderate the relationship between company average age and company work ability, such that the negative relationship is weaker when HIWPs are higher (vs. lower).

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Company work ability and company performance. As work ability partly reflects employee health, employees with lower work ability tend to have more sickness absences and work-related disabilities, and retire earlier (Ahlstrom et al., 2010; Alavinia et al., 2009). All of these outcomes have negative financial effects on the organization in the form of an increased turnover rate and insurance costs (Kuoppala et al., 2008; Loeppke et al., 2007). In addition, work ability is the basis for productive work (Ilmarinen, 2006, 2009). While company work ability has not been previously linked to company performance, it has been found that the collective knowledge, skills, and malleable abilities of the individuals comprising a unit are related to unit performance (e.g., Bell, 2007; Stewart, 2006). In terms of company work ability and company performance, this could mean that employees who have higher average work ability are more likely to perform effectively in their individual tasks and they are also more likely to learn from working with other employees in the same company. Furthermore, a company composed of employees with higher work ability also has more resources to deal with challenges and demands not specified in their routine roles. Therefore, we hypothesize that a company of members with higher work ability is better at carrying out functions specified for members' individual roles and coordinated actions in the company, which can in turn enjoy higher company performance.

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Hypothesis 6: Company work ability is positively related to company performance.

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Considering that we expect company average age to relate to company work ability (i.e., Hypothesis 1), which in turn influences company performance (i.e., Hypothesis 6), we further propose:

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Hypothesis 7: The negative relationship between company average age and company performance is mediated by company work ability.

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METHOD

Participants and Procedure

Data were collected in 2011 by the Finnish Institute of Occupational Health. Participants of this study were employees working in companies in the Finnish metal and retail trade industries. The metal and retail trade industries were selected because they are good representatives of the manufacturing sector and service sector, respectively (Guest, Michie, Conway, & Sheehan, 2003; M. E. von Bonsdorff, Vanhala, Seitsamo, Janhonen, & Husman, 2010). In addition, they are among the largest industries and employers in Finland (Statistics Finland, 2014), providing a sufficient number of companies for our sampling (a total of 4,157 companies in the company register of Statistics Finland). Two hundred and one companies agreed to provide company-level data, which resulted in a sampling coverage rate of 4.8% at the company level.

Companies were drawn from the company register of Statistics Finland using a stratified sampling approach. The International Standard Industrial Classification was used to identify the retail trade and metal industry companies targeted in the current study. The stratified sampling approach took industry subcategories and company sizes into consideration in creating the strata. First, we selected several sub-categories within metal industry and retail trade industry, respectively. Metal industry comprises manufacturing of motor vehicles, trailers, semi-trailers, fabricated metal products, machinery, and equipment whereas retail trade industry comprises retail sale of food, household equipment, and other specialized items (Statistics Finland, 2014). These sub-categories within metal and retail trade industries were considered as representative of the particular industry. Second, after we established our metal industry and retail trade industry subcategories, we stratified companies in these industries according to the number of individuals they employ (i.e., company size). Within each stratum, we then used random sampling to

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3 identify companies to contact for data collection. Specifically, we randomly sampled both
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5 industries in four company size groups (companies with 10-19 employees, 20-49 employees, 50-
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7 99 employees, and 100+ employees). This was done in order to ensure that the sample contained
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9 companies from different size groups³. This procedure was consistent with previous
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11 organizational-level research in Finland (e.g. Tuomi, Vanhala, Nykyri, & Janhonen, 2004).
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15 Seventy of the companies that participated in company-level survey further participated
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17 in the employee-level survey. Among these 70 companies, all employees of those companies
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19 employing 50 or fewer people received the survey questionnaires. For those companies
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21 employing 51 or more people, a random sample of 50 employees in each company received the
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23 survey questionnaires. This cut-off point (companies employing 50 or fewer employees vs. more
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25 than 50 employees) was based on the European Union's definition of micro and small-sized
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27 companies (employing no more than 50 people) vs. medium-sized and large companies
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29 (employing more than 50 people; European Commission, 2013). This sampling method has also
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31 been used in previous studies in Finland (e.g., Tuomi et al., 2004).
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36 There were no statistically significant differences in company size, company
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38 performance, or industry between companies that participated in the employee-level survey and
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40 those companies that did not. Companies handled the distribution and the collection of the
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42 employee questionnaires. In the cover letter accompanying the questionnaire, we explained the
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44 purpose of the study, and informed the participants of the voluntariness of the study and that they
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46 could drop out at any time during the study without punishment. Furthermore, we informed all
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48 participants that the results of the study would be reported in a way which would make it
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50 impossible to identify individual respondents.
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3 A total of 889 employees (response rate = 38.5%⁴) from these 70 companies provided
4 data on demographic information and measures of HIWPs, SOC, and work ability. Company
5 performance ratings for all of these 70 companies were obtained from their CEOs or general
6 managers. The average age of the participants was 42.33 years ($SD = 11.73$), ranging from 18 to
7 68. Among the participants, 496 (55.8%) were men, 199 (22.4%) held a university degree, and
8 276 (31%) worked as managers. Among the 70 companies studied, 31 (44.3%) were in the retail
9 trade industry, and 39 (55.7%) were in the metal industry. Company size measured by number of
10 employees ranged from 9 to 935 at the end of 2010⁵, with an average size of 92.17 employees
11 ($SD = 163.59$).
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24 Measures

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26 All surveys distributed to the respondents were in Finnish. Following previous research
27 conducted using translated scales (e.g., Gong, Wang, Huang, & Cheung, 2014; Rupp, McCance,
28 Spencer, & Sonntag, 2008), SOC, HIWPs and company performance scales were translated from
29 English to Finnish following Brislin's (1980) recommended translation-back translation
30 procedure.
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39 **Company average age.** Age was reported by employees. Company average age was the
40 mean of company employees' ages.
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44 **Employee average use of SOC strategies.** Use of SOC strategies at work was measured
45 with a modified version of the 12-item SOC questionnaire developed by P. Baltes, M. Baltes,
46 Freund, and Lang (1999). The scale includes four components (i.e., elective selection, loss-based
47 selection, optimization, and compensation), with three questions per component. The four
48 components together reflect the overall score of SOC (Freund & B. Baltes, 2002). All items are
49 listed in Appendix A.
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3 The scale used in the current study asked respondents to rate their use of SOC behaviors
4 at work on a five-point scale ranging from “1” (=very little) to “5” (very much). The original P.
5 Baltes, M. Baltes, Freund, and Lang (1999) scale forced the respondents to pick between an SOC
6 and a non-SOC behavior in each item. The scale used in the current study overcame several
7 measurement limitations of the original scale. First, due to the complicated instructions, the
8 original scale could place a considerable amount of cognitive load on respondents (Zacher &
9 Frese, 2011). By using the revised version, we were able to minimize survey time and lessen the
10 cognitive demands on the participants, which are important for reducing potential common
11 method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Moreover, the original scale
12 asked participants to use forced choice to indicate “which of the statements, characterizing the
13 life-management behavior of two fictitious Persons A and B, respectively, described them (the
14 participants) better” (Freund & P. Baltes, 2002, p. 647), which is not a direct measure of the
15 extent to which respondents use SOC behaviors. In addition, the scale used in this study has been
16 used in previous research as well (Zacher & Frese, 2011; Ziegelmann & Lippke, 2007a; 2007b).
17 These studies consistently suggested that this scale was a reliable and valid measure of
18 individuals’ use of SOC behaviors.
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41 Considering that we are interested in SOC as a general strategy, we followed previous
42 research (e.g., Freund & P. Baltes, 2002) and calculated a summary score across all individual
43 items of the four components, to indicate overall use of SOC strategies (Cronbach’s $\alpha = .72$).
44 Based on the conceptualization proposed, employee average use of SOC strategies was
45 calculated as the mean of company members’ SOC scores. Although our conceptualization of
46 employee average use of SOC does not require within-company consensus, in order to show that
47 mean is a meaningful measure of average SOC use in a company, we also examined $r_{wg(j)}$ of
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3 SOC. Across all companies, average $r_{wg(j)}$ was .97, with median = .97, minimum = .90, and
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5 maximum = .99. These results supported using mean to indicate employee average use of SOC.
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8 We calculated the within-company and between-company level variances of SOC. Results
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10 showed that there was a significant amount of between-company level variance in SOC ($F[69,$
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12 $819] = 2.55, p < .01, ICC[1] = .11, ICC[2] = .61$), which supported analyzing SOC at the
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14 company level. Considering that a large proportion of variance in SOC was at the within-
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16 company level, we controlled for within-company standard deviation (SD) of SOC of each
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18 company in the analyses.⁶
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22 **Perceived company work ability.** Employees' self-reported work ability was assessed
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24 by the Work Ability Index (Tuomi et al., 2002). As explained earlier, the work ability index
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26 comprises seven types of information. These seven types were measured by different items
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28 (listed in Appendix A), which used different anchors in the response scales. Therefore, responses
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30 on different items were standardized (using means and standard deviations based on all
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32 respondents in this study), and an index score of work ability was formed by averaging the
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34 standardized scores of the seven subscales. Since its conceptualization follows an additive
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36 composition model, company work ability was calculated as the mean of company members'
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38 work ability scores. We also calculated the within-company and between-company level
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40 variance of work ability. Results showed that there was a significant amount of between-
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42 company level variances in work ability ($F[69, 819] = 2.57, p < .01, ICC[1] = .11, ICC[2] = .61$),
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44 which supported analyzing work ability at the company level. Considering that there was a large
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46 proportion of variance in work ability at the within-company level, we controlled for within-
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48 company SD of work ability of each company in the analyses.
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3 **HIWPs.** HIWPs of the companies were measured with a 10-item scale (Harmon et al.
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6 2003). Following the referent-shift composition model (Chan, 1998), employees were asked to
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8 evaluate the extent to which their *company* exhibited the HRM practices included in the HIWPs
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10 construct. Ratings were provided on a scale from 1 (very little) to 5 (very much). Items covered
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12 the areas of information sharing, performance-based rewards, teamwork, empowerment, and
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14 interaction between supervisors and subordinates (e.g., “employees are kept informed on issues
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16 affecting their jobs” and “employees are encouraged to come up with new and better ways of
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18 doing things”). Cronbach’s alpha for this scale was .90. While all items of the HIWP scale
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20 measured positive elements, such as rewarding, communication, etc., the scale score expressed
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22 the combined quantity of these positive practices perceived by the employees.
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27 In this study, following recommendations from previous research on HRM practices
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29 (e.g., Takeuchi et al., 2009; Toh, Morgeson, & Campion, 2008; Yanadori & van Jaarsveld,
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31 2014), HIWPs were measured by aggregating employees’ evaluations of HRM practices instead
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33 of using managers’ ratings of HIWPs for several reasons. First, there are differences in the
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35 theoretical meaning between employee perceived HRM practices and manager-rated HRM
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37 practices (Gerhart, Wright, & McMahan, 2000; Khilji & Wang, 2006; Wright, Gardner,
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39 Moynihan, Park, Gerhart, & Delery, 2001; Wright & Nishii, 2007). The managers’ ratings of
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41 HIWPs represent the intended HRM practices that exist in companies’ policies. These intended
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43 practices may not be the same as implemented HRM practices as perceived by employees (Nishii
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45 & Wright, 2007). Focusing on the existence of intended HRM practices rather than the
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47 implemented HRM practices has been recognized as limiting HRM research (Gerhart et al.,
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49 2000; Khilji & Wang, 2006; Wright et al., 2001). This inconsistency between intended HRM
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51 practices and actual implementation can be particularly problematic when measuring HRM
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practices from a single source – the managers. This is because the managers, especially those in larger companies, may not be able to access information about the actual implementation of HRM practices among employees throughout the organization (Gerhart, 2007; Liao, Toya, Lepak, & Hong, 2009). Moreover, in this research, we are particularly interested in capturing a shared perception of HRM practices among employees, which indicates the shared level of HIWPs in the company as a collective. This shared perception serves as a company-level contextual factor that shapes the effect of company average age and employee average use of SOC on company work ability.

Individual employees' HIWPs scores were aggregated to the company level to indicate HIWPs. $r_{wg(j)}$ of HIWPs across all companies ranged from .76 to .98 (*Median* = .92, *Mean* = .92), which suggested that employees in each company held shared perceptions about their companies' HIWPs. In addition, one-way random factor analysis of variance (ANOVA) results suggested that there were significant variances among companies in company-level HIWPs ratings, $F(69, 819) = 3.98, p < .01$ ($ICC[1] = .19$ and $ICC[2] = .75$). These test results together supported the aggregation of HIWPs scores to the company level.

Perceived company performance. Company performance was measured by a 10-item scale developed by Delaney and Huselid (1996). The CEOs or general managers were asked to evaluate their companies' current performance, compared with their competitors, in terms of the quality of products/services, market share, growth of sales, profitability, liquidity, etc. The five-point Likert-type scale ranged from 1 (much weaker) to 5 (much stronger). Cronbach's alpha was .74 for this scale. We used this widely accepted relative measure of company performance for several reasons. First, as one of the first studies that integrate aging and HRM literatures, we want to use measures that are comparable to previous HRM research. Therefore, we used the

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3 measure of company performance from one of the most influential studies in strategic HRM
4 literature, i.e., Delaney and Huselid (1996). Second, as explained by Delaney and Huselid, this
5 relative, benchmarked measure allows HRM research to include companies that have different
6 goals that are aligned with their specific business purposes. Moreover, this measure has been
7 shown to be moderately to strongly correlated with objective measures. Third, this measure from
8 Delaney and Huselid captures a broader space of company performance (such as satisfaction of
9 customers and clients, relations between management and other employees) than narrow,
10 specific financial indicators. Furthermore, more specific to our research context, because
11 companies of different sizes and from different industries are included in our sample, these
12 companies might not be comparable on absolute, financial measures of company performance.
13 Similar to the U.S., in Finland, the accounting measures (e.g., taxes, interests) vary between
14 sectors. Small and large companies may also have different interest in showing profits. Finally,
15 we used company manager's assessment by following the recommendation from a large amount
16 of previous research (e.g., Cranet, 2012; Reichel & Mayerhofer, 2006; Rogers & Wright, 1998).

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Control variables. Company size, industry, and employee demographic characteristics (i.e., percentages of employees with university degree and managers) were included as control variables, because previous studies have suggested that these company characteristics may influence company performance (e.g., Huselid, 1995; O'Reilly, Caldwell, & Barnett, 1989). We also included number of employees responded as a covariate to control for potential sampling differences. Within-company SDs of SOC and work ability were also controlled for in the analyses.

Multilevel Confirmatory Factor Analyses

Multilevel confirmatory factor analyses were conducted to examine whether items in the SOC, HIWPs, and work ability measures captured three distinctive constructs. Scores on the four SOC components were used as indicators for SOC. Considering that multilevel CFA models have a large number of parameters to be estimated and our unit level sample size is relatively small, we used three item parcels each for HIWPs and work ability scales by following previous research on using item parcels (Bandalos, 2002; Hau & Marsh, 2004). Following recommendations from Mehta and Neale (2005), the expected three-factor model was specified by having indicators load on their respective latent variables and allowing the correlations among the three latent factors to be freely estimated, at both within- and between-company levels (illustrated in Figure B1). Results suggested that the three-factor model fit the data well, $\chi^2(71, N = 889) = 211.03, p < .01, CFI = .96, RMSEA = .05, \text{ and } TLI = .94$. All indicators significantly loaded on their respective latent factors (estimates reported in Table B1). Three alternative two-factor models were specified by having all indicators from every possible two-factor combination load on one latent factor. Results suggested that the two-factor models fit the data significantly worse than the three-factor model, Satorra-Bentler adjusted $\Delta\chi^2s(5, N = 889) \geq 276.78, ps < .01$. Taken together, these results suggested that the measures of SOC, HIWPs, and work ability captured three distinctive constructs.

Analytic Strategy

The proposed model contains moderated mediation relationships at the company level (Figure 1). We thus used path analysis to estimate the model parameters simultaneously. The effects of company average age, employee average use of SOC strategies and HIWPs, their interaction terms on company work ability were estimated. The effect of company work ability on company performance was also estimated. The interaction terms were formed by multiplying

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3 the mean-centered scores of company average age, employee average use of SOC strategies, and
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5 HIWPs. The effects of the control variables (i.e., industry, company size, percentages of
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7 employees with university degree and managers, number of respondents, within-company SDs of
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9 SOC and work ability) on company work ability and company performance were included. The
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11 direct effects of company average age, employee average use of SOC strategies, and HIWPs on
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13 company performance were controlled, as well. Model estimation was conducted using Mplus
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15 7.0 (Muthén & Muthén, 2012).
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20 RESULTS

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22 Means, standard deviations, and simple correlations among study variables are reported
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24 in Table 1. The path analysis results are reported in Table 2 and Figure 2. Results showed that all
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26 the predictors included in the model accounted for 44% of the variance in company work ability
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28 and 28% of the variance in company performance. These results suggest that the model could
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30 explain a considerable proportion of the variances in company work ability and company
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32 performance.
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39 Insert Table 1. about here
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Company average age was negatively related to company work ability ($B = -.02, p < .01$), which provided support to Hypothesis 1. The main effect of employee average use of SOC on company work ability was not significant. Therefore, Hypothesis 2 was not supported. The two-way interaction term between company average age and employee average use of SOC was positively related to company work ability ($B = .02, p < .05$). Following Cohen, Cohen, West, and Aiken's (2003) recommendations, we plotted the interaction at conditional values of employee average use of SOC strategies (1 SD above and below the mean). As shown in Figure 3, when employee average use of SOC strategies was higher (1 SD above the mean), the negative relationship between company average age and company work ability was weaker ($B = -.01, p < .05$) than when employee average use of SOC strategies was lower (1 SD below the mean, $B = -.02, p < .01$). Therefore, Hypothesis 3 was supported.

Insert Figure 3. about here

HIWPs were positively related to company work ability ($B = .23, p < .05$), which supported Hypothesis 4. The two-way interaction term between company average age and HIWPs did not have a significant effect on company work ability. Thus, Hypothesis 5 was not supported. Supporting Hypothesis 6, company work ability was positively related to company performance ($B = .48, p < .01$). The confidence interval derived from 20,000 Monte Carlo replications showed that the indirect relationship between company average age and company performance via company work ability was negative and statistically significant (*indirect effect* = $-.007, 95\% \text{ CI} = [-.015, -.002]$). Therefore, Hypothesis 7 was supported.

DISCUSSION

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4 Drawing on aging and HRM literatures, this study tested a company-level model on
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6 company work ability as a mediator in the relationship between company average age and
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8 company performance. We also examined employee average use of SOC strategies and HIWPs
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10 as moderators in this relationship. We found a negative relationship between company average
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12 age and company work ability. In addition, employee average use of SOC strategies buffered the
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14 negative effect of company average age on company work ability. We also found a positive
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16 association between HIWPs and company work ability. Finally, we found that company work
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18 ability was positively related to company performance and acted as a mediator in the indirect,
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20 negative relationship between company average age and company performance.
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24 **Theoretical Implications**

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27 The findings of this study have several theoretical implications. First, this study marks
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29 the steps towards establishing work ability as a company-level construct, by demonstrating that
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31 company average age is negatively associated with company work ability and that company
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33 work ability mediates the negative impact of company average age on company performance.
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35 Our finding is consistent with previous individual-level findings which showed that individual
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37 employee's age is negatively related to individual work ability (Alavinia et al., 2009; van den
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39 Berg, et al. 2009). In accordance with Ployhart and Moliterno's (2011) theory, company work
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41 ability, presenting a summary of individual employees' available resources in relation to
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43 respective job demands (Ilmarinen, 2009), can be viewed as one component of company-level
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45 human capital resources. This company resource can be affected by an important demographic
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47 characteristic of employees in this company (i.e., company average age), which in turn relates to
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49 company performance. The current findings also contribute to research on occupational health
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51 and aging literatures in general by demonstrating that the important individual-level associations
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3 among age, work ability and work outcomes (McGonagle et al., 2015; Palermo et al., 2013; M.
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5 B. von Bonsdorff et al., 2010; Weigl et al., 2013) may be identified at the company level as well.
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8 By illustrating work ability as a mediator in the relationship between company average age and
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10 company performance, we showed that, in addition to individual employees' job performance
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12 and well-being, aging of company workforce also impacts company's bottom line and this effect
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14 is mediated through losses in resources possessed by employees as a collective (Ng & Feldman,
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18 2008).

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20 Second, we found that employee average use of SOC behaviors acted as a buffer in the
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22 negative relationship between company average age and company work ability. This indicates
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24 that a company with high employee average use of SOC strategies might be more capable of
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26 adapting to age-related resource loss as a whole, because the use of SOC strategies as an
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28 informal practice can help maintain resources needed for employee functions (Freund & P.
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30 Baltes, 2002). By examining this company-level effect of employee use of SOC strategies, this
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32 research contributes to SOC literature and aging research. Previous research has mainly
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34 examined use of SOC at the individual level (Moghimi et al. 2016). This research moves this
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36 concept to the collective level, which can be a fruitful area for future research.
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41 Third, by examining the relationship between age, HIWPs, and work ability, we answer
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43 the call for integrating HRM and aging literatures (Ng & Feldman, 2008). Previous research
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45 suggested that HRM practices can help individual employees maintain their work ability
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47 (Ilmarinen & Tuomi, 2004). Taking a company-level perspective further deepens our
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49 understanding of company-level relationship between HIWPs and work ability of employees in
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51 the same company. This is consistent with the principles of HIWPs, which state that formal
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3 management practices can help sustain and promote collective human capital resources in the
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5 company, including employee work ability (Ilmarinen, 2006, 2009; Ilmarinen & Tuomi, 2004).
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8 **Practical Implications**

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10 Our finding that company work ability, as a company-level construct, mediated the
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12 association between company average age and company performance offers some important
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14 implications for organizational practices. As the average age of employees in the Industrialized
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16 Countries is rising, organizations need to identify ways to maintain and improve work ability at
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18 the company level (Ilmarinen, 2006, 2009). While work ability has so far been considered as an
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20 individual level construct, connected to significant individual outcomes (McGonagle et al., 2015;
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22 Palermo et al., 2013; M. B. von Bonsdorff et al., 2010; Weigl et al., 2013), our study showed that
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24 work ability may also be examined at the company level, which transmits the impact of
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26 workforce aging on company performance (Ng & Feldman, 2008). Our findings suggest that to
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28 counter the potential negative effect of workforce aging on company performance, companies
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30 can develop and encourage use of SOC strategies among employees. Further, if there are
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32 available resources, companies can offer HIWPs, such as skill-enhancing practices, opportunities
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34 for cooperation and teamwork, job design, and other productivity-enhancing HRM practices, to
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36 help maintain the work ability of their employees (Cahill, James, & Pitt-Catsouphes, 2015;
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38 Moen, Kojola, Kelly, & Karakaya, 2016; Sanders & Frenkel, 2011). As suggested by Zacher and
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40 Frese (2011), in low-complexity jobs, which are largely represented by the retail and metal
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42 industry jobs in our study, practitioners can set up training of theoretical background and
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44 practical use of SOC strategies to help employees understand the benefits of use of SOC. Finally,
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46 in order to meet aging employees' everyday needs for support in the workplace, SOC strategies
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3 should be integrated with other HRM policies and practices (e.g., family-friendly policies; Earl
4 & Taylor, 2015; Kooij, 2015).
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7 8 **Limitations and Future Directions** 9

10 First, since cross-sectional data collection was used, this study is potentially limited by
11 common method variance and causal inference issues. However, the data were collected from
12 two different sources (i.e., employees and top-level managers), which helps mitigate concerns
13 about common method bias (Podsakoff et al., 2003). In addition, following suggestions from
14 Brannick, Chan, Conway, Lance, & Spector (2010), we examined the correlations between
15 variables measured from the same source and correlations between variables measured from
16 different sources. We found that certain correlations between employee-reported variables (e.g.,
17 $r = -.05$ between company average age and employee average use of SOC) were actually weaker
18 than some correlations between employee- and manager-reported variables (e.g., $r = .30$ between
19 HIWPs and company performance). This result suggests that although some variables were
20 measured from the same source, their correlations were not purely due to common method
21 variance. Moreover, this study examined the theoretically-based interaction effects between
22 employee age, SOC use, and HIWPs on work ability. Literature on common method variance
23 (Evans, 1985; Schaubroeck & Jones, 2000; Siemsen, Roth, & Oliveira, 2010) has suggested that
24 complex interaction effects based on theoretical expectations are less likely to be explained by
25 response biases.
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48 Given the cross-sectional nature of the current study, we cannot rule out the possibility of
49 reversed causation between SOC and work ability (i.e., work ability influences SOC). However,
50 previous longitudinal research supports that the use of SOC behaviors can affect work ability
51 regardless of the existence of the effect of work ability on future use of SOC behaviors (Jopp &
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3 Smith, 2006; Weigl et al., 2013). Moreover, it should be noted that we focus on the moderation
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5 effect of employee average use of SOC on the relationship between company average age and
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7 company work ability and this moderation effect was significant. Company work ability can only
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9 be positioned as an endogenous variable in this moderation relationship, as company work ability
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11 is unlikely to interact with employee average use of SOC to reversely predict company average
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13 age. Taking these reasons together, we consider the current findings supportive of the expected
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15 relationships between employee age, SOC use, HIWPs, work ability, and company performance.
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17 Nevertheless, future studies on these relationships should pay more attention to common method
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19 in the design stage and directly measure potential method factors. In order to further establish
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21 causal relationship among HIWPs, SOC, and work ability on the company level, future research
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23 should use longitudinal cohort sequential studies to follow these variables over several years or
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25 decades. This would allow the monitoring of intra-company development of employee average
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27 use of SOC strategies and company work ability. Based on existing empirical and theoretical
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29 evidence (Ilmarinen, 2009; Weigl et al., 2013) we assumed that the relationship between
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31 employee average age and work ability is linear. Nevertheless, future studies should further
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33 examine the possible non-linear relationship when linking age and work ability. Future research
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35 can also examine how HRM practices influence intra-individual work ability change. Previous
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37 research showed that employees' work ability decreased more quickly after they reached near
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39 retirement age (M. E. von Bonsdorff et al., 2011). In light of these longitudinal findings, it is
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41 plausible that companies could use HRM practices targeting at older workers to help maintain
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43 the fit between their work load and work ability.
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53 Another possible limitation in our study is the healthy-worker effect (Li & Sung, 1999;
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55 Wunch, Duchene, Thiltges, & Salhi, 1996), which is an on-going process where those who are
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3 occupationally active tend to be healthier than those who exit employment. Employees with poor
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5 health and work ability have probably retired early. It may also be that employees included in
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7 this study had greater access to occupational health services (Li & Sung, 1999). However, given
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9 that the restriction of range in sampling would have decreased the size of the effect of age on
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11 work ability, the current study could have been a conservative test of the relationship.
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13 Nevertheless, future research should take the on-going attrition of employees due to aging into
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15 consideration.
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20 It should also be noted that our sample has a relatively small proportion of large
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22 companies. Although this was consistent with the distribution of company size in Europe where
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24 only 2.5% of the companies employed more than 50 employees in year 2012 (Eurostat, 2016),
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26 future research should further test our model using a sample that is more representative of
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28 companies in specific industries in the U.S. in terms of company size. In addition, company size
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30 may be correlated with other organizational characteristics we did not measure, such as number
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32 of staff devoted to aging-related HRM policies and practices (e.g., retirement benefits). Future
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34 research should examine whether these characteristics are boundary conditions of our model.
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39 Another possible avenue for future research would be to examine the mediating role of
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41 employee productivity in the work ability–company performance relationship. This would
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43 provide us with new knowledge on the complex relationship between employee well-being and
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45 various company performance measures. Further, although our study sample consisted of
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47 differently aged employees working in companies situated around Finland as well as employees
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49 in different job positions, and both genders were equally represented, the findings of the current
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51 study should be generalized into the general working population cautiously. Future research
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53 should collect data beyond retail and metal industry employees. For example, by collecting
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3 additional data from the public sector, broader generalizations of the findings could be made. We
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5 also call for further studies that explore other demographic characteristics of the employees to
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7 further understand how company-level knowledge, skills, malleable abilities, and other
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9 characteristics of the human capital resources are formed (Ployhart & Moliterno, 2011).
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13 Finally, although our theoretical model is focusing on the relationship between average
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15 age and work ability at the company level, future studies can examine the relationship among age
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17 dispersion, HRM practices, and company performance. For example, it is possible that age
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19 dispersion influences the climate strength regarding health- or retirement-related practices, which
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21 in turn influences the relationship between HRM practices or organizational climates, and
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23 employees' collective attitudes and behaviors. Future studies can also examine the within-
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25 company variation of work ability and its relationship with company performance. Another
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27 possible extension of the current research is to examine alternative conceptualizations of age. For
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29 example, the average number of dependent children among employees (as an alternative index of
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31 age) might interact with family-friendly policies to influence employees' work ability and
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33 company performance.
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REFERENCES

- Ahlstrom, L., Grimby-Ekman, A., Hagberg, M., & Dellve, L. 2010. The work ability index and single-item question: associations with sick leave, symptoms, and health – a prospective study of women on long-term sick leave. *Scandinavian Journal of Work, Environment & Health*, 36: 404-412.
- Alavinia, S. M., de Boer, A. G. E.M., van Duivenbooden, J. C., Frings-Dresen, M. H. W., & Burdorf, A. 2009. Determinants of work ability and its predictive value for disability. *Occupational Medicine*, 59: 32-37.
- Avery, D. R., McKay, P. F., & Wilson, D. C. 2007. Engaging the aging workforce: The relationship between perceived age similarity, satisfaction with coworkers, and employee engagement. *Journal of Applied Psychology*, 92: 1542-1556.
- Bajor, J. K., & Baltes, B. B. 2003. The relationship between selection optimization with compensation, conscientiousness, motivation, and performance. *Journal of Vocational Behavior*, 63: 347-367.
- Baltes, B. B., & Heydens-Gahir, H. A. 2003. Reduction of work-family conflict through the use of selection, optimization, and compensation behaviors. *Journal of Applied Psychology*, 88: 1005-1018.
- Baltes, B. B., & Rudolph, C. W. 2012. The theory of selection, optimization, and compensation. In M. Wang (Ed.), *The Oxford Handbook of Retirement*: 88-101. New York, NY: Oxford University Press.
- Baltes, P. B. 1993. The aging mind: Potential and limits. *The Gerontologist*, 33: 580-594.
- Baltes, P. B., & Baltes, M. M. 1990. Psychological perspectives on successful: The model of selective optimization with compensation. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences*: 1-34. Cambridge: Cambridge University press.
- Baltes, P. B., Baltes, M. M., Freund, A. M., & Lang, F. 1999. *The measurement of selection, optimization, and compensation (SOC) by self-report: Technical report 1999*. Berlin, Germany: Max Planck Institute for Human Development.
- Bandalos, D. L. 2002. The effects of item parceling on goodness-of-fit and parameter estimate bias in structural equation modeling. *Structural Equation Modeling*, 9: 78-102.
- Bantel, K. A., & Jackson, S. E. 1989. Top management and innovations in banking: Does the composition of the top team make a difference? *Strategic Management Journal*, 10: 107-124.
- Becker, B. E., & Huselid, M. A. 1998. High performance work systems and firm performance: A synthesis of research and managerial implications. *Research in Personnel and Human Resources Management*, 16: 53-101.
- Bell, S. T. 2007. Deep-level composition variables as predictors of team performance: A meta-analysis. *Journal of Applied Psychology*, 92: 595-615.
- Bliese, P. D. 2000. Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel*

- 1
2
3 *theory, research, and methods in organizations: Foundations, extensions, and new*
4 *directions*: 349-381. San Francisco, CA: Jossey-Bass.
- 6 Boxall, P., & Macky, K. 2009. Research and theory on high-performance work systems:
7 progressing the high-involvement stream. *Human Resource Management Journal*, 19: 3–
8 23.
- 10 Brannick, M. T., Chan, D., Conway, J. M., Lance, C. E., & Spector, P. E. 2010. What is method
11 variance and how can we cope with it? A panel discussion. *Organizational Research*
12 *Methods*, 13: 407-420.
- 14 Brislin, R. W. 1980. Translation and content analysis of oral and written material. In H. C.
15 Trandis, & J. W. Berry (Eds.), *Handbook of cross-cultural psychology*: 398-444. Boston,
16 MA: Allyn & Bacon.
- 18 Butts, M. M., Vandenberg, D. M., DeJoy, D. M., Schaffer, B. S., & Wilson, M. G. 2009.
19 Individual reactions to high involvement work processes: Investigating the role of
20 empowerment and perceived organizational support. *Journal of Occupational Health*
21 *Psychology*, 14: 122-136.
- 23 Cahill, K. E., James, J. B., & Pitt-Catsouphes, M. 2015. The impact of a randomly assigned time
24 and place management initiative on work and retirement expectations. *Work, Aging and*
25 *Retirement*, 1: 350-368.
- 27 Chan, D. 1998. Functional relations among constructs in the same content domain at different
28 levels of analysis: A typology of composition models. *Journal of Applied Psychology*, 83:
29 234-246.
- 31 Cohen, J., Cohen, P., West, S., & Aiken, L. 2003. *Applied multiple regression/correlation*
32 *analysis for the behavioral sciences* (3rd ed.). Hillsdale, NJ: Erlbaum.
- 34 Cranet. 2012. Cranet Survey on Comparative Human Resource Management, International
35 Executive Report 2011.
36 http://management.aalto.fi/fi/research/groups/cranet/cranet_report_2012_280212.pdf.
37 [Accessed 5th March, 2016]
- 39 Delaney, J. T., & Huselid, M. A. 1996. The impact of human resource management practices on
40 perceptions of performance in for-profit and nonprofit organizations. *Academy of*
41 *Management Journal*, 39: 949-969.
- 43 de Zwart, B. C. H., Frings-Dresen, M. W. H., & Duivenbooden, J. C. 2002. Test-retest reliability
44 of the Work Ability Index questionnaire. *Occupational Medicine*, 52: 177-188.
- 46 Earl, C., & Taylor, P. 2015. Is workplace flexibility good policy? Evaluating the efficacy of age
47 management strategies for older women workers. *Work, Aging and Retirement*, 1: 214-
48 226.
- 50 Edgar, F. 2003. Employee-centred human resource management practices. *New Zealand Journal*
51 *of Industrial Relations*, 28: 230-240.
- 53 Eskelinen, L., Toikkanen, J., Tuomi, K., Mauno, I., Nygård, C-H., Klockars, M., & Ilmarinen, J.
54 1991. Work-related stress symptoms of ageing employees in municipal occupations.
55 *Scandinavian Journal of Work, Environment & Health*, 17: 87-93.
- 57
58
59
60

- 1
2
3 European Commission. Facts and Figures. 2013.
4 [http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-](http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/index_en.htm)
5 [definition/index_en.htm](http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/index_en.htm). [Accessed 5th March, 2016].
6
7 Eurostat. 2016. Annual enterprise statistics by size class.
8 <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>. [Accessed 5th
9 March, 2016].
10
11 Evans, M. G. 1985. A Monte Carlo study of the effects of correlated method variance in
12 moderated multiple regression analysis. *Organizational Behavior and Human Decision*
13 *Processes*, 36: 305-323.
14
15 Feldt, T., Hyvönen, K., Mäkikangas, A., Kinnunen, U., & Kokko, K. 2009. Development
16 trajectories of Finnish managers' work ability over a 10-year follow-up period.
17 *Scandinavian Journal of Work, Environment & Health*, 35: 37-47.
18
19 Freund, A. M., & Baltes, P. B. 1998. Selection, optimization, and compensation as strategies of
20 life-management: Correlations with subjective indicators of successful aging.
21 *Psychology and Aging*, 13: 531-543.
22
23 Freund, A. M., & Baltes, P. B. 2002. Life-management strategies of selection, optimization, and
24 compensation: Measurement by self-report and construct validity. *Journal of Personality*
25 *and Social Psychology*, 82: 642-662.
26
27 Gerhart, B. 2007. Horizontal and vertical fit in human resource systems. In C. Ostroff & T. A.
28 Judge (Eds), *Perspectives on Organizational Fit*: 317-348. New York: Lawrence
29 Erlbaum Associates.
30
31 Gerhart, B., Wright, P. M., & McMahan, G. C. 2000. Measurement error in research on the
32 human resources and firm performance relationship: Further evidence and
33 analysis. *Personnel Psychology*, 53: 855-872.
34
35 Gong, Y., Wang, M., Huang, J-C, & Cheung, S. 2014. Toward a goal orientation-based feedback-
36 seeking typology: Implications for employee performance outcomes. *Journal of*
37 *Management*, on-line first, doi:0149206314551797.
38
39 Guest, D. E. 2002. Human resource management, corporate performance and employee
40 wellbeing: Building the worker into HRM. *Journal of Industrial Relations*, 44: 335-358.
41
42 Guest, D. E, Michie, J., Conway, N., & Sheehan, M. 2003. Human resource management and
43 corporate performance in the UK. *British Journal of Industrial Relations*, 41: 291-314.
44
45 Guthrie, J. P. 2001. High-involvement work practices, turnover, and productivity: Evidence from
46 New Zealand. *Academy of Management Journal*, 44: 180-190.
47
48 Guthrie, J. P., Flood, P., Liu, W., & MacCurtain, S. 2009. High performance work systems in
49 Ireland: Human resource and organizational outcomes. *International Journal of Human*
50 *Resource Management*, 20: 112-125.
51
52 Harmon, J., Scotti, D. J., Behson, S., Farias, G., Petzel, R., Neuman, J. H., & Keashly, L. 2003.
53 Effects of high-involvement work systems on employee satisfaction and service costs in
54 veteran healthcare. *Journal of Healthcare Management*, 48: 393-406.
55
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57
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59
60
- Hau, K. T., & Marsh, H. W. 2004. The use of item parcels in structural equation modelling: Non-normal data and small sample sizes. *British Journal of Mathematical and Statistical Psychology*, 57: 327-351.
- Hopkins, K. D., & Weeks, D. L. 1990. Tests for normality and measures of skewness and kurtosis: Their place in research reporting. *Educational and Psychological Measurement*, 50: 717-729.
- Huhtala, M., Kangas, M., Lämsä, A-M., & Feldt, T. 2013. Ethical managers in ethical organisations? The leadership-culture connection among Finnish managers. *Leadership & Organization Development Journal*, 34: 250-270.
- Huselid, M. A. 1995. The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal*, 38: 635-672.
- Ilmarinen, J. 2006. *Towards a longer worklife – Ageing and the quality of worklife in the European Union*. Helsinki: Finnish Institute of Occupational Health.
- Ilmarinen, J. 2009. Work ability - a comprehensive concept for occupational health research and prevention. *Scandinavian Journal of Work, Environment & Health*, 35: 1-5.
- Ilmarinen, J., & Tuomi, K. 2004. Past, present and future of work ability. Helsinki: *People and Work research reports* 65: 1-25. Helsinki, Finland: Finnish Institute of Occupational Health.
- Ilmarinen, J., Tuomi, K., Eskelinen, L., Nygård, C-H., Huuhtanen P., & Klockars, M. 1991. Summary and recommendations of a project involving cross-sectional and follow-up studies on the aging workers in Finnish municipal occupations (1981-1985). *Scandinavian Journal of Work, Environment & Health*, 17: 135-141.
- James, J. B., & Pitt-Catsouphes, M. 2016. Change in the meaning and experience of work in later life: Introduction to the special issue. *Work, Aging and Retirement*, 2: 281-285.
- Jex, S. M., Wang, M., & Zarubin, A. 2007. Aging and occupational health. In K. S. Shultz and G. A. Adams (Eds.), *Aging and Work in the 21st Century*: 199-223. Mahwah, NJ: LEA.
- Jopp, D., & Smith, J. 2006. Resources and life-management strategies as determinants of successful aging: On the protective effect of selection, optimization, and compensation. *Psychology and Aging*, 21: 253-265.
- Khilji, S. E., & Wang, X. 2006. 'Intended' and 'implemented' HRM: the missing linchpin in strategic human resource management research. *The International Journal of Human Resource Management*, 17: 1171-1189.
- Kooij, D. T. 2015. Successful aging at work: The active role of employees. *Work, Aging and Retirement*, 1: 309-319.
- Kozlowski, S. W. J., & Klein, K. J. 2000. A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions*: 3-90. San Francisco, CA: Jossey-Bass.

- 1
2
3 Kuoppala, J., Lamminpää, A., & Husman P. 2008. Work health promotion, job well-being, and
4 sickness absences - A systematic review and meta-analysis. *Journal of Occupational and*
5 *Environmental Medicine*, 50: 1216-1227.
6
7 Lawler III, E. E. 1988. Substitutes for hierarchy. *Organizational Dynamics*, 17: 5-15.
8
9 Leana, C. R., & Florkowski, G. W. 1992. Employee involvement programs: Integrating
10 psychological theory and management practices. *Research in Personnel and Human*
11 *Resources Management*, 10: 233-270.
12
13 Lepak, D. P., Liao, H., Chung, Y., & Harden, E. E. 2006. A conceptual review of human
14 resource management systems in strategic human resource management research.
15 *Research in Personnel and Human Resources Management*, 25: 217-271.
16
17 Li, C.-Y., & Sung, F.-C. 1999. A review of the healthy worker effect in occupational
18 epidemiology. *Occupational Medicine*, 49: 225-229.
19
20 Liao, H., Toya, K., Lepak, D. P., & Hong, Y. 2009. Do they see eye to eye? Management and
21 employee perspectives of high-performance work systems and influence processes on
22 service quality. *Journal of Applied Psychology*, 94: 371-391.
23
24 Loeppke, R., Taitel, M., Richling, D., Parry, T., Kessler, R. C., Hymel, P., & Konicki, D. 2007.
25 Health and productivity as a business strategy. *Journal of Occupational and*
26 *Environmental Medicine*, 49: 712-721.
27
28 Masunaga, H. & Horn, J. 2001. Expertise and age-related changes in components of intelligence.
29 *Psychology and Aging*, 16: 293-311.
30
31 Mauno S., Kinnunen U., Mäkikangas, A., & Nätti, J. 2005. Psychological consequences of
32 fixedterm employment and perceived job insecurity among health care staff. *European*
33 *Journal of Work and Organizational Psychology*, 14: 209-237.
34
35 McGonagle, A. K., Fisher, G., G., Bernes-Farrel, J., L., & Grosch, J. W. 2015. Individual and
36 work factors related to perceived work ability and labor force outcomes. *Journal of*
37 *Applied Psychology*, 100: 376-398.
38
39 Mehta, P. D., & Neale, M. C. 2005. People are variables too: multilevel structural equations
40 modeling. *Psychological Methods*, 10: 259-284.
41
42 Moen, P., Kojola, E., Kelly, E. L., & Karakaya, Y. 2016. Men and women expecting to work
43 longer: Do changing work conditions matter? *Work, Aging and Retirement*, 2: 321-344.
44
45 Moghimi, D., Zacher, H., Scheibe, S., & Van Yperen, N. W. 2016. The selection, optimization,
46 and compensation model in the work context: A systematic review and meta-analysis of
47 two decades of research. *Journal of Organizational Behavior*. Version of Record online:
48 DOI: 10.1002/job.2108.
49
50 Muthén, L. K., & Muthén, B. O. 2010. *Mplus user's guide* (6th ed.). Los Angeles, CA: Muthén
51 & Muthén.
52
53 Nishii, L. H. & Wright, P. M. 2007. *Variability within organizations: Implications for strategic*
54 *human management* (CAHRS Working Paper #07-02). Ithaca, NY: Cornell University,
55 School of Industrial and Labor Relations, Center for Advanced Human Resource Studies.
56 <http://digitalcommons.ilr.cornell.edu/cahrswp/467>.
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AGE, WORK ABILITY AND COMPANY PERFORMANCE

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46
47
48
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52
53
54
55
56
57
58
59
60
- Ng, T. W. H., & Feldman, D. C. 2008. The relationship of age to ten dimensions of job performance. *Journal of Applied Psychology*, 93: 392-423.
- OECD. 2013. Pensions at a Glance 2013. *Retirement-income systems in OECD and G20 countries*. <http://www.oecd.org/pensions/public-pensions/OECDPensionsAtAGlance2013.pdf> [Accessed 19th February, 2016].
- O'Reilly III, C. A., Caldwell, D. F., & Barnett, W. P. 1989. Work group demography, social integration, and turnover. *Administrative Science Quarterly*, 34: 21-37.
- Palermo, J., Fuller-Tyszkiewicz, M., Walker, A., & Appannah, A. 2013. Primary- and secondary-level organizational predictors of work ability. *Journal of Occupational Health Psychology*, 18: 220-229.
- Ployhart, R. E., & Moliterno, T. P. 2011. Emergence of the human capital resource: A multilevel model. *Academy of Management Review*, 36: 127-150.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.Y., & Podsakoff, N. P. 2003. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88: 879-903.
- Procter, S., & Burridge, M. 2008. Teamworking and Performance: The extent and intensity of teamworking in the 1998 UK Workplace Employee Relations Survey (WERS98). *International Journal of Human Resource Management*, 19: 153-168.
- Reichel, A. & Mayrhofer, W. 2006. Saving Faith? The Merit of Subjective Form Performance Measures - A Methodological Contribution to the HRM-Firm Performance Debate. In: S. Vanhala & M. Kolehmainen. (Eds.) *HRM - Between Performance and Employees*. Helsinki: Helsinki School of Economics.
- Riedel, N., Müller, A., & Ebner, M. 2015. Applying strategies of Selection, Optimization, and Compensation to maintain work ability—A psychosocial resource complementing the Job Demand-Control Model? *Journal of Environmental and Occupational Health*, 57: 552-61.
- Rodgers, W. L. 1982. Estimable functions of age, period, and cohort effects. *American Sociological Review*, 47: 774-787.
- Rupp, D. E., McCance, A. S., Spencer, S., & Sonntag, K. 2008. Customer (in)justice and emotional labor: The role of perspective taking, anger, and emotional regulation. *Journal of Management*, 34: 903-924.
- Rutenfranz, J. 1985. Arbeitspsychologie. In H. Valentin, G. Lehnert, & H. Petry (Eds.), *Arbeitspsychologie und Arbeitshygiene. Grundlagen für Prävention und Begutachtung*. 3. auflage (pp. 22-144). Stuttgart – New York: Thieme.
- Sanders, K., & Frenkel, S. 2011. HR-line management relations: characteristics and effects. *International Journal of Human Resource Management*, 22: 1611-1617.
- Schaubroeck, J., & Jones, J. R. 2000. Antecedents of workplace emotional labor dimensions and moderators of their effects on physical symptoms. *Journal of Organizational Behavior*, 21: 163-183.

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- Siemsen, E., Roth, A., & Oliveira, P. 2010. Common method bias in regression models with linear, quadratic, and interaction effects. *Organizational Research Methods*, 13: 456-476.
- Statistics Finland. 2014. Statistical Databases.
http://pxweb2.stat.fi/Dialog/varval.asp?ma=068_syr_tau_115_fi&ti=Yritysten+markkina+osuudet+er%20toimialoilla+liikevaihdolla+mitattuna+2009%2D2012&path=../Database/StatFin/yri/syr/010_yr_tol08/&lang=3&multilang=fi. [Accessed 6th February, 2016]
- Stewart, G. L. 2006. A meta-analytic review of relationships between team design features and team performance. *Journal of Management*, 32: 29-55.
- Takeuchi, R., Chen, G., & Lepak, D. P. 2009. Through the looking glass of a social system: cross-level effects of high-performance work systems on employees' attitudes. *Personnel Psychology*, 62: 1-29.
- Toh, S. M., Morgeson, F. P., & Campion, M. A. 2008. Human resource configurations: investigating fit with the organizational context. *Journal of Applied Psychology*, 93: 864-882.
- Tuomi, K., Ilmarinen, J., Jahkola, A., Katajarinne, L., & Tulkki, A. 2002. *Work Ability Index*, Occupational Health Care No. 19, 2nd revised edn. Helsinki: Finnish Institute of Occupational Health.
- Tuomi, K., Ilmarinen, J., Klockars, M., Nygård, C-H., Seitsamo, J., Huuhtanen, P., Martikainen, R. & Aalto, L. 1997. Finnish research project on aging workers in 1981-1992. *Scandinavian Journal of Work, Environment & Health*, 23: 7-11.
- Tuomi, K., Vanhala, S., Nykyri, E., & Janhonen, M. 2004. Organizational practices, work demands and the well-being of employees: A follow-up study in the metal industry and retail trade. *Occupational Medicine*, 54: 115-121.
- van den Berg, T.I.J., Elders, L.A.M., de Zwart, B.C.H., & Burdorf, A. 2009. The effects of work-related and individual factors on the Work Ability Index: A systematic review. *Occupational and Environmental Medicine*, 66: 211-220.
- von Bonsdorff, M. B., Seitsamo, J., Ilmarinen, J., Nygård, C-H., von Bonsdorff, M. E., & Rantanen, T. 2010. Midlife work ability as a predictor of mortality and late-life disability: A 28-year prospective study. *Canadian Medical Association Journal*, 183: E235-42.
- von Bonsdorff M. E., Kokko K., Seitsamo J., von Bonsdorff M. B., Nygård C-H., Ilmarinen J., & Rantanen T. 2011. Work strain in midlife and 28-year work ability trajectories. *Scandinavian Journal of Work, Environment & Health*, 37: 455-463.
- von Bonsdorff, M. E., Vanhala S., Seitsamo, J., Janhonen, M., & Husman, P. 2010. Employee well-being, early retirement intentions, and company performance. *Journal of Occupational and Environmental Medicine*, 52: 1255-1261.
- Walker, A. & Maltby, T. 2012. Active ageing: A strategic policy solution to demographic ageing in the European Union. *International Journal of Social Welfare*, 21: S117-S130.
- Wang, M., Olson, D., & Shultz, K. 2013. *Mid and Late Career Issues: An Integrative Perspective*. New York: Psychology Press.

AGE, WORK ABILITY AND COMPANY PERFORMANCE

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2
3 Weigl, M., Müller, A., Hornung, S., Zacher, H., & Angerer, P. 2013. The moderating effects of
4 job control and selection, optimization, and compensation strategies on the age-work
5 ability relationship. *Journal of Organizational Behavior*, 34: 607-628.
6
7
8 Wiese, B. S., Freund, A. M., & Baltes, P. B. 2002. Subjective career success and emotional well-
9 being: Longitudinal predictive power of selection, optimization, and compensation.
10 *Journal of Vocational Behavior*, 60: 321–335.
11
12
13 Wright, P. M. & Boswell, W. R. 2002. Desegregating HRM: A review and synthesis of micro
14 and macro human resource management research (*CAHRS Working Paper #02-11*).
15 Ithaca, NY: Cornell University, School of Industrial and Labor Relations, Center for
16 Advanced Human Resource Studies. <http://digitalcommons.ilr.cornell.edu/cahrswp/52>.
17
18
19 Wright, P. M., Gardner, T. M., Moynihan, L. M., Park, H. J., Gerhart, B. A., & Delery, J. 2001.
20 Measurement error in research on human resources and firm performance: Additional
21 data and suggestions for future research. *Personnel Psychology*, 54: 875-901.
22
23 Wright, P. M., & Nishii, L. H. 2007. Strategic HRM and organizational behavior: Integrating
24 multiple levels of analysis. *CAHRS Working Paper Series*, 468. Ithaca, NY: Cornell
25 University, School of Industrial and Labor Relations, Center for Advanced Human
26 Resource Studies.
27 <http://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=1469&context=cahrswp>
28
29 Wunsch, G., Duchêne, J., Thiltgès, E., & Salhi, M. 1996. Socio-economic differences in
30 mortality. A life course approach. *European Journal of Population*, 12: 167–185.
31
32 Yanadori, Y., & van Jaarsveld, D. 2014. The influence of human resource practices on the
33 negative consequences of customer aggression. *Academy of Management Proceedings*, 1:
34 14719.
35
36 Yeung, D. Y., & Fung, H. H. 2009. Aging and work: How do SOC strategies contribute to job
37 performance across adulthood? *Psychology and Aging*, 24: 927-940.
38
39 Young, L. M., Baltes, B. B., & Pratt, A. K. 2007. Using selection, optimization, and
40 compensation to reduce job/family stressors: Effective when it matters. *Journal of*
41 *Business and Psychology*, 21: 511-539.
42
43 Zacher, H., & Frese, M. 2011. Maintaining a focus on opportunities at work: The interplay
44 between age, job complexity, and the use of selection, optimization, and compensation
45 strategies. *Journal of Organizational Behavior*, 32: 291-318.
46
47 Ziegelmann, J. P., & Lippke, S. 2007a. Planning and strategy use in health behavior change: A
48 life span view. *International Journal of Behavioral Medicine*, 14: 30–39.
49
50 Ziegelmann, J. P., & Lippke, S. 2007b. Use of selection, optimization, and compensation
51 strategies in health self-regulation. Interplay between with resources and successful
52 development. *Journal of Aging and Health*, 19: 500-518.
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FOOTNOTES

¹In this article, we are not using “selection” and “compensation” to refer to HR practices. These two terms are used to refer to strategies used by individuals.

²It should be noted that other approaches to describe unit-level (e.g., company-level) knowledge, skills, abilities, and others (KSAOs) also exist in the literature. For example, the variation approach describes the heterogeneity of the unit (e.g., company) in member KSAOs and the conjunctive-disjunctive approach describes the maximum or minimum individual KSAOs in the unit (e.g., Bantel & Jackson, 1989). In the present study, the companies that make up the sample are from the metal trade and retail industries, which commonly require that all employees' abilities be combined for performance and company members compensate for each other in task performance (Procter & Burridge, 2008). We do not assume that a single employee's work ability (either as minimum or maximum) can decide the performance of the company. In addition, homogeneity of the group is not of theoretical concern in this study, although we controlled for within-company variation in work ability in the analyses.

³Compared to the population (i.e., companies in metal and retail trade industries in Finland), our final sample included a higher percentage of medium- to large-sized companies. Specifically, our final sample included 39 companies in the metal industry, including 20.51%, 28.21%, 12.82%, and 38.46% companies in the 9-19, 19-49, 50-99, and 100 or more size groups, respectively. The Finnish population percentages of companies in the metal industry in these four groups were 42.93%, 34.92%, 11.62%, and 10.53%, respectively. Our sample included 31 companies in the retail trade industry, including 51.61%, 19.35%, 16.13%, and 12.90% companies in the 9-19, 19-49, 50-99, and 100 or more size groups. The Finnish population percentages of companies in the retail trade industry in these four groups were 63.16%, 29.38%, 5.07%, and 2.39%, respectively.

⁴A response rate of 35-45% is typical for surveys distributed to companies in Finland (e.g., Huhtala, Kangas, Lämsä, & Feldt, 2013; Mauno, Kinnunen, Mäkikangas, & Nätti, 2005). Considering that companies varied in response rate (ranged from .13 to .82), we included response rate of each company into the analyses. Results suggested that the findings were consistent with or without including response rate as a covariate. For the purpose of parsimony, we did not include this variable in the main analyses.

⁵One company in the sample employed a smaller number of employees (i.e., 9) when data were collected than the number of employees it had when sampling procedure was planned.

⁶We also examined the estimated within-company skewness of work ability and SOC against its sampling distribution (i.e., [-1.96 standard deviation of skewness, +1.96 standard deviation of skewness]). If skewness value falls within this range, skewness is not statistically significant (Hopkins & Weeks, 199). Results showed that only two companies in the sample had significant skewness in work ability and only four had significant skewness in SOC. In addition, we included skewness of SOC and work ability as control variables in the analyses. Hypotheses testing results are virtually the same.

AGE, WORK ABILITY AND COMPANY PERFORMANCE

Table 1

Means, Standard Deviations, and Bivariate Correlations among Study Variables

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12
1. Industry	.56	.50	–											
2. Company size (number of employees)	92.17	163.59	.10	–										
3. Percentage of workers with university degree	.24	.24	-.27*	.16	–									
4. Percentage of managers	.14	.12	.41**	.19	.29*	–								
5. Number of respondents	12.70	7.74	.21	.60**	-.09	.18	–							
6. Within-company SD of SOC	.32	.13	.27*	.06	-.24	.16	.15	–						
7. Within-company SD of work ability	.51	.21	.08	-.07	-.12	-.10	-.11	.29*	–					
8. Company average age	41.99	6.81	.35**	.04	-.03	.31*	.06	.25*	.29*	–				
9. Employee average use of SOC strategies	3.45	.22	-.14	.08	-.21	-.15*	.05	-.06	-.03	-.03	–			
10. HIWPs	3.21	.41	-.42**	.06	.05	-.24	-.09	-.08	-.14	-.47**	.28*	–		
11. Company work ability	.06	.31	-.15	.14	.35**	.21	.14	-.15	-.61**	-.38**	.08	.39**	–	
12. Company performance	3.75	.42	-.20	.28*	-.02	-.03	.18	-.17	-.20	-.19	.25*	.27*	.34**	–

Note. *N* = 70. Industry was coded as 1 = metal and 0 = retail trade. * *p* < .05. ** *p* < .01.

AGE, WORK ABILITY AND COMPANY PERFORMANCE

46

Table 2

Estimates of Unstandardized (*B*) and Standardized (β) Path Coefficients from Path Analyses

Predictor	Company work ability			Company performance		
	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β
Intercept	.07*	.03	.22	3.72**	.04	8.79
Control variables						
Industry	.03	.08	.04	-.19	.11	-.23
Company size	.00	.00	-.10	.001*	.00	.29
Percentage of workers with university degree	.40**	.14	.31	-.39	.24	-.22
Percentage of managers	.71†	.39	.28	.09	.42	.03
Number of respondents	.01*	.00	.21	.00	.01	-.02
Within-company SD of SOC	-.04	.17	-.02			
Within-company SD of work ability				.08	.20	.04
Main effects						
Company average age (X)	-.02**	.01	-.33	.00	.01	-.01
Employee average use of SOC strategies (Z1)	.15	.11	.11	.24	.18	.12
HIWPs (Z2)	.23*	.09	.31	.00	.13	.00
Two-way interactions						
X × Z1	.02*	.01	.12			
X × Z2	.00	.01	.04			
Mediator						
Company work ability				.48**	.16	.35
<i>R</i> ² explained	.44**			.28**		

Note. *N* = 70. Industry was coded as 1 = metal and 0 = retail trade. † *p* < .10. * *p* < .05. ** *p* < .01.

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Figure 1

Hypothesized model. H = Hypothesis

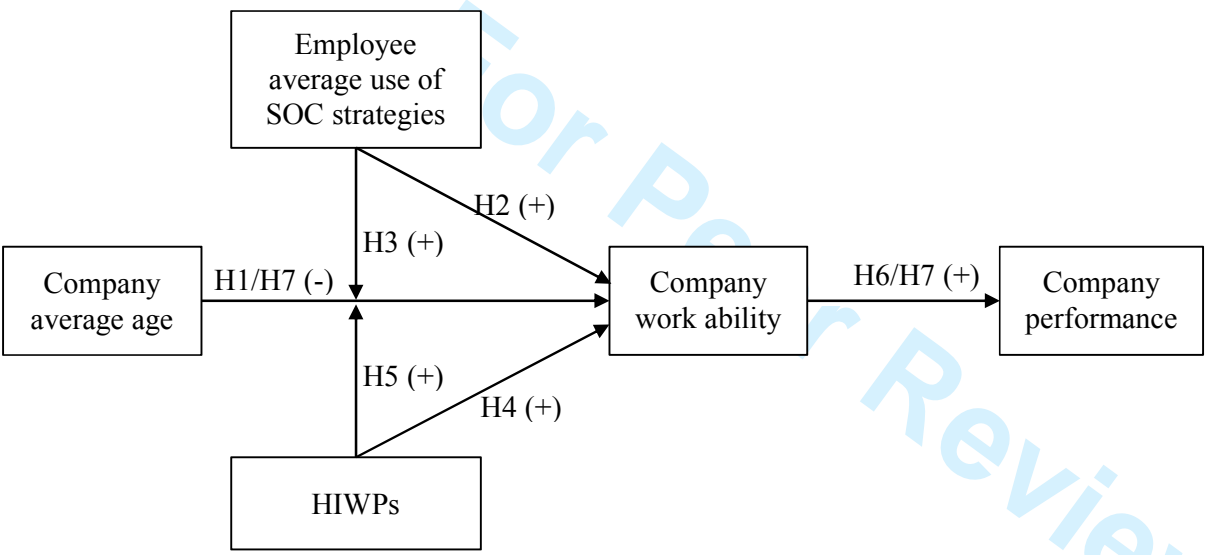


Figure 2

Estimates of unstandardized path coefficients. † $p < .10$. * $p < .05$. ** $p < .01$. Solid lines represent significant paths and dashed lines represent non-significant paths. For the purpose of brevity, estimates of the direct effects and effects of number of respondents, within-company SDs of SOC and work ability are not illustrated (reported in Table 2)

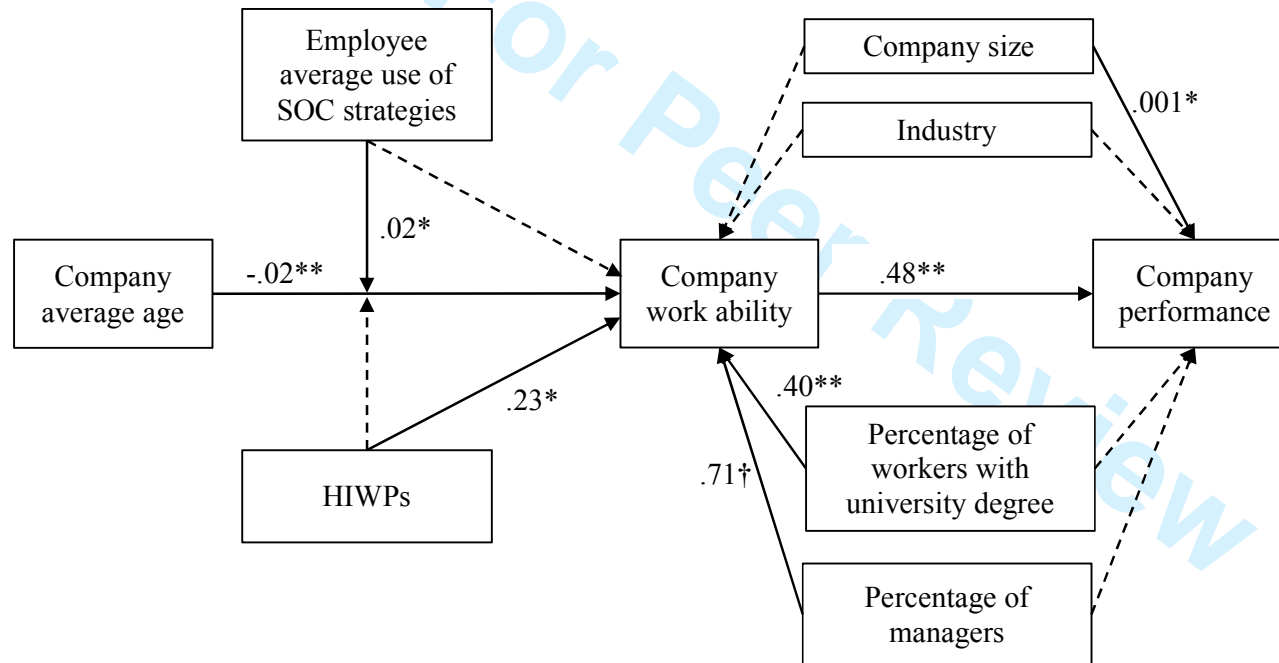
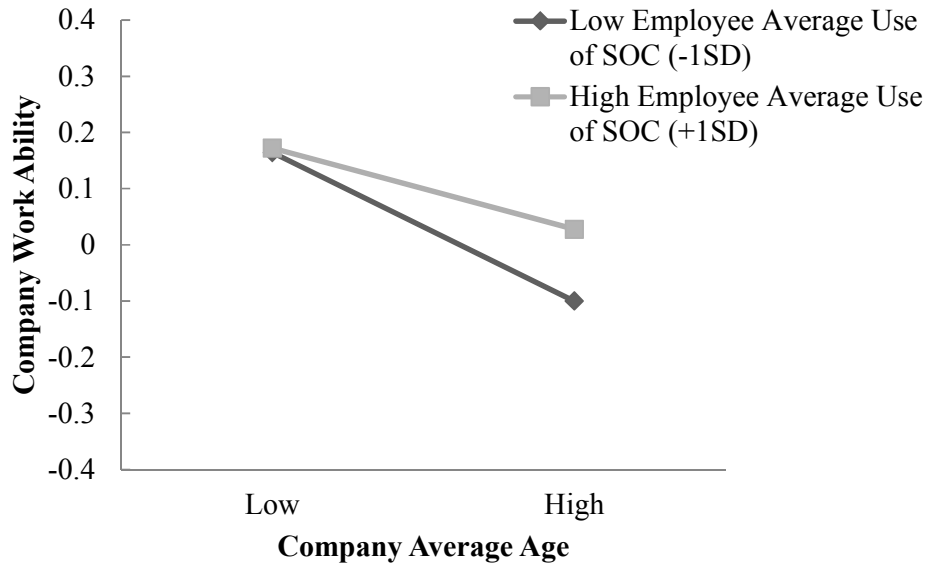


Figure 3

Employee average use of SOC strategies moderates the relationship between company average age and company work ability



Review

ONLINE SUPPLEMENT

Work Ability Index (Finnish Institute of Occupational Health, Tuomi et al. 2002)

Is your work:

Psychologically demanding?

Physically demanding?

Physically and psychologically demanding?

1. *Current work ability compared to highest work ability ever*

Assume that your work ability at its best has a value of 10 points. How many points would you give your current work ability?

(0 means that you currently cannot work at all)

0 1 2 3 4 5 6 7 8 9 10

Completely unable to work

Work ability at its best

2. *Work ability in relation to the demands of the job*

How do you rate your current work ability with respect to the physical demands of your work?

5 = very good, 1 = very poor

How do you rate your current work ability with respect to the mental demands of your work?

5 = very good, 1 = very poor

3. *Number of current diseases diagnosed by a physician*

In the following list, mark your diseases or injuries. Also indicate whether a physician has diagnosed or treated these diseases. For each disease, therefore, there can be 2 (physician's diagnosis), 1 (own opinion), or no alternatives circled.

Injury from accidents

01 back 2 1

02 arm/hand 2 1

03 leg/foot 2 1

04 other part of body, where and what kind of injury? 2 1

Musculoskeletal disease

05 disorder of the upper back or cervical spine, repeated instances of pain 2 1

06 disorder of the lower back, repeated instances of pain 2 1

07 (sciatica) pain radiating from the back into the leg 2 1

08 Musculoskeletal disorder affecting the limbs (hands, feet), repeated instances of pain 2 1

09 rheumatoid arthritis 2 1 10 other musculoskeletal disorder, what? 2 1 ...

Cardiovascular diseases

11 hypertension (high blood pressure) 2 1

12 Coronary heart disease, chest pains during exercise (angina pectoris) 2 1

13 coronary thrombosis, myocardial infarction 2 1

14 cardiac insufficiency 2 1

15 other cardiovascular disease, what? 2 1 ... Respiratory disease

16 repeated infections of the respiratory tract (tonsillitis, acute sinusitis, acute bronchitis) 2 1

- 1
2
3 17 chronic bronchitis 2 1
4 18 chronic sinusitis 2 1
5 19 bronchial asthma 2 1
6 20 emphysema 2 1
7 21 pulmonary tuberculosis 2 1
8 22 other respiratory disease, what 2 1 ...
9

10
11 Mental disorder

- 12 23 mental disease or severe mental health problem (for example, severe depression, mental
13 disturbance) 2 1
14 24 slight mental disorder or problem (for example, slight depression, tension, anxiety,
15 insomnia) 2 1 Neurological and sensory disease
16 25 problems or injury to hearing 2 1
17 26 visual disease or injury (other than refractive error) 2 1
18 27 neurological disease (for example stroke, neuralgia, migraine, epilepsy) 2 1
19 28 other neurological or sensory disease, what? 2 1 ... Digestive disease
20 29 gall stones or disease 2 1
21 30 liver or pancreatic disease 2 1
22 31 gastric or duodenal ulcer 2 1
23 32 gastritis or duodenal irritation 2 1
24 33 colonic irritation, colitis 2 1
25 34 other digestive disease, what? 2 1
26 Genitourinary disease
27 35 urinary tract infection 2 1
28 36 kidney disease 2 1
29 37 genitals disease (for example fallopian tube infection in women or prostatic infection in
30 men 2 1
31 38 Other genitourinary disease, what? 2 1 ...
32
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35 Skin diseases

- 36 39 allergic rash, eczema 2 1
37 40 other rash, what 2 1 ...
38 41 other skin disease, what? 2 1 ...
39

40 Tumor

- 41 42 benign tumor 2 1
42 43 malignant tumor (cancer), where? 2 1 ...
43
44

45 Endocrine and metabolic diseases

- 46 44 obesity 2 1
47 45 diabetes 2 1
48 46 goiter or others thyroid disease 2 1
49 47 other endocrine or metabolic disease, what? 2 1 ... Blood diseases
50 48 anemia 2 1
51 49 other blood disorder, what? 2 1 ... Birth defects
52 50 birth defect, what? 2 1 ... Other disorder or disease
53 51 What? 2 1
54
55

56 4. *Estimated work impairment due to diseases*

57 Is your illness or injury a hindrance to your current job?
58
59
60

Circle more than one alternative if needed.

- There is no hindrance/I have no diseases 6
- I am able to do my job, but it causes some symptoms 5
- I must sometimes slow down my work pace or change my work methods 4
- I must often slow down my work pace or change my work methods 3
- Because of my disease, I feel I am able to do only part-time work 2
- In my opinion, I am entirely unable to work 1

5. *Sick leave during the past year (12 months)*

How many whole days have you been off work because of a health problem (disease or health care or for examination) during the past year (12 months)?

- none at all 5
- at the most 9 days 4
- 10 - 24 days 3
- 25 - 99 days 2
- 100 - 365 days 1

6. *Own prognosis of work ability two years from now*

Do you believe that – from the standpoint of your health – you will be able to do your current job two years from now?

- unlikely 1
- no certain 4
- relatively certain 7

7. *Mental resources*

Have you recently been able to enjoy your regular daily activities?

- often 4
- rather often 3
- sometimes 2
- rather seldom 1
- never 0

Have you recently been active and alert?

- often 4
- rather often 3
- sometimes 2
- rather seldom 1
- never 0

Have you recently felt yourself to be full of hope for the future?

- continuously 4
- rather often 3
- sometimes 2
- rather seldom 1
- never 0

Selection, Optimization, and Compensation (SOC)

Modified from: Zacher & Frese, 2011; Ziegelmann & Lippke, 2007a; 2007b.

Please indicate the extent to which the following statements describe you, when you think about yourself in the work context. (1= very little, 5= very much)

ES = elective selection, LS = loss-based selection, O = optimization, C = compensation

1. I concentrate all my energy on few things (ES)
2. I always focus on the one most important goal at a given time (ES)
3. I commit myself to one or two important goals (ES)
4. When things don't go as well as they have in the past, I choose one or two important goals (LS)
5. When I can't do something important at work the way I did before, I look for a new goal (LS)
6. When I can't do something at work as well as I used to, I think about my priorities and what exactly is important to me (LS)
7. I keep working on what I have planned until I succeed (O)
8. At work, I make every effort to achieve a given goal (O)
9. If something matters to me at work, I devote myself fully and completely to it (O)
10. When things don't go as well as they used to, I keep trying other ways until I can achieve the same result I used to (C)
11. When something at work isn't working as well as it used to, I ask others for advice or help (C)
12. When it becomes harder for me to get the same results at work, I keep trying harder until I can do it as well as before (C)

ONLINE SUPPLEMENT. Multilevel Confirmatory Factor Analysis.

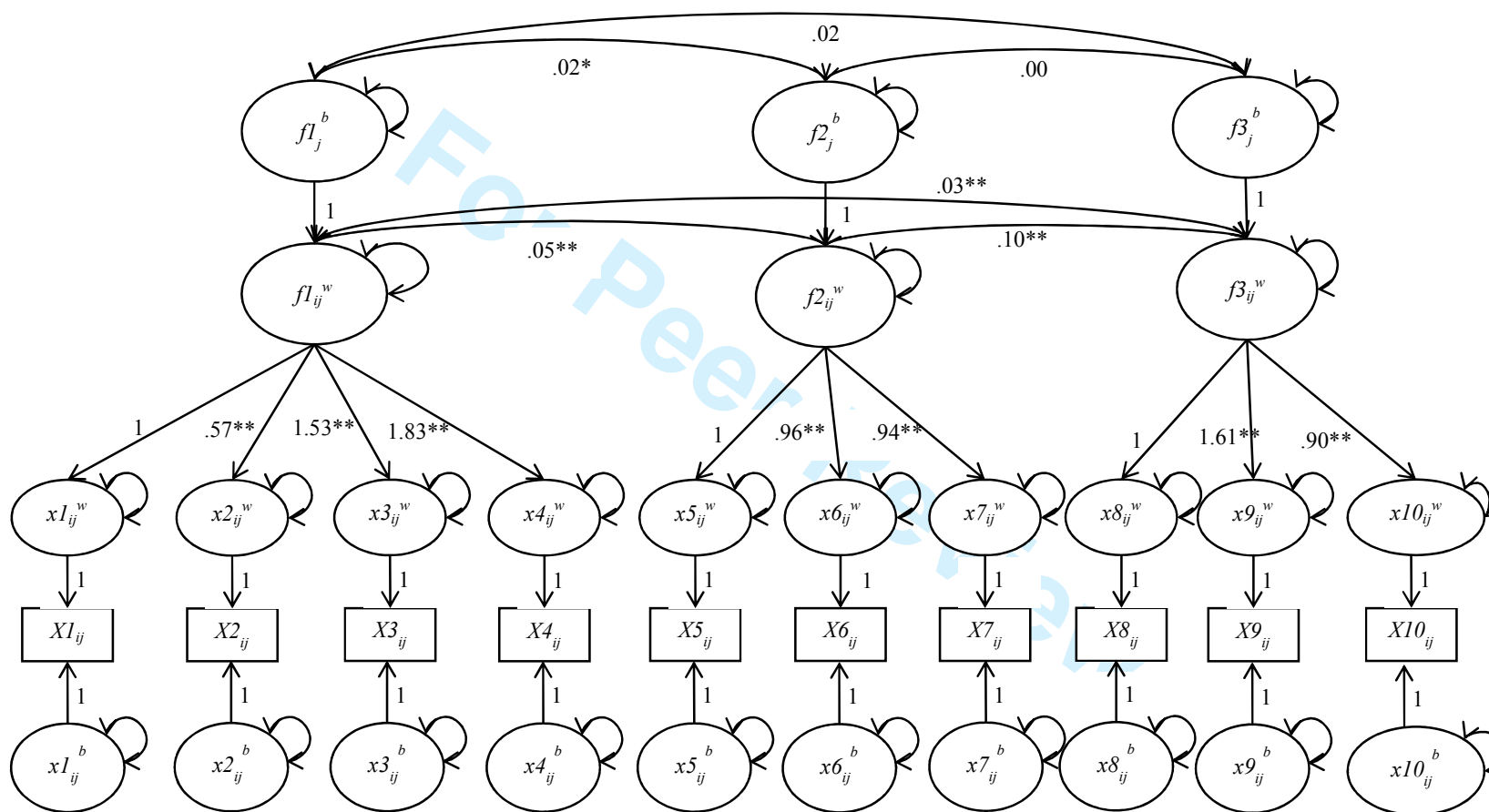


Figure B1. Multilevel confirmatory factor analysis model (Mehta & Neale, 2005). Note. $N = 70$ at the company level and $N = 889$ at the individual level. Unstandardized parameter estimates are illustrated in the figure. X1, X2, X3, and X4 are indicators of SOC. X5, X6, and X7 are indicators of HIWPs. X8, X9, and X10 are indicators of work ability. "ij" indicates individual i in group j . "w" indicates individual-level variables and "b" indicates company-level variables. "f1", "f2", and "f3" indicate SOC, HIWPs, and work ability, respectively. Double-ended arrows around the same circles indicate residual variances (estimates reported in Table B1).

Table B1. Results from Multilevel Confirmatory Factor Analysis (Unstandardized Parameter Estimates)

Observed indicator	Individual level				Company level					
	Factor loading		Residual variances		Factor loading		Residual variances		Intercept	
	<i>Estimate</i>	<i>SE</i>	<i>Estimate</i>	<i>SE</i>	<i>Estimate</i>	<i>SE</i>	<i>Estimate</i>	<i>SE</i>	<i>Estimate</i>	<i>SE</i>
X1	1.00	—	.27**	.02	1.00	—	.08*	.03	3.29**	.02
X2	.57**	.11	.25**	.02	.57**	.11	.08*	.04	3.32**	.03
X3	1.53**	.25	.23**	.03	1.53**	.25	.08*	.03	3.69**	.03
X4	1.83**	.37	.13**	.03	1.83**	.37	.00	.00	3.52**	.03
X5	1.00	—	.21**	.02	1.00	—	.00	.00	3.27**	.04
X6	.96**	.04	.16**	.01	.96**	.04	.16**	.03	3.31**	.05
X7	.94**	.03	.15**	.01	.94**	.03	.10**	.04	3.04**	.05
X8	1.00	—	.12**	.03	1.00	—	.00	.06	.07	.05
X9	1.61**	.14	.32**	.02	1.61**	.14	.00	.00	.06	.03
X10	.90**	.06	.19**	.02	.90**	.06	.03	.06	.06*	.03
Covariance between SOC and HIWPs	.05**	.01			.02*	.01				
Covariance between SOC and work ability	.03**	.01			.00	.00				
Covariance between HIWPs and work ability	.10**	.02			.02	.01				
Variance of SOC	.05**	.01			.01	.00				
Variance of HIWPs	.42**	.03			.10**	.02				
Variance of work ability	.17**	.02			.03	.02				