

Sense of Coherence and the Motivational Process of the Job-Demands–Resources Model

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This longitudinal study systematically examines the various roles played by the personal resource “sense of coherence” (SoC) in the motivational process described by the job-demands–resources model. SoC captures the extent to which people perceive their life as comprehensible, manageable and meaningful, and there is evidence of its influence in many health-related outcomes. The first aim here was to establish whether a resourceful working environment builds up SoC and whether SoC leads to work engagement. A second aim was to test reverse relationships: how work engagement leads to SoC and how SoC in turn relates to job resources. A third aim was to assess whether SoC boosts the relationship between job resources and work engagement. The study utilized a 3-wave, 3-month panel design, involving 940 employees working in a broad range of occupations and economic sectors. The results of longitudinal structural equation modeling show that job resources predict SoC and SoC predicts work engagement, suggesting a mediating role of SoC. In addition, SoC predicts job resources, suggesting reciprocal relationships between job resources and SoC. No boosting effect of SoC was found. Overall, the present findings support the view that providing employees with a resourceful working environment will help to build their SoC. The effects of SoC on perceptual, appraisal, and behavioral processes may in turn lead to enhanced job resources and positive outcomes such as greater work engagement.

Keywords: sense of coherence, personal resources, job-demands–resources model, longitudinal, work engagement

In today’s working life, employees are expected to show initiative and to be innovative and psychologically connected to their work. Accordingly, organizations must inspire and empower employees to apply their full capabilities and should ensure that working conditions include resources that will motivate and energize them (Bakker, Albrecht, & Leiter, 2011). In addition, the increasing uncertainty, complexity and lack of boundaries in working life creates a greater need for the sustainable development of

employees through more comprehensible, manageable and meaningful work (Kira, 2003).

A well-established indicator of the motivating capacity of working conditions is work engagement, which has been defined as “a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication and absorption” (Schaufeli, Salanova, González-Romá, & Bakker, 2002, p. 74). Engaged employees experience their work as stimulating, energetic, significant and meaningful, and they are engrossed and concentrate fully (Bakker et al., 2011). Work engagement is related to relevant outcomes such as job performance (Bakker & Bal, 2010), customer loyalty (Salanova, Agut, & Peiró, 2005), innovativeness (Hakanen, Perhoniemi, & Toppinen-Tanner, 2008), productivity and pay level (Hakanen & Koivumäki, 2014), and employee health (Airila et al., 2014; see Halbesleben, 2010, for a meta-analysis).

The motivational path to work engagement is most commonly examined in the context of the job-demands–resources (JD-R) model. One core assumption of this model is that job resources—that is, physical, psychological, social, or organizational aspects of the job that are functional in achieving work goals, reduce job demands, or stimulate personal growth and development (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001)—lead to work engagement, so building a “motivational process” (Bakker & Demerouti, 2007). This assumption finds support in a number of studies (e.g., Hakanen, Schaufeli, & Ahola, 2008; Mauno, Kin-

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nunen, & Ruokolainen, 2007; Schaufeli, Bakker, & Van Rhenen, 2009; see Schaufeli & Taris, 2014, for an overview).

However, as noted in early approaches such as the job characteristics model (Hackman & Oldham, 1976) or the person-environment fit model (Edwards & Shipp, 2007), employees' functioning and well-being may be determined not only by situational factors such as job characteristics but also by characteristics of the individual. Recent conceptualizations of the JD-R model have integrated personal resources as additional main predictors of work engagement (Bakker & Demerouti, 2008, 2014). Personal resources have been defined as lower order, cognitive-affective aspects of an individual's personality, entailing positive beliefs about oneself and the world and motivating and facilitating goal attainment (Van den Heuvel, Demerouti, Schaufeli, & Bakker, 2010). In the context of conservation of resources (COR) theory, personal resources have been described as the psychological characteristics or aspects of the self that are generally associated with resilience and pertain to an individual's ability to successfully control and impact their environment (Hobfoll, Johnson, Ennis, & Jackson, 2003). It has been shown that this kind of positive self-evaluation predicts relevant outcomes such as job performance, job satisfaction, and motivation (see Judge, Van Vianen, & De Pater, 2004, for a review).

One of the most important personal resources in relation to health and well-being is sense of coherence (SoC; Eriksson & Lindström, 2006). This construct originated in observations of the health status of female concentration camp survivors, leading Antonovsky (1979) to pose the question that subsequently informed the theory of salutogenesis: How do some people manage to stay healthy? Rather than following the pathogenic paradigm (studying the factors that make people ill), Antonovsky developed a theory to explain the origin (genesis) of health (salus). Antonovsky (1979) criticized the dichotomous classification of persons as either diseased or healthy; instead, he viewed health as a continuum from total ill health (dis-ease) to total health (ease). Based on a series of life history interviews, Antonovsky identified SoC as a central variable in explaining an individual's movement toward the healthy end of the continuum. He described SoC as a global orientation, in which an individual perceives life as comprehensible, manageable and meaningful (Antonovsky, 1987a). Individuals with high SoC perceive life events as structured, predictable, explicable and occurring for a certain reason (sense of comprehensibility). They are confident about their future and about the availability of resources that will enable demands to be successfully coped with (sense of manageability). Such individuals know which areas of life are important to them, and demands are seen as challenges that are worthy of investment and engagement (sense of meaningfulness; Antonovsky, 1987a). The theory of salutogenesis further states that generalized resistance resources (that is, any characteristic such as money, knowledge, cultural stability or social support that can facilitate effective tension management; Antonovsky, 1979) provide an individual with coherent life experiences and so build SoC over time. This improves an individual's status on the health continuum by making it more likely that a situation will be defined as a nonstressor or even as a welcome challenge; that one is confident that a stressor can be handled successfully; that one has a greater variety of generalized resistance resources at one's disposal and that those resources are mobilized and used appropriately (Antonovsky, 1979, 1987a).

In recent years, SoC has been studied in multiple contexts and has consistently been found of particular relevance as a personal resource predicting health and well-being. For example, one large-scale prospective cohort study found that SoC predicted reduced mortality, even when controlling for factors such as smoking, social class, or body mass index (Surtees, Wainwright, Luben, Khaw, & Day, 2003). Similar results were reported by Super, Verschuren, Zantinge, Wagemakers, and Picavet (2014). Furthermore, SoC has been found to predict reduced psychiatric morbidity (Kouvonen et al., 2010) and sickness absences (Kivimäki et al., 1997), as well as a better subjective state of health (Suominen, Helenius, Blomberg, Uutela, & Koskenvuo, 2001).

Although SoC was at one time thought to be relatively fixed by the age of 30 (Antonovsky, 1987a), this assumption has been challenged by a number of longitudinal studies (e.g., Feldt, Leskinen, Kinnunen, & Mauno, 2000; Hakanen, Feldt, & Leskinen, 2007; Smith, Breslin, & Beaton, 2003). Feldt, Metsäpelto, Kinnunen, and Pulkkinen (2007) concluded that, although SoC seems relatively stable, it should not be regarded as a separate personality trait like, for instance, neuroticism but as a stable, generalized orientation that influences perception and the ability to control one's environment, developed through life experiences. Indeed, there is empirical evidence (e.g., Surtees et al., 2003) that the positive effect of SoC on health extends beyond a mere absence of anxiety or neuroticism (Strümpfer, Gouws, & Viviers, 1998).

The relationship of SoC to constructs such as hardiness or resilience (e.g., Almedom, 2005) has also been explored. Antonovsky (1987a) viewed the similarities between these constructs as confirming the basic assumptions of salutogenic theory and demonstrating the relevance of comprehensibility, manageability and meaningfulness. Among these constructs, SoC is probably the most influential and widely studied, making it a matter of particular interest here (Almedom, 2005).

While salutogenic theory is strongly focused on resources, the role of SoC has so far been researched primarily in relation to coping with stressors and demands, preventing an individual's movement toward ill health (Antonovsky, 1979, 1987a). The present study adds a new perspective by investigating SoC in its relationship to outcomes and processes beyond the absence of illness, focusing instead on the positive motivational process of how job resources engender work engagement.

It is interesting to study SoC in the context of the JD-R model for at least three reasons. First, SoC is perhaps the most salient personal resource in the prediction of long-term public health outcomes (e.g., Super et al., 2014; Surtees et al., 2003). For the field of occupational health psychology, then, it is important to know how SoC relates to the central assumptions of one of its most widely studied models (JD-R). Second, among personality theories and frameworks, salutogenesis (and, in particular, the construct of SoC) places the strongest emphasis on generalized resistance resources (Antonovsky, 1987a). In this respect, it mirrors the JD-R model, which emphasizes the importance of job resources for positive outcomes such as work engagement (Bakker & Demerouti, 2008). Third, as discussed above, SoC is seen to be an overarching concept that encompasses other related constructs such as neuroticism, hardiness, or resilience (Antonovsky, 1987a; Almedom, 2005) and can therefore be regarded as a particularly significant personal resource.

The present study, then, aims to investigate SoC and its relationship to the positive, motivational process of the JD-R model. Through its use of a full panel design, the study further contributes a systematic investigation of the different roles of personal resources in the JD-R model. In the following section, the role of personal resources in general, and of SoC in particular, in the two-way relationship between job resources and work engagement will be described and discussed.

How Sense of Coherence Mediates the Relationship Between Job Resources and Work Engagement

Job Resources Lead to Personal Resources

Working in a resourceful environment may help to build employees' personal resources. For example, an early study by Kohn and Schooler (1982) reported that positive learning experiences within the workplace are generalized to life off the job and so affect the employee's personality. In more recent discussion of the concept of "psychological capital," it has been shown that a supportive organizational climate can help to build an individual's personal resources (Luthans, Norman, Avolio, & Avey, 2008). Direct effects of job resources on self-efficacy, organization-based self-esteem and optimism have also been found in both cross-sectional (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007) and longitudinal studies (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009).

As discussed earlier, salutogenic theory states that generalized resistance resources support coherent life experiences and so help to build SoC over time (Antonovsky, 1987a). Given that most people spend a significant portion of their waking hours at work, job resources may be of particular relevance in building SoC in adulthood (Antonovsky, 1987a, 1987b). For example, an employee who knows what is expected of them at work, who feels that colleagues are there for support if needed and who sees possibilities for development in the job is more likely to experience comprehensibility, manageability and meaningfulness. In line with this reasoning, a longitudinal study by Feldt, Kinnunen, and Mauno (2000) found that a good organizational climate was associated with strong SoC. Similarly, Togari and Yamazaki (2012) found that SoC was enhanced by a positive psychosocial work environment—that is, flexibility, the opportunity to increase one's skills and the possibility of deciding things for oneself. Using the more specific concept of "work-related sense of coherence," Vogt, Jenny, and Bauer (2013) reported that job resources may help to strengthen perception of comprehensibility, manageability and meaningfulness in the work context. These and other findings, suggesting that working conditions might influence SoC, form the basis for a first hypothesis:

Hypothesis 1a: Job resources at Time (T)1 have a positive, cross-lagged effect on SoC at T2 and, similarly, from T2 to T3.

Personal Resources Lead to Work Engagement

As noted by Luthans, Avolio, Avey, and Norman (2007), not only may job resources help to strengthen personal resources but personal resources may in turn lead to further positive outcomes. For instance, there is evidence that personal resources such as

optimism, self-efficacy and organization-based self-esteem mediate the relationship between job resources and work engagement (Llorens, Schaufeli, Bakker, & Salanova, 2007; Xanthopoulou et al., 2007).

A core assumption of salutogenic theory, that SoC leads to health and well-being (Antonovsky, 1987a), has found support in a systematic review by Eriksson and Lindström (2006), as well as in a number of studies of SoC in the workplace. For example, a high level of SoC was found to be associated with fewer psychosomatic symptoms and lower levels of emotional exhaustion (Feldt, 1997), fewer symptoms of stress (Albertsen, Nielsen, & Borg, 2001), and better general physical and psychological health (Kinman, 2008). Additionally, Van der Colff and Rothmann (2009) report that strong SoC is related to greater work engagement. The experience of life (including working life) as comprehensible, manageable, and meaningful may, it seems, foster the experience of vigor, dedication, and absorption in the workplace. Conversely, high vigor and absorption at work seem less likely in constantly changing or unsupportive working conditions, in which employees' experiences are chaotic rather than comprehensible and beyond their control rather than manageable. Similarly, experiencing one's (working) life as less meaningful is likely to undermine dedication. On that basis, a second hypothesis can be formulated:

Hypothesis 1b: SoC at T1 has a positive, cross-lagged effect on work engagement at T2 and, similarly, from T2 to T3.

Taken together, Hypotheses 1a and 1b suggest a further hypothesis concerning SoC as a mediator between job resources and work engagement:

Hypothesis 1c: SoC at T2 mediates the relationship between job resources at T1 and work engagement at T3.

Reverse Relationships: How Sense of Coherence Mediates the Relationship Between Work Engagement and Job Resources

According to COR theory, individuals strive to obtain, retain and protect resources (Hobfoll, 2001). The theory further suggests that resources evolve as "caravans"; those who possess resources are more likely to and more capable of gaining more resources (Hobfoll, 2002). It follows that the relationships between resources are not unidirectional but reciprocal and dynamic and develop in "gain cycles," and a number of studies have reported reciprocal relationships between job resources, personal resources, health, and well-being. For instance, a longitudinal study of schoolteachers found that personal resources and organizational resources fostered flow experiences, which again predicted future resources (Salanova, Bakker, & Llorens, 2006). Hakanen, Perhoniemi, et al. (2008) reported positive reciprocal associations between job resources, work engagement and personal initiative. Similarly, using two large longitudinal samples, Salanova, Llorens, and Schaufeli (2011) showed that the personal resources of efficacy and work engagement reciprocally influenced each other. Applying these findings here, it seems likely that while job resources lead to SoC, leading in turn to work engagement, reverse relationships can also be expected.

Work Engagement Leads to Personal Resources

Fredrickson's (2001) broaden-and-build (BaB) theory suggests that positive affective states broaden people's momentary thought-action repertoires, so building enduring personal resources. As a state of positive affect and motivation at work, work engagement may therefore consolidate personal resources over time, triggering an upward spiral toward emotional well-being. Similarly, COR theory asserts that individuals who possess resources (e.g., work engagement) are more likely to gain additional resources (e.g., SoC; Hobfoll, 2001). Recent conceptualizations of the JD-R model have integrated this feedback loop between work engagement and personal resources (Bakker & Demerouti, 2008, 2014), and these notions are supported by empirical studies. Xanthopoulou et al. (2009) reported that work engagement predicted personal resources of self-efficacy, organization-based self-esteem, and optimism over time. Even at daily level, positive emotions at work have been found to relate to personal resources (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2012).

To our knowledge, the effect of positive affective states on SoC has not to date been hypothesized or studied. However, based on BaB and COR theory, it might be expected that work engagement would help to strengthen an individual's SoC. For example, if an employee feels full of energy and is highly dedicated to their work, they will be more likely to have the energy to explore new ways of restructuring their job, both mentally and practically. Over time, these positive changes may help increase the employee's overall sense of comprehensibility, manageability and meaningfulness. Our next hypothesis is formulated on that basis:

Hypothesis 2a: Work engagement at T1 has a positive, cross-lagged effect on SoC at T2 and, similarly, from T2 to T3.

Personal Resources Lead to Job Resources

As early as 1982, Kohn and Schooler pointed out that the relationship between personality and working conditions is reciprocal and that employees with personal resources may build more favorable working environments over time. In line with this observation, a central assumption of COR theory is that those with greater resources are more capable of resource gain, and that possession of one resource (e.g., SoC) is typically linked to possession of others (e.g., a positive working environment; Hobfoll, 2001). Similarly, a number of studies have shown that personal resources underpin subjective experience of job resources. For example, Judge, Bono, and Locke (2000) report that employees' core self-evaluations (self-esteem, self-efficacy, locus of control, and low neuroticism) influence how they perceive their job. Similarly, Xanthopoulou et al. (2007) found that self-efficacy, organization-based self-esteem, and optimism are significant predictors of job resources, and this was later replicated using longitudinal data (Xanthopoulou et al., 2009). The authors interpreted these results to mean that employees who hold personal resources were more likely to identify and create a positive working environment. In line with this finding, Bakker, Tims, and Derks (2012) reported that employees with proactive personalities were more likely to change aspects of their jobs in a positive way.

With regard to SoC, Feldt, Kivimäki, Rantala, and Tolvanen (2004) argued that employees with high SoC may have a greater

ability to change their working conditions for the better. Using longitudinal data relating to more than 600 managers, they found that higher SoC was a predictor of good organizational climate. From a content analysis of employees' written responses, Muller and Rothmann (2009) found that perceptions of helping and constraining factors in the workplace differed according to the employee's SoC level.

It follows that there are two possible mechanisms by which SoC may affect the level of job resources. On the one hand, those with high SoC may interpret, perceive, or appraise a given level of resources differently or more favorably—for instance, a high SoC individual may be more likely to perceive as more available such resources as a helpful colleague or the freedom to make one's own decisions and may also appraise these factors in a more positive way. On the other hand, high SoC individuals may actually behave differently, in ways that lead them to activate and create more resources. For instance, a high SoC individual may feel confident that new challenges and situations are manageable, comprehensible and meaningful and may therefore actively ask a supervisor for feedback or take on new and interesting tasks. Based on this reasoning, the following hypothesis can be formulated:

Hypothesis 2b: SoC at T1 has a positive, cross-lagged effect on job resources at T2 and, similarly, from T2 to T3.

In line with the literature suggesting that job resources and work engagement are reciprocal (e.g., Hakanen, Perhoniemi, et al., 2008; Xanthopoulou et al., 2009), and in accordance with the reasoning above, a reverse mediating effect of SoC might therefore be expected:

Hypothesis 2c: SoC at T2 mediates the relationship between work engagement at T1 and job resources at T3.

Personal Resources Boost the Relationship Between Job Resources and Work Engagement

The definition of personal resources by Hobfoll et al. (2003) implies that, as well as being reciprocally related to job characteristics and well-being, these may also buffer the burnout effects of job demands and boost the impact of job resources on work engagement. In his salutogenic theory, Antonovsky (1987a) was unclear about the moderating role of SoC. While denying this role by saying that SoC is not primarily a buffer variable, he also discussed SoC as a protective shield from the negative health effects of stressors. In support of the latter view, the buffering role of SoC has been tested and confirmed by several studies (e.g., Feldt, 1997; Kinman, 2008).

However, though not directly hypothesized by the theory of salutogenesis, SoC may also boost the effect of job resources on positive outcomes such as work engagement. As SoC has been shown to be related to perceptual processes (Amirkhan & Greaves, 2003; Muller & Rothmann, 2009), high SoC employees might be expected to perceive and appraise environmental resources differently and to utilize them more effectively. In other words, an employee who perceives life as comprehensible, manageable and meaningful seems more likely to identify and profit from the available resources in their working life. For example, high SoC employees may more readily perceive possibilities for advancement, such as training opportunities; they may appraise these more

positively, seeing any possible challenge as manageable and so feeling able to exploit this resource by selecting a training course that is personally meaningful. In combination, the personal resource of SoC and a well-resourced work environment may be especially motivating, suggesting that SoC will enhance the positive impact of job resources on work engagement:

Hypothesis 3: SoC at T1 boosts the effect of job resources at T1 on work engagement at T2 and, similarly, from T2 to T3.

Method

Participants and Procedure

The present study was based on longitudinal data from three waves of measurement with a 3-month time interval. Participants from German-speaking countries (Austria, Germany, and Switzerland) were recruited through an online panel data service. They received a minimal incentive for their participation (points that can be redeemed toward a given service after participating in several surveys). Participation was voluntary, and the anonymity and confidentiality of data were ensured and emphasized.

A total of 2,764 persons clicked on the link to the first page of the online questionnaire, and 1,852 employees completed the questionnaire in the first wave. Those who indicated that they worked less than 20 hr per week or not at all, or who were self-employed or were not within the age range of 18 to 65 years were excluded at the outset.

Three months later, those who had completed the first wave were invited to participate for a second time, and 1,229 employees answered this second questionnaire (representing 66% of those who had completed the first wave). For the third wave, 6 months after the baseline measurement, 940 again participated in the study (representing 76% of the second wave participants). The time interval of 3 months between measurements was chosen to ensure that most of the participating employees would be at the same workplace and would be unlikely to experience major organizational changes during the study. The optimal time lag for detecting

impacts is difficult to determine (Mitchell & James, 2001; Zapf, Dormann, & Frese, 1996); given the rarity of shorter time lags in longitudinal studies using the JD-R model, it was decided to adopt the 3-month interval.

A test for selective dropout revealed that men were more likely to participate in all three waves; 63% of those who participated in all three waves were male as compared to 48% of participants in the first wave only, $\chi^2(1) = 23.5, p < .001$. Additionally, participants responding to all three waves were older, with a mean age of 41.2 years as compared to a mean of 37.4 years, $F(1) = 43.2, p < .001$. However, no significant differences were found by hours worked or in relation to the study variables (job resources, work engagement, and SoC). It can therefore be assumed that selective dropout did not significantly bias our results.

Of the study participants, 54% were from Germany, 32% from Austria, and 14% from Switzerland. Forty percent had completed an apprenticeship, and 33% had a degree from a higher educational institution such as a college or university. Participants came from a broad range of occupations and economic sectors; 10% worked in the health and social sector, 12% in the public/defense/social security sector, 8% in trading, 9% in the production of goods, 8% in information/communication, 6% in finance/insurance, 7% in technology/science, and 5% in education. The remaining participants came from other sectors such as real estate, the hotel and restaurant industry and transport and building. Mean organizational tenure was 10.7 years ($SD = 9.1$). Overall, demographic variables and industrial sectors suggest that the study sample accurately reflected the working population in Austria, Germany, and Switzerland (see Table 1).

Measures

All measures validated in languages other than German were translated into German and checked for accuracy, using the back-translation procedure. Five job resources that are relevant to a broad range of jobs and organizations were assessed, as follows: *control* (six items, such as "I can decide when to take a break"), *role clarity* (five items, such as "I am clear about what is expected

Table 1
Comparison Between the Study Sample and the Working Population of Austria, Germany, and Switzerland

Variable	Present study	Austria ^a	Germany ^b	Switzerland ^c
% Males	63	54	54	55
Mean age	41.2	40.4	42.7	41.1
Mean organizational tenure	10.7	9.6	10.8	—
Education: % Apprenticeship	40	39	49	34
Education: % Higher education degree	33	32	29	37
Sector: % Health and social	10	9	11	14
Sector: % Public/defense/social security	12	7	8	5
Sector: % Trading	8	15	14	14
Sector: % Production of goods	9	16	19	14
Sector: % Information/communication	8	2	3	3
Sector: % Finance/insurance	6	4	3	4
Sector: % Technology/science	7	5	5	8
Sector: % Education	5	6	6	7

Note. — = information not available.

^a Statistik Austria (2012). ^b Information retrieved from www.destatis.de. ^c Information retrieved from www.bfs.admin.ch.

of me at work”), *social support from colleagues* (four items, such as “I get the help and support I need from my colleagues”), and *social support from supervisor* (five items, such as “My line manager encourages me”). These were assessed using an indicator tool developed by the United Kingdom Health and Safety Executive (Cousins et al., 2004). Items were scored on a 5-point scale, ranging from 1 (*not at all true*) to 5 (*completely true*). *Variety and possibilities for development* was assessed using six items from the salutogenic subjective work analysis questionnaire (Richter, Nebel, & Wolf, 2006; Udris & Rimann, 1999). One item from the original scale was reformulated: to better capture the underlying concept of job resources, “With this work, I lose many abilities that I had before” was changed to “With this work, I can develop my abilities.”

Of all these work characteristics, role clarity is perhaps the most difficult to categorize within the JD-R model. However, following Demerouti et al. (2001), role clarity can indeed be considered a job resource while its opposite (role ambiguity) is a job demand. In the present study, role clarity was measured using items that clearly describe a desired, positively valued state, adhering to Schaufeli and Taris’ (2014) recent conceptualization of job resources in terms of positively *valued* work characteristics. Additionally, the measurement of job resources was based mainly on the broadly used and widely researched indicator tool developed by the United Kingdom Health and Safety Executive (Cousins et al., 2004).

Work engagement was assessed using the nine-item version of the Utrecht Work Engagement Scale (Schaufeli, Bakker, & Salanova, 2006). This measures the three underlying dimensions of work engagement: vigor (e.g., “At work, I feel like I am bursting with energy”); dedication (e.g., “I am enthusiastic about my job”), and absorption (e.g., “I am immersed in my work”). Items were scored on a 7-point scale ranging from 1 (*never*) to 7 (*always/every day*).

SoC was assessed using the SoC-L9 scale (Schumacher, Wilz, Gunzelmann, & Brähler, 2000). This scale has been validated in a large, representative community sample of the German population and comprises those nine items with the highest item-total correlation with Antonovsky’s (1987a) original 29-item Orientation to Life questionnaire measuring SoC. The scale employs a 7-point response format and three dimensions: comprehensibility (e.g., “Do you have the feeling that you are in an unfamiliar situation and don’t know what to do?”; responses range from *very often* to *very seldom or never*), manageability (e.g., “When you think of difficulties you are likely to face in important aspects of your life, do you have the feeling that . . .”; responses range from *you will always succeed in overcoming the difficulties* to *you won’t succeed in overcoming the difficulties*), and meaningfulness (e.g., “Doing the things you do every day is . . .”; responses range from *a source of deep pleasure and satisfaction to a source of pain and boredom*). In keeping with the original questionnaire, no additional instructions were given concerning time frame or role specificity.

Data Analysis

The data were analyzed using structural equation modeling techniques and the AMOS 21 software package. Work engagement was indicated by the subdimensions of vigor, dedication and absorption, and SoC was indicated by the subdimensions of comprehensibility, manageability and meaningfulness. Job resources were indicated by

their respective subscales. The JD-R model classifies job resources into a single factor leading to work engagement and building the motivational process as confirmed by a number of studies (e.g., Hakanen, Schaufeli, et al., 2008; Schaufeli et al., 2009). Within salutogenic theory, job resources can be understood as generalized resistance resources in the work-life context that, taken together rather than separately, contribute to building SoC. The same accumulation of resources (resource caravans) is also proposed by COR theory (Hobfoll, 2001). Conceptually and with regard to the research questions, then, it makes sense to combine the resources into a single latent factor. In addition, a confirmatory factor analysis, in which the “job resources” factor is indicated by the five dimensions of “control” (standardized $\beta = .50$), “role clarity” (standardized $\beta = .58, p < .001$), “social support by colleagues” (standardized $\beta = .68, p < .001$), “social support by supervisor” (standardized $\beta = .72, p < .001$) and “variety and possibilities for development” (standardized $\beta = .62, p < .001$) showed a good fit ($\chi^2 = 36.5; df = 5$; comparative fit index [CFI] = .969; Tucker–Lewis index [TLI] = .938; normed fit index [NFI] = .965; root-mean-square error of approximation [RMSEA] = .082), providing additional support for the combination of different measures of job resources into a single latent factor.

Several alternative nested models were evaluated, using the RMSEA, CFI, NFI, and the TLI with the conventional cut-off values (i.e., RMSEA < .08; CFI > .95; NFI > .95; TLI > .95; Schermelleh-Engel, Moosbrugger, & Möller, 2003), and compared with chi-square difference tests (Jöreskog & Sörbom, 1993). The significance of the mediation effect was examined using 10,000 bootstrapped samples (Cheung & Lau, 2008).

The error terms of the indicators were allowed to covary with the corresponding error terms of the other two waves, and correlations between the latent variables at T1 and between their error terms at T2 and T3 were also allowed. Additionally, equality constraints were set on the cross-lagged effects between variables from Wave 1 to Wave 2 and from Wave 2 to Wave 3 (Finkel, 1995).

To test whether SoC has a boosting effect on the relationship between job resources and work engagement, moderated structural equation modeling was conducted with a separate model containing four exogenous latent factors (SoC at T1, job resources at T1, their interaction, and work engagement at T1) and one endogenous latent factor (work engagement at T2), using the procedure of Mathieu, Tannenbaum, and Salas (1992) as described by Cortina, Chen, and Dunlap (2001). Each exogenous factor was indicated by its standardized factor score, and paths to their respective indicators were fixed using the square roots of their reliabilities. The error variances of each indicator were set as equal to the product of its variance and one minus its reliability. The reliability score of the interaction term was calculated as described by Cortina et al. (2001). Again, these effects were tested for Wave 2 and Wave 3 data (SoC at T2, job resources at T2, their interaction, and work engagement at T2 predicting work engagement at T3).

Results

Descriptive Statistics

The means, standard deviations, Cronbach alphas and correlations among the study variables are presented in Table 2. Cronbach alphas are good for all three occasions of measurement. All study

Table 2
Means (M), Standard Deviations (SD), Internal Consistencies (Cronbach's α), and Correlations Between the Study Variables (N = 940)

Variables	M	SD	α	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1. Control T1	3.48	.82	.82																					
2. Role clarity T1	4.30	.64	.86	.29																				
3. Social support by colleagues T1	3.66	.80	.84	.32	.44																			
4. Social support by supervisor T1	3.35	.98	.92	.32	.41	.51																		
5. Variety/possibilities for development T1	3.36	.85	.89	.40	.33	.38	.47																	
6. Sense of coherence T1	5.02	1.13	.90	.30	.42	.36	.33	.41																
7. Work engagement T1	4.46	1.42	.97	.34	.44	.40	.53	.61	.53															
8. Control T2	3.43	.79	.83	.77	.22	.26	.29	.35	.27	.30														
9. Role clarity T2	4.19	.69	.88	.23	.71	.37	.37	.30	.36	.39	.28													
10. Social support by colleagues T2	3.62	.82	.85	.25	.35	.69	.46	.33	.32	.34	.31	.45												
11. Social support by supervisor T2	3.29	1.01	.93	.27	.33	.43	.80	.38	.30	.44	.33	.42	.52											
12. Variety/possibilities for development T2	3.33	.84	.89	.37	.29	.31	.41	.80	.37	.57	.41	.35	.35	.41										
13. Sense of coherence T2	5.00	1.16	.91	.28	.40	.34	.31	.38	.82	.47	.29	.39	.34	.33	.38									
14. Work engagement T2	4.38	1.42	.97	.31	.40	.33	.47	.55	.47	.81	.35	.42	.34	.49	.63	.48								
15. Control T3	3.41	.79	.83	.72	.21	.24	.28	.34	.28	.27	.75	.24	.25	.29	.35	.29	.31							
16. Role clarity T3	4.18	.68	.88	.18	.66	.33	.35	.25	.37	.36	.20	.71	.34	.36	.28	.40	.37	.25						
17. Social support by colleagues T3	3.65	.79	.85	.24	.33	.70	.46	.31	.35	.34	.25	.35	.72	.46	.29	.35	.33	.31	.41					
18. Social support by supervisor T3	3.26	1.01	.93	.23	.31	.41	.77	.35	.30	.41	.25	.33	.42	.79	.34	.32	.41	.31	.42	.51				
19. Variety/possibilities for development T3	3.30	.83	.89	.32	.26	.30	.41	.76	.39	.55	.33	.30	.29	.39	.79	.38	.56	.38	.32	.34	.42			
20. Sense of coherence T3	5.01	1.17	.92	.27	.37	.33	.30	.38	.81	.47	.28	.38	.32	.30	.37	.84	.46	.32	.41	.35	.32	.41		
21. Work engagement T3	4.36	1.40	.97	.25	.39	.31	.47	.51	.49	.78	.26	.40	.31	.47	.56	.49	.82	.29	.40	.34	.47	.62	.52	

Note. T = time. All correlations are statistically significant ($p < .001$).

variables are positively correlated with each other. Test–retest correlations between T1 and T3 variables range between .66 and .81, indicating relatively high stability.

Validity and Invariance of the Measurement Models

Before testing the hypotheses, confirmatory factor analyses were performed to ascertain whether the concepts of job resources, work engagement and SoC could be distinguished. As shown in Table 3, the measurement Model (M)0 showed a good fit to the data. Additionally, the time invariance tests of the factor loadings showed no significant differences between the unconstrained model and the constrained model ($\Delta\chi^2 = 10.1, \Delta df = 16, ns$). It follows that the factor loadings can be considered invariant across the three measurement points (Byrne, 2004).

Cross-Lagged Relationships Between Variables

The fit indices of all tested models are shown in Table 3. First, a stability model M1 was tested, in which all latent variables were predicted by their respective baseline values. Next, a fully mediated causal model M2, in which job resources predicted SoC and SoC predicted work engagement (for both T1 and T2 as well as T2 and T3), was compared to the stability model M1 and was found to fit the data significantly better ($\Delta\chi^2 = 22.0, \Delta df = 2, p < .001$). In the next step, a partially mediated causal model M3 with an additional path from job resources at T1 to work engagement at T3 was compared to the fully mediated causal model M2 and was found to fit the data significantly better ($\Delta\chi^2 = 23.4, \Delta df = 1, p < .001$).

Similarly, a fully mediated reversed model M4 (in which work engagement predicted SoC and SoC predicted job resources) and a partially mediated reversed model M5 (with an additional path from work engagement at T1 to job resources at T3) were fitted to the data. Again, the fully mediated reversed model M4 was superior to the stability model M1 ($\Delta\chi^2 = 14.6, \Delta df = 2, p < .001$), and the partially mediated reversed model M5 was superior to the fully mediated reversed model M4 ($\Delta\chi^2 = 8.3, \Delta df = 1, p < .01$).

Finally, reciprocal models with mediated pathways in both the causal and reversed causal direction were tested. The reciprocal model with full mediation M6 was superior to the stability model M1 ($\Delta\chi^2 = 46.0, \Delta df = 4, p < .001$); to the causal fully mediated model M2 ($\Delta\chi^2 = 24.0, \Delta df = 2, p < .001$) and to the reversed fully mediated model M4 ($\Delta\chi^2 = 31.4, \Delta df = 2, p < .001$). Additionally, and in line with the previous results, the reciprocal model with partial mediation M7 was superior to the fully mediated model M6 ($\Delta\chi^2 = 25.5, \Delta df = 2, p < .001$). The paths from work engagement to SoC were not significant and were therefore deleted in the final model M8 (see Figure 1).

These findings provide support for Hypotheses 1a and 1b: Job resources had a significant cross-lagged effect on SoC (standardized $\beta = .04, p < .05$, both from T1 to T2 and from T2 to T3), and SoC had a significant cross-lagged effect on work engagement (standardized $\beta = .06, p < .001$, both from T1 to T2 and from T2 to T3). The results from bootstrapping showed that the estimated indirect effect from Time 1 job resources to Time 3 work engagement through SoC was significant, with $p < .01$ and a 95% bias-corrected confidence interval [.003, .02], supporting Hypothesis 1c.

Table 3
Fit Statistics for the Study Models (N = 940)

Model (M)	Model description	χ^2	df	CFI	TLI	NFI	RMSEA	Model comparison	$\Delta\chi^2$	Δdf
M0	Measurement model	1,047.8	426	.981	.976	.968	.039			
M1 _{stabil}	Stability model	1,275.7	447	.974	.970	.961	.044			
M2 _{causal_full}	Fully mediated causal model (M1 _{stabil} + JR → SoC; SoC → WE)	1,253.7	445	.975	.970	.962	.044	M1 _{stabil} vs. M2 _{causal_full}	22***	2
M3 _{causal_partial}	Partially mediated causal model (M2 _{causal_full} + JR T1 → WE T3)	1,230.3	444	.976	.971	.963	.043	M2 _{causal_full} vs. M3 _{causal_partial}	23.4***	1
M4 _{reversed_full}	Fully mediated reversed model (M1 _{stabil} + WE → SoC; SoC → JR)	1,261.1	445	.975	.970	.962	.044	M1 _{stabil} vs. M4 _{reversed_full}	14.6***	2
M5 _{reversed_partial}	Partially mediated reversed model (M4 _{reversed_full} + WE T1 → JR T3)	1,252.8	444	.975	.970	.962	.044	M4 _{reversed_full} vs. M5 _{reversed_partial}	8.3**	1
M6 _{reciprocal}	Reciprocal model (M2 _{causal_full} + M4 _{reversed_full})	1,229.7	443	.976	.971	.963	.043	M1 _{stabil} vs. M6 _{reciprocal}	46.0***	4
								M2 _{causal_full} vs. M6 _{reciprocal}	24.0***	2
								M4 _{reversed_full} vs. M6 _{reciprocal}	31.4***	2
M7 _{reciprocal_partial}	Reciprocal model with partial mediation (M6 _{reciprocal} + JR T1 → WE T3; WE T1 → JR T3)	1,204.2	441	.976	.972	.963	.043	M6 _{reciprocal} vs. M7 _{reciprocal_partial}	25.5***	2
M8 _{final}	Final model (M7 _{reciprocal_partial} with nonsignificant paths from WE to SoC deleted)	1,204.2	442	.977	.972	.963	.043			

Note. CFI = comparative fit index; TLI = Tucker–Lewis index; NFI = normed fit index; RMSEA = root-mean-square error of approximation; JR = job resources; SoC = sense of coherence; WE = work engagement; T = time.
** $p < .01$. *** $p < .001$.

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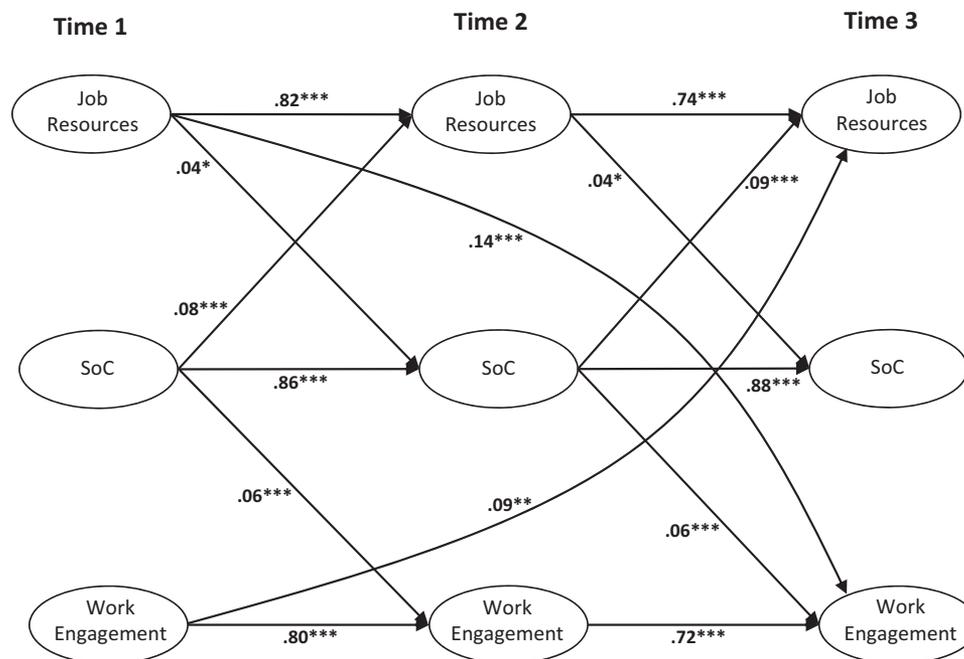


Figure 1. The final model (M8) of the statistically significant cross-lagged relationships between job resources, sense of coherence, and work engagement ($N = 940$). * $p < .05$. ** $p < .01$. *** $p < .001$.

No significant effect was found from work engagement to SoC, so rejecting Hypotheses 2a (effect of work engagement on SoC) and 2c (mediating effect of SoC on the relationship between work engagement and job resources). However, there was a significant effect of SoC on job resources (standardized $\beta = .08$, $p < .001$ from T1 to T2; standardized $\beta = .09$, $p < .001$ from T2 to T3), supporting Hypothesis 2b and suggesting that job resources and SoC influence each other reciprocally.

The results of moderated structural equation modeling showed that the path coefficient from the interaction term of job resources and SoC to work engagement did not reach significance, for both T1 and T2 (standardized $\beta = -.03$, ns ; $\chi^2 = 91.0$; $df = 17$; CFI = .991; NFI = .989; TLI = .982; RMSEA = .068) and for T2 and T3 (standardized $\beta = .02$, ns ; $\chi^2 = 76.4$; $df = 17$; CFI = .993; NFI = .991; TLI = .985; RMSEA = .061). This indicates that SoC does not moderate the relationship between job resources and work engagement, so rejecting Hypothesis 3.

In summary, the results of longitudinal structural equation modeling show that job resources had a positive, cross-lagged effect on SoC (Hypothesis 1a); SoC had a positive, cross-lagged effect on work engagement (Hypothesis 1b) and SoC was found to mediate the relationship between job resources and work engagement (Hypothesis 1c). In addition, SoC had a positive, cross-lagged effect on job resources (Hypothesis 2b), indicating reciprocal relationships between SoC and job resources. However, work engagement had no effect on SoC (Hypothesis 2a), and there was no mediating effect of SoC on the relationship between work engagement and job resources (Hypothesis 2c). Additionally, there was no evidence that SoC boosted the effect of job resources on work engagement (Hypothesis 3).

Discussion

The main purpose of this longitudinal study was to systematically test the different roles of the salutogenic personal resource SoC in the motivational process of the JD-R model. In particular, the aims were (a) to study whether a resourceful work environment builds SoC and whether SoC leads to work engagement, (b) to test reverse relationships (work engagement leading to SoC and SoC leading to job resources), and (c) to test whether SoC boosts the effect of job resources on work engagement. The study brings together two flourishing theoretical fields: Antonovsky's salutogenic approach, which features mainly in the epidemiology and health promotion literature, and the JD-R model, which has been highly influential in occupational health psychology research over the last decade.

Sense of Coherence Mediates the Relationship Between Job Resources and Work Engagement

As hypothesized, the present findings indicate that job resources predict future SoC, which in turn predicts work engagement. It follows that providing employees with control, role clarity, social support and opportunities for development helps them to build SoC, making it more likely that, over time, they will be vigorous, dedicated and absorbed in their work. This finding aligns with Antonovsky's (1987a, 1987b) suggestion that a well-resourced working environment will strengthen the employee's view of the world as comprehensible, manageable and meaningful. In support of this view, previous studies have found that SoC is not a fixed personality trait but can be shaped through experience, both inside and outside working life (Albertsen et al., 2001; Feldt, Kinnunen,

et al., 2000; Feldt, Kokko, Kinnunen, & Pulkkinen, 2005; Togari & Yamazaki, 2012). However, although the relevance of positive factors in the workplace for employees' SoC was pointed out as early as 1987 (Antonovsky, 1987b), this study is one of the first to investigate the relationship of SoC to resources (rather than stressors or demands) and to positive outcomes such as work engagement (rather than negative outcomes such as burnout), so adding relevant knowledge in relation to the role of SoC in working life.

Work Engagement Does Not Lead to Sense of Coherence

Although previous studies have shown that positive affective states at work (i.e., work engagement) may strengthen personal resources over time (Hakanen et al., 2008; Xanthopoulou et al., 2009), no support was found here for this position. In other words, although positive affective states such as work engagement may broaden an employee's thought-action repertoire, so allowing for more initiative and creativity (Fredrickson, 2001), this has no effect on their general sense of comprehensibility, manageability and meaningfulness. One possible explanation for this finding is that the time interval employed here was relatively short, and perhaps the processes suggested by the BaB theory (Fredrickson, 2001) need more time to produce measurable effects in a relatively stable personal resource such as SoC.

Sense of Coherence Leads to Job Resources

In line with other studies reporting that personal resources may lead to job resources (Xanthopoulou et al., 2007, 2009), it was hypothesized and found that SoC predicts future job resources. These findings can be interpreted as evidence of two different mechanisms by which SoC can influence the level of job resources. First, high SoC employees may perceive and appraise resources in their work environment differently and more favorably (e.g., Muller & Rothmann, 2009). And second, employees who perceive their world as comprehensible, manageable, and meaningful may be more likely to actively create a resource-rich work environment over time. This can also be interpreted in terms of the concept of job crafting, describing self-initiated forms of behavior in which employees proactively shape the characteristics of their jobs to align with their own abilities, needs and preferences (Wrzesniewski & Dutton, 2001). Apparently, high SoC employees not only perceive their work environment differently but also craft their jobs by actively increasing their resources at work—for instance, by asking colleagues for advice, trying to learn new things or requesting feedback from their supervisor (Tims, Bakker, & Derks, 2012).

In combination with the finding that job resources help to build employees' SoC, this indicates a reciprocal relationship between job resources and SoC; the availability of job resources makes it more likely that employees will develop their SoC. Similarly, high SoC makes it more likely that employees will create a resourceful work environment. This finding echoes those of other studies that suggest that resources develop in cycles (Hakanen, Schaufeli, et al., 2008; Xanthopoulou et al., 2009), providing further support for the COR theory (Hobfoll, 2002) and supporting recent conceptu-

alizations of the JD-R model that integrate a feedback loop between job and personal resources.

No Boosting Effect of Sense of Coherence

We hypothesized that SoC would boost the effect of job resources on future work engagement, as high SoC employees might be expected to perceive, appraise and use the resources in their working environment more effectively. However, this expectation was not confirmed. One possible explanation might be a substitution effect (Hobfoll & Leiberhan, 1987), in which one type of resource (e.g., SoC) may substitute for another (e.g., job resources). For those individuals who perceive their lives as being comprehensible, manageable and meaningful, job resources (or lack thereof) may simply seem less important. Furthermore, high SoC individuals may more often draw resources from areas other than the workplace (e.g., from relationships and families). A third possible explanation is ceiling effects, as those with a high SoC tend to be already highly engaged in their work.

The present findings contribute in several ways to research on the general role of personal resources in the JD-R model. First, the study employed a full panel design with three waves of measurement, allowing for rigorous testing of hypotheses. Second, the study participants came from a broad range of occupations and economic sectors and can be considered representative of the working population of the German-speaking countries of Austria, Germany, and Switzerland. Third, the findings suggest that, among several personal resources, a single salutogenic individual resource—SoC—can boost both work engagement and job resources.

Study Limitations

The present study has some limitations that should be taken into account. First, as all measures were self-reported, common method biases may have influenced the results (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). However, constructs such as SoC or "work engagement" are difficult to measure using methods other than self-reporting. Additionally, the longitudinal design of our study reduces the risk of common method bias (Doty & Glick, 1998). Nevertheless, it would be interesting for future studies to investigate the relationships between job resources, SoC, work engagement and some more objectively measured outcomes such as innovation, productivity or health-related outcomes.

A second concern is that the cross-lagged effects found here were relatively small. However, like most psychosocial constructs (Taris & Kompier, 2006), job resources, SoC, and work engagement remain relatively stable over time. Accordingly, most of the variance in T2 or T3 concepts could be explained by the respective T1 or T2 concepts. However, the fact that significant effects were found even when controlling for baseline variables and with a short time lag of 3 months indicates that these relationships are relevant.

Third, as the mean levels of the study variables remained the same over time, growth curves were not investigated, and the study therefore provides no evidence for true gain spirals (i.e., increases in the mean levels of job resources or SoC) as suggested by COR theory (Hobfoll, 2002). Future studies might usefully investigate these relationships, using approaches such as latent growth curve modeling (e.g., Duncan & Duncan, 2004).

Fourth, while it can be argued that SoC is a central variable in the explanation of health, some construct validity issues remain, such as the strong association with other personal resources (Almedom, 2005; Strümpfer et al., 1998). Future studies might for instance compare different personal resources such as SoC, optimism, self-efficacy, hope, and resilience and their effects on work-related well-being to gain more insight into the shared variance of these concepts and the differences between them.

Conclusion: Theoretical and Practical Implications

The present study advances both the salutogenic theory and knowledge of the JD-R model by showing that SoC is not only relevant to coping with negative factors (i.e., stressors) but also plays a role in positive processes leading to outcomes beyond the absence of illness—that is, in the positive motivational process that leads from job resources to work engagement. Interestingly, both COR and salutogenic theory emphasize the importance of resources in relation to stress and well-being (Antonovsky, 1979, 1987a; Hobfoll, 2001). In the notion of generalized resistance resources (that is, any characteristic such as money, knowledge, cultural stability or social support that can facilitate effective tension management; Antonovsky, 1979, p. 72), salutogenesis understands resources in a very broad way. This comes close to the approach of COR theory, which defines resources as valued entities such as objects, conditions, personal characteristics and energy resources. When describing different resources, Hobfoll (2001) also mentions personal resources—“feeling that one’s life has meaning and purpose”; “feeling that one has control over life,” “a sense of optimism”—that are not far from the concept of SoC.

When employees are provided with resources, a gain cycle may be initiated. The presence of job resources builds employees’ SoC over time, making it more likely that those employees will activate and create even more resources in their environment. This notion of gain cycles, suggested by COR theory, has not been explicitly acknowledged by salutogenic theory. In this respect, the present study adds something of relevance to the explanation of how SoC can influence well-being and provides empirical support for this notion. These findings are also important for salutogenic theory in that they show how SoC can be influenced and developed by working conditions, even within the relatively short time frame of 3 months. The study also provides support for Antonovsky’s (1987b) assumption that work may play an important role in building and maintaining SoC in adult life, and connects recent understandings of workplace health (the JD-R model) to salutogenic theory.

For research and theory on the JD-R model, this study is relevant because it is the first to investigate the role of SoC—which has been shown to be one of the most important personal resources—in the context of the JD-R model using longitudinal data. Furthermore, this study adds relevant knowledge by systematically testing the most recent formulations of the JD-R theory on the role of personal resources (Bakker & Demerouti, 2014; Schaufeli & Taris, 2014). In particular, the present study is one of the first to test (and reject) the hypothesis that a personal resource might boost the relationship between job resources and work engagement.

In conclusion, this study has systematically investigated the different roles of SoC in the motivational process of the JD-R

model, using a large, longitudinal and heterogeneous sample of employee groups. Adopting the perspective of positive occupational health psychology (Bakker & Derks, 2010), the study highlights the importance of both job and personal resources. The findings confirm that providing a resourceful working environment can help to build employee SoC and the creation of additional job resources, leading to positive outcomes such as work engagement.

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