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# Does social support at home moderate the association between social support at work and work functioning among cancer patients?

Manon M. T. Schallig<sup>1</sup> · Ute Bültmann<sup>1</sup> · Adelita V. Ranchor<sup>2</sup> · Sander K. R. van Zon<sup>1</sup>

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## Abstract

**Purpose** The aims of this study were to examine (1) the longitudinal associations of supervisor and colleague social support with work functioning in cancer patients who have returned to work and (2) the moderating role of social support at home.

**Methods** Data from the longitudinal Work Life after Cancer study were used ( $n=384$ ). Work functioning (low versus moderate to high work functioning) was measured with the validated Work Role Functioning Questionnaire 2.0. Social support at work was measured from both supervisor and colleagues with the Copenhagen Psychosocial Questionnaire. Social support at home was measured with the Social Support List-Discrepancies. Logistic generalized estimating equations were used to analyse associations between supervisor and colleague social support and work functioning, and to examine the possible moderating effect of social support at home.

**Results** More supervisor (OR: 1.21; 95% CI: 1.10, 1.32) and colleague (1.13; 1.03, 1.24) social support were significantly associated with moderate to high work functioning. The association between colleague social support and work functioning was attenuated for those who did not experience enough social support at home but remained almost significant for supervisor social support (1.17; 1.00, 1.37).

**Conclusions** Supervisor social support is associated with better work functioning regardless of social support at home, while colleague social support is only associated with better work functioning when cancer patients experience enough social support at home.

**Implications for Cancer Survivors** Occupational physicians may play a key role in creating awareness that social support at work and at home are beneficial for cancer patients' work functioning.

**Keywords** Cancer · Cancer patients · Work · Work functioning · Social support

## Introduction

A total of 73% of occupationally active cancer patients at the time of their diagnosis return to work (RTW) [1]. Social support to return to or stay at work is mainly given by family, friends, employers and colleagues [2] and is important for

a successful RTW [3]. Cancer patients experienced a more positive RTW when they had contact with their supervisors, but not with their colleagues, while they were on sick leave [4]. When back at work, cancer patients may face challenges like cognitive problems that negatively affect their work ability and job performance [5], fatigue [6] and impaired work functioning [7]. A safe and supportive work environment is important so that cancer patients feel comfortable again at the workplace during and after RTW [8]. Supervisors and colleagues may play a crucial role in creating such a supportive work environment and may help cancer patients to better function at work. While often addressed in qualitative studies, quantitative studies investigating the role of supervisor and colleague social support on cancer patients' work functioning after RTW are currently scarce. Cancer patients may experience social support from multiple sources both at work (i.e., from supervisors and colleagues) and at home

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(e.g., from family and friends). In a Dutch qualitative study, cancer patients expressed that they experienced social support from supervisors and colleagues but also that the social support at work decreased over time and that the lack of workplace support formed a barrier for good work functioning [6]. Cancer patients also reported that the lack of attention and mutual understanding could lead to difficulties in collaborating with colleagues. Social support at home and from colleagues and supervisors (from here on *workplace social support*) targets mainly emotional health, which has been shown to facilitate the ability to work among breast cancer patients on active treatment [9], suggesting that both the work environment and the personal environment may be important for work functioning among (breast) cancer patients.

The scarce quantitative literature shows that workplace social support is associated with better work outcomes among cancer patients. A study among Norwegian working cancer patients revealed that 84% and 90% perceived their supervisors and colleagues, respectively, as caring directly after their cancer diagnosis [10]. Moreover, those cancer patients who perceived their supervisor and colleagues as being supportive were less likely to leave the workforce or to change work than those who did not perceive their supervisor and colleagues as supportive. Similarly, a Finnish study found that cancer patients with enough colleague social support were less likely to report work ability impairments [11]. Moreover, the concept of work functioning among cancer patients has not been studied in-depth either. A study by Dorland et al. (2017) indicated that more cognitive symptoms, more time between diagnosis and RTW and a changed meaning of work were associated with persistent lower levels of work functioning over 18 months [7]. This study further showed that cancer patients with a persistent high level of work functioning reported more colleague social support compared to cancer patients with persistent low and moderate levels of work functioning. Interestingly, the study also showed that cancer patients' levels of work functioning was not associated with either type of cancer or cancer treatment [7].

Social support from the personal environment, from here on *social support at home*, not only plays a crucial role in relation to health-related outcomes, like quality of life, sexual functioning and emotional well-being [3, 12–14], but also in the RTW process. Positive social support at home was perceived as encouraging for cancer patients' work abilities [3]. A lack of social support both at home and at work, however, was perceived as being ignored and treated differently, which could undermine cancer patients' perceptions of their own capability to undertake their roles as part of their RTW process. Among employees sick-listed with physical health problems (e.g., musculoskeletal problems and circulatory or neurological diseases), more perceived

social support from their network (e.g., family, friends, supervisor and colleagues) was related to a shorter time to RTW [15]. High social support at home may reinforce the effect of workplace social support because cancer patients may be more used to accept help or initiate themselves talking about their illness or experienced challenges. Moreover, social support from different sources may complement each other and thereby have a larger effect on work functioning than social support from a single source [16]. Besides, cancer patients experiencing not enough social support at home may be more reluctant to ask for help at work.

The present study aims to investigate (1) the longitudinal associations of supervisor and colleague social support with work functioning in cancer patients who have returned to work and (2) whether social support at home moderates these associations, using 18-month follow-up data of the Work Life after Cancer (WOLICA) cohort [7]. Based on previous research, it is hypothesized (1) that both supervisor and colleague social support are positively associated with work functioning over time and (2) that the positive effect of workplace social support is reinforced by social support at home.

## Methods

### Study design and study population

The current study used data from the WOLICA study, a longitudinal cohort study among working cancer patients with 18-month follow-up [7]. Cancer patients were included when they (1) were aged 18–65 years and (2) had resumed their work for at least 12 h/week during their treatment or within 3 months after their treatment. Cancer patients were excluded when they (1) had no job at least 1 year prior to their cancer diagnosis, (2) had recurrent cancer, (3) were treated with hospice care or palliative care, and (4) were not able to complete Dutch questionnaires.

Eligible participants were identified and informed about the study during a regular visit with their occupational health physician (OHP) in the RTW process. In total, 516 cancer patients were contacted between March 2013 and July 2015. They received an information letter, an informed consent form and the baseline questionnaire. From those contacted, 53 cancer patients were excluded due to different causes (i.e., not eligible for the study, could not be reached or death). From the 463 cancer patients who received the baseline questionnaire, 387 eligible participants (84%) returned the questionnaire. Non-response mainly occurred due to the reason of “no time to complete the questionnaire” [7]. After completion of the baseline questionnaire, another three cancer patients were excluded because their RTW was more than 3 months ago. This resulted in the 384 participants in

the WOLICA cohort. Participants completed questionnaires at home regarding sociodemographic factors, health-related factors and work-related factors at baseline and 6-, 12- and 18-month follow-up. All participants signed the informed consent form before participating. The WOLICA study was approved by the Medical Ethical Committee of the University Medical Center Groningen (M12.125242).

## Measures

### Work functioning

Work functioning was measured with the validated Work Role Functioning Questionnaire 2.0 (WRFQ) [17] at baseline and at 6-, 12- and 18-month follow-up. This 27-item questionnaire measures workers' perceived difficulties in meeting work demands given their physical or emotional problems during the last 4 weeks and was validated among cancer patients [17]. Example items are as follows: 'I found it difficult to work the required number of hours', and 'I found it difficult to work fast enough'. Responses ranged from 'difficult all the time' to 'not difficult at all' [18]. Cancer patients could also indicate when an item was not applicable in their job, which was coded as missing. A total score of the WRFQ was calculated if at least 80% of the items were completed. The total score was calculated by summing the scores on the items, divided by the number of items that were answered and then multiplied by 25 to obtain percentages between 0 and 100 [18] (Cronbach's alpha  $\alpha=0.85$ ). Higher scores indicate better work functioning. For example, a score of 75 reflects that a cancer patient is experiencing difficulties in meeting the work demands 25% of the time. In a fulltime job of 40 h/week, a cancer patient experiences difficulties in meeting the work demands 1.25 days (10 h) per week. As the WRFQ sum scores were positively skewed to the right, work functioning was dichotomized as low work functioning (WRFQ score  $<75$ ) and moderate to high work functioning (WRFQ score  $\geq 75$ ) based on existing literature [19].

### Social support at work

Social support at work was measured with the supervisor social support subscale and the colleague social support subscale of the short version of the of the validated Copenhagen Psychosocial Questionnaire II (COPSOQ-II) [20] at baseline and at 6-, 12- and 18-month follow-up. Both supervisor social support and colleague social support were measured with two items: 'How often is your immediate superior/are your colleagues willing to listen to your problems at work, if needed?' and 'How often do you get help and support from your immediate superior/colleagues, if needed?'. Responses ranged from 0 = never to 4 = always; the Cronbach's alpha

were 0.85 for supervisor social support and 0.83 for colleague social support. Cancer patients could also indicate if an item was not applicable, which was coded as missing. The subscale score was calculated by summing the scores on the item(s), divided by the number of items and then multiplied by two to obtain subscale scores between 0 and 8, with higher scores indicating either more supervisor social support or colleague social support.

### Social support at home

Social support at home comprised general social support from cancer patients' personal environment and was measured with the validated 6-item Social Support List-Discrepancies (SSL-D) [21] at baseline and at 6-, 12- and 18-month follow-up. The six items measure to what extent a person experiences a lack of support. An example item is 'Are you satisfied with the attention people pay to you or the affection they show, for example with a hug or a caress, or with the attention people pay to listen to you?'. Responses ranged from 1 ('I miss it, I would like it to happen more often') to 3 ('Just right, I would not want it to happen more or less often') [21] (Cronbach's alpha  $\alpha=0.88$ ). Responses ranged between 6 and 18, with higher scores indicating a better match with a person's needs and thus more perceived social support at home. If more than one subscale was missing ( $<83\%$  of items completed), the SSL-D scores were set as missing. Because social support at home was positively skewed, we dichotomized on the mean into experiencing not enough (scores  $<16$ ) and enough (scores 16–18) social support at home.

### Covariates

Covariates were measured at baseline and included age, sex, marital status, educational level, cancer type, time from diagnosis to RTW (in months), working hours/week (measured at all timepoints), RTW with the same colleagues (yes/no) and tenure with current employer (in years). At baseline, cancer patients reported their current amount of working hours and their contracted working hours. Partial RTW was calculated as (current amount of working hours/contracted working hours)  $\times 100\%$ . Full RTW was defined as 100% RTW. Marital status was categorized as living together with partner and living alone. Educational level was categorized into (1) low, i.e., primary, junior secondary vocational and junior general secondary education; (2) medium, i.e., senior secondary vocational education and senior general secondary education; and (3) high, i.e., higher professional education, college and university. Cancer type was divided into breast cancer, gastrointestinal cancer, haematological cancer, urogenital cancer, skin cancer, head and neck cancer, lung cancer, gynaecological cancer or other cancer. Tenure

with current employer was categorized into (1)  $\leq 5$  years, (2) between 6 and 10 years and (3)  $> 10$  years.

## Statistical analysis

To examine the longitudinal associations between either supervisor social support or colleague social support and work functioning over time, logistic generalized estimating equations (GEE) with an exchangeable correlation structure were conducted. An exchangeable correlation structure was deemed most suitable after examining the correlation structure of the outcome and by comparing the quasi-likelihood under the independence model criterion with an autoregressive correlation structure. The model takes both within and between individual correlations into account [22]. Analyses were performed separately for supervisor social support and colleague social support. A stepwise approach was used to analyse the longitudinal associations between social support at work and work functioning. Three models were fitted: model 1 included time, either supervisor or colleague social support, and work functioning. These variables were all time varying. Model 2 additionally included age, sex, educational level and marital status (all fixed). Finally, model 3 additionally included working hours (time varying), time from diagnosis to RTW, RTW with the same colleagues and tenure with current employer (both fixed variables). Only model 3 is presented; results from models 1 and 2 are shown in Appendix 1, Table 3 (supervisor social support) and Appendix 2, Table 4 (colleague social support). The odds ratios (OR) of the GEE analyses can be interpreted: (1) cross-sectional/between-subjects and (2) longitudinal/within-subjects [22]. A subject with a one-unit higher score for supervisor/colleague social support, compared to another subject, has an  $x$  times higher odds of being in the moderate to high work functioning group. An increase of one unit in supervisor/colleague social support within a subject over time is associated with an  $x$  times higher odds of moving to the moderate to high work functioning group compared to the situation in which no change occurs in supervisor/colleague social support.

To examine possible moderation of the association between social support at work and work functioning by social support at home, an interaction term between social support at work and social support at home (enough/not enough) (time varying) was added to model 3. If a significant interaction effect was found, stratified analyses were performed for cancer patients experiencing enough or not enough social support at home.

A sensitivity analysis with complete cases was performed to investigate the impact of missing data on the social support items. Furthermore, an attrition analysis was performed by comparing baseline characteristics of

participants who completed and those who were lost to follow-up. All statistical analyses were performed with SPSS Statistics 25.0 [23].

## Results

### Baseline characteristics

Of the 384 cancer patients, 63% were female (Table 1). The mean age of participants was 50.7 years ( $SD = 8.6$ , range 23–65 years) and almost 80% lived with their partner. Most cancer patients were diagnosed with breast cancer (46%), followed by gastrointestinal (15%) and haematological cancer (11%). Cancer patients were on average absent for 7 months ( $SD = 6.1$ ) after their diagnosis and worked 16 h/week (median,  $IQR = 12$ ) after RTW. Most cancer patients (61%) reported moderate to high ( $\geq 75$ ) work functioning. More than half of the cancer patients returned to their work with the same colleagues (63%). Appendix 3, (Table 5) shows that *breast cancer patients* and *other cancer patients* reported longer time (in months) from diagnosis to RTW than other cancer types (time from diagnosis to RTW = 8.0 ( $IQR = 7.0$ ) and 9.0 ( $IQR = 3.0$ ), respectively) and worked less hours per week (working hours/week = 16.8 ( $IQR = 8.0$ ) and 12.0 ( $IQR = 4.0$ ), respectively). Appendix 3 (Table 5) also shows that at baseline, *head and neck cancer patients* and *other cancer patients* had the lowest rates of work resumption of 40.7% and 41.9%, respectively. Cancer patients reported on average slightly higher colleague (mean = 5.8,  $SD = 1.6$ ) than supervisor social support (mean = 5.5,  $SD = 1.9$ ). The majority (79%) of cancer patients reported experiencing enough social support at home. A total of 309 (80%) cancer patients were followed-up for 18 months. The attrition analysis showed no differences in baseline characteristics between participants who completed the follow-up and those who were lost to follow-up.

### The relationship between social support at work and work functioning over 18 months

Supervisor social support (OR: 1.21; 95% confidence interval (CI): 1.10, 1.32) and colleague social support (OR: 1.13; 95% CI: 1.03, 1.24) were both significantly associated with a higher odds for moderate to high work functioning in the fully adjusted model (Table 2).

### The moderating role of social support at home

A significant interaction effect was found between supervisor ( $p = 0.002$ ) and colleague ( $p = 0.009$ ) social

**Table 1** Sociodemographic, health-related and work-related factors at baseline (n = 384)

Gender (female), <i>n</i> (%)	243 (63.3)
Age in years, <i>M</i> ( <i>SD</i> )	50.7 (8.6)
Level of education, <i>n</i> (%)	
Low	105 (27.3)
Medium	129 (33.6)
High	149 (38.8)
Marital status, <i>n</i> (%)	
Living with partner	306 (79.9)
Living without partner	77 (20.1)
Cancer type, <i>n</i> (%)	
Breast cancer	178 (46.4)
Gastrointestinal cancer	58 (15.1)
Haematological cancer	42 (10.9)
Urogenital cancer	41 (10.7)
Skin cancer	16 (4.2)
Head and neck cancer	15 (3.9)
Lung cancer	13 (3.4)
Gynaecological cancer	12 (3.1)
Other cancer	8 (2.1)
Employment contract, <i>n</i> (%)	
Permanent contract	363 (94.5)
Temporary contract	16 (4.2)
Self-employed	5 (1.3)
Time from diagnosis to RTW, <i>median</i> ( <i>IQR</i> )	7.0 (7.0)
Working hours/week, <i>median</i> ( <i>IQR</i> )	16 (12.0)
Tenure with current employer, <i>n</i> (%)	
≤ 5 years	67 (17.4)
6–10 years	72 (18.8)
> 10 years	245 (63.8)
RTW with same colleagues, <i>n</i> (%)	
Same colleagues	243 (63.3)
Same and other colleagues	135 (35.2)
Work functioning, <i>median</i> ( <i>IQR</i> ) (range 0–100)	83.3 (23.6)
Low work functioning (WRFQ score < 75), <i>n</i> (%)	119 (31.0)
Moderate to high work functioning (WRFQ score ≥ 75), <i>n</i> (%)	233 (60.7)
Supervisor social support, <i>M</i> ( <i>SD</i> ), (range 0–8)	5.5 (1.9)
Colleague social support, <i>M</i> ( <i>SD</i> ) (range 0–8)	5.8 (1.6)
Social support at home, <i>median</i> ( <i>IQR</i> ) (range 6–18)	18.0 (2.0)
Enough social support at home, <i>n</i> (%)	305 (79.4)
Not enough social support at home, <i>n</i> (%)	74 (19.3)

*n* number, *M* mean, *SD* standard deviation, *IQR* interquartile range

support on the one hand and experiencing enough social support at home on the other in the fully adjusted model. Figure 1 shows the associations between social support at work and work functioning stratified for participants

experiencing enough and participants experiencing not enough social support at home. In cancer patients experiencing enough social support at home, supervisor social support (OR: 1.17, 95% CI: 1.06, 1.31) and colleague



**Table 2** Associations between supervisor and colleague social support and work functioning over time

	Supervisor social support <sup>1</sup> OR (95% CI)	Colleague social support <sup>2</sup> OR (95% CI)
Intercept	0.25 (0.05, 1.18)	0.46 (0.10, 2.31)
Time		
Baseline	Ref	Ref
6 months	1.79 (1.31, 2.44)	1.74 (1.29, 2.53)
12 months	2.73 (1.90, 3.94)	2.53 (1.70, 3.63)
18 months	2.38 (1.67, 3.38)	2.20 (1.56, 3.12)
Supervisor social support <sup>a</sup>	1.21 (1.10, 1.32)	-
Colleague social support <sup>a</sup>	-	1.13 (1.03, 1.24)
Gender		
Male	Ref	Ref
Female	1.15 (0.74, 1.78)	1.15 (0.74, 1.79)
Age in years	1.01 (0.99, 1.03)	1.01 (0.98, 1.03)
Level of education		
Low	Ref	Ref
Medium	0.63 (0.38, 1.03)	0.59 (0.36, 0.97)
High	0.70 (0.42, 1.16)	0.67 (0.41, 1.11)
Marital status		
Living with partner	Ref	Ref
Living without partner	0.86 (0.54, 1.38)	0.92 (0.57, 1.49)
Time from diagnosis to RTW	0.97 (0.94, 1.00)	0.97 (0.94, 1.00)
Working hours/week	1.04 (1.02, 1.07)	1.04 (1.02, 1.07)
Working with same colleagues		
Mainly same colleagues	Ref	Ref
Both same and new colleagues	0.95 (0.64, 1.42)	0.79 (0.60, 1.31)
Tenure with current employer		
≤ 5 year	Ref	Ref
6–10 years	1.28 (0.70, 2.35)	1.18 (0.65, 2.16)
> 10 years	1.37 (0.84, 2.25)	1.33 (0.82, 2.16)

<sup>a</sup>OR per point increase (range 0–8)

<sup>1</sup>Available person-measurement observations: 1089 (71%) of a potential maximum of 1536

<sup>2</sup>Available person-measurement observations: 1082 (70%) of a potential maximum of 1536

social support (OR: 1.17, 95% CI: 1.04, 1.32) were significantly associated with a higher odds for moderate to high work functioning. The associations attenuated and were no longer statistically significant among cancer patients that did not experience enough social support at home but was almost significant for supervisor social support (OR: 1.17, 95% CI: 1.00, 1.37).

### Sensitivity analysis

The sensitivity analysis with complete cases on the social support items showed no differences for the associations between supervisor and colleague social support and cancer patients' work functioning (Appendix 4, Table 6).

### Discussion

In this longitudinal study among working cancer patients, more supervisor and colleague social support was associated with moderate to high work functioning over time. Social support at home moderated these associations in such a way that experiencing not enough social support at home attenuated the associations between colleague social support and cancer patients' work functioning. Our results revealed prominent associations for both supervisor and colleague social support with work functioning and showed a moderating effect of social support at home related to cancer patients' work functioning.

The present study showed that more social support at work is associated with higher levels of work functioning





experiencing enough social support at home attenuates the effect of colleague social support on work functioning and to unravel the exact mechanisms through which social support at home and at work affect work functioning of cancer patients.

Strengths of this study include the longitudinal design, with repeated measures of work functioning, social support at work and social support at home at baseline and at 6-, 12- and 18-month follow-up, and the high participation rate over time. The high retention rate (i.e., 80% during 18-month follow-up) reduced the chance of selective drop-out during follow-up. Moreover, our attrition analysis showed no differences between participants who completed the entire follow-up and participants who were lost over time, indicating no selective drop-out in the current study. In contrast to previous research related to more general social support and cancer patients' quality of life [13, 28], emotional well-being [26] and the RTW process [3], we were able to differentiate between supervisor social support, colleague social support and social support at home.

Study limitations may concern possible selection bias during recruitment and response bias by using self-reported data. Some selection bias may have occurred in recruiting cancer patients as OHPs asked cancer patients to participate. OHPs may not have asked cancer patients for the current study if they thought it would be too burdensome, which may have led to participation of healthier and better functioning cancer patients. Social support at work might thus be even more important for cancer patients that were not invited by OHPs. Response bias might have occurred as cancer patients provided self-reported data on both social support (independent variables) and work functioning (dependent variable). Both work functioning scores and social support at home scores were positively skewed to the right with ceiling effects that limited discrimination among subjects at the top end of these scales.

Our findings have implications for (occupational) health care policy and practice. First, supervisors should be informed by OHPs about the importance of their continued social support for the work functioning of their employees with cancer [27]. Second, OHPs need to discuss the topic of work and work functioning with their working age cancer patients, thereby actively including the social environment of cancer patients, their significant other in particular, during the treatment and recovery process. Achieving an optimal match between cancer patients' needs and the provided social support may contribute to better long-term functional work outcomes like work functioning.

Our findings also have implications for further research. First, to the best of our knowledge, a questionnaire to study cancer patients' needs for supervisor and colleague social support after RTW does not exist. A more extensive questionnaire about the needs of support instead of perceived support may shed additional light on what type of support (i.e., emotional, instrumental or informational support [24]) is actually needed to improve cancer patients' work functioning. Second, since social support at home seems to reinforce social support at work, future studies should further elucidate the role of social support from these different sources related to cancer patients' work functioning. Third, cut-off points reflecting different levels of work functioning in cancer patients are currently lacking. The current cut-off points are based on patients with musculoskeletal disorders and might therefore not reflect work functioning levels in cancer patients. Clinically relevant cut-off points are needed to identify and help cancer patients experiencing difficulties when back at work. Fourth, we recommend future research to include an even larger number of cancer patients with more heterogeneous cancer types to enable the examination of possible differential effects between cancer types. Finally, to date only one study reported on work functioning and work resumption percentage [29]. As this study was among patients with common mental disorders, we suggest that future research on cancer patients includes information on the course of work resumption percentage to elaborate further on the role of social support in cancer patients' work functioning.

In conclusion, our study showed that both supervisor and colleague social support were positively associated with cancer patients' work functioning. However, not experiencing enough social support at home attenuated the association between colleague social support and work functioning. This suggests that social support at home may be considered as resource for higher levels of work functioning and stresses the importance of both social support at work and at home for cancer patients' work functioning. Awareness regarding the importance of social support both at work and at home after return to work should be increased. Both OHPs and treating physicians may play a key role in creating this awareness in cancer patients, their family and friends, employers and employees and in monitoring experienced social support and work functioning in cancer patients at work.

## Appendix 1

**Table 3** Associations between supervisor social support and work functioning over time

	Model 1 <sup>1</sup> OR (95% CI)	Model 2 <sup>2</sup> OR (95% CI)	Model 3 <sup>3</sup> OR (95% CI)
Intercept	0.72 (0.44, 1.17)	0.64 (0.18, 2.31)	0.25 (0.05, 1.18)
Time			
Baseline	Ref	Ref	Ref
6 months	1.74 (1.30, 2.30)	1.72 (1.29, 2.31)	1.79 (1.31, 2.44)
12 months	2.72 (1.93, 3.82)	2.71 (1.92, 3.82)	2.73 (1.90, 3.94)
18 months	2.35 (1.69, 3.26)	2.34 (1.68, 3.27)	2.38 (1.67, 3.38)
Supervisor social support <sup>a</sup>	1.21 (1.11, 1.31)	1.20 (1.11, 1.31)	1.21 (1.10, 1.32)
Gender			
Male		Ref	Ref
Female		0.91 (0.62, 1.35)	1.15 (0.74, 1.78)
Age in years		1.01 (0.99, 1.03)	1.01 (0.99, 1.03)
Level of education			
Low		Ref	Ref
Medium		0.68 (0.42, 1.11)	0.63 (0.38, 1.03)
High		0.78 (0.48, 1.27)	0.70 (0.42, 1.16)
Marital status			
Living with partner		Ref	Ref
Living without partner		0.99 (0.62, 1.57)	0.86 (0.54, 1.38)
Time from diagnosis to RTW			0.97 (0.94, 1.00)
Amount of working hours/week			1.04 (1.02, 1.07)
Working with same colleagues			
Mainly same colleagues			Ref
Both same and new colleagues			0.95 (0.64, 1.42)
Tenure with current employer			
≤ 5 year			Ref
6–10 years			1.28 (0.70, 2.35)
> 10 years			1.37 (0.84, 2.25)

<sup>a</sup>OR per point increase (range 0–8)

<sup>1</sup>Available person-measurement observations model 1: 1164 (76%) of a potential maximum of 1536

<sup>2</sup>Available person-measurement observations model 2: 1150 (75%) of a potential maximum of 1536

<sup>3</sup>Available person-measurement observations model 3: 1089 (71%) of a potential maximum of 1536

## Appendix 2

**Table 4** Associations between colleague social support and work functioning

	Model 1 <sup>1</sup> OR (95% CI)	Model 2 <sup>2</sup> OR (95% CI)	Model 3 <sup>3</sup> OR (95% CI)
Intercept	0.96 (0.57, 1.63)	1.13 (0.30, 4.18)	0.46 (0.10, 2.31)
Time			
Baseline	Ref	Ref	Ref
6 months	1.65 (1.25, 2.19)	1.64 (1.23, 2.17)	1.74 (1.29, 2.53)
12 months	2.49 (1.78, 3.50)	2.49 (1.77, 3.50)	2.53 (1.70, 3.63)
18 months	2.15 (1.55, 2.97)	2.15 (1.55, 2.98)	2.20 (1.56, 3.12)
Colleague social support <sup>a</sup>	1.13 (1.04, 1.23)	1.12 (1.03, 1.22)	1.13 (1.03, 1.24)
Gender			
Male		Ref	Ref
Female		0.91 (0.61, 1.34)	1.15 (0.74, 1.79)
Age in years		1.00 (0.98, 1.03)	1.01 (0.98, 1.03)
Level of education			
Low		Ref	Ref
Medium		0.65 (0.40, 1.05)	0.59 (0.36, 0.97)
High		0.77 (0.48, 1.24)	0.67 (0.41, 1.11)
Marital status			
Living with partner		Ref	Ref
Living without partner		1.04 (0.65, 1.65)	0.92 (0.57, 1.49)
Time from diagnosis to RTW			0.97 (0.94, 1.00)
Amount of working hours/week			1.04 (1.02, 1.07)
Working with same colleagues			
Mainly same colleagues			Ref
Both same and new colleagues			0.79 (0.60, 1.31)
Tenure with current employer			
≤ 5 years			Ref
6–10 years			1.18 (0.65, 2.16)
> 10 years			1.33 (0.82, 2.16)

<sup>a</sup>OR per point increase (range 0–8)

<sup>1</sup>Available person-measurement observations model 1: 1156 (75%) of a potential maximum of 1536

<sup>2</sup>Available person-measurement observations model 2: 1142 (74%) of a potential maximum of 1536

<sup>3</sup>Available person-measurement observations model 3: 1082 (70%) of a potential maximum of 1536

### Appendix 3

**Table 5** Work specific factors per cancer type

Cancer type	<i>n</i> (%)	Time from diagnosis to RTW in months, median (IQR)	Working hours/week, median (IQR)	RTW with same colleagues, <i>n</i> (%)	Work resumption at baseline (%)
Breast	178 (46.4)	8.0 (7.0)	16.8 (8.0)	105 (58.9)	63.4
Gastrointestinal	58 (15.1)	7.0 (8.0)	19.8 (9.5)	37 (63.8)	60.3
Haematological	42 (10.9)	7.0 (5.0)	22.0 (8.4)	24 (57.1)	57.1
Urogenital	41 (10.7)	4.0 (6.0)	20.0 (16.5)	30 (73.2)	59.6
Skin	16 (4.2)	2.0 (10.5)	25.1 (7.6)	11 (68.8)	70.2
Head and neck	15 (3.9)	4.0 (4.0)	15.0 (14.0)	11 (73.3)	40.7
Lung	13 (3.4)	5.0 (4.0)	16.0 (12.5)	10 (76.9)	55.6
Gynaecological	12 (3.1)	6.0 (6.0)	19.0 (8.1)	7 (58.3)	72.4
Other	8 (2.1)	9.0 (3.0)	12.0 (4.0)	3 (37.5)	41.9

*n* number, *M* mean, *SD* standard deviation, *IQR* interquartile range

### Appendix 4

**Table 6** Associations between supervisor social support and colleague social support and work functioning over time; complete case analyses (model 3)

	Supervisor social support <sup>1</sup> OR (95% CI)	Colleague social support <sup>2</sup> OR (95% CI)
Intercept	0.27 (0.06, 1.26)	0.45 (0.10, 2.12)
Time		
Baseline	Ref	Ref
6 months	1.79 (1.31, 2.46)	1.73 (1.27, 2.35)
12 months	2.73 (1.88, 3.96)	2.55 (1.77, 3.69)
18 months	2.39 (1.66, 3.42)	2.19 (1.54, 3.12)
Supervisor social support <sup>a</sup>	1.20 (1.09, 1.31)	-
Colleague social support <sup>a</sup>	-	1.14 (1.04, 1.25)
Gender		
Male	Ref	Ref
Female	1.16 (0.74, 1.79)	1.12 (0.72, 1.75)
Age in years	1.01 (0.99, 1.03)	1.01 (0.98, 1.03)
Level of education		
Low	Ref	Ref
Medium	0.60 (0.36, 0.99)	0.55 (0.34, 0.92)
High	0.70 (0.42, 1.14)	0.63 (0.38, 1.04)
Marital status		
Living with partner	Ref	Ref
Living without partner	0.89 (0.56, 1.43)	0.91 (0.56, 1.47)
Amount of working hours/week	1.04 (1.02, 1.07)	1.04 (1.02, 1.07)
Time diagnosis to RTW	0.98 (0.95, 1.01)	0.97 (0.94, 1.01)
Working with same colleagues		
Mainly same colleagues	Ref	Ref
Both same and new colleagues	0.93 (0.62, 1.39)	0.88 (0.59, 1.32)
Tenure with current employer		
≤ 5 year	Ref	Ref
6–10 years	1.24 (0.68, 2.27)	1.21 (0.67, 2.22)
> 10 years	1.36 (0.83, 2.24)	1.34 (0.82, 2.18)

<sup>a</sup>OR per point increase (range 0–8)

<sup>1</sup>Available person-measurement observations: 1066 (69%) of a potential maximum of 1249

<sup>2</sup>Available person-measurement observations: 1066 (69%) of a potential maximum of 1249

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## Declarations

**Conflict of interest** The authors declare that they have no conflict interests.

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