Acta Oncologica, 2015; 54: 232–242

informa
healthcare

ORIGINAL ARTICLE

Psychometric properties of the Occupational Stress and Coping Inventory (AVEM) in a cancer population

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ABSTRACT

Background. Although the Occupational Stress and Coping Inventory (AVEM) questionnaire is used to assess work behaviour during occupation-related oncological rehabilitation, little is known about its psychometric characteristics in cancer patients. Therefore, we analysed the psychometric properties of the AVEM in this group.

Material and methods. The AVEM was administered to 477 cancer patients at the beginning of rehabilitation. The AVEM consists of 11 subscales that categorise patients into one of four types of work behaviour. We obtained data from several subgroups and analysed reliability using Cronbach's α. We performed a confirmatory factor analysis (CFA) of the dimensional structure proposed by the authors of the AVEM. In addition, we analysed the AVEM's predictive validity by examining work-related outcomes one year after the end of rehabilitation (N = 336).

Results. Similar to a population-based reference sample, half of the patients exhibited work behaviours that might be problematic in stressful working situations. The AVEM proved to be a reliable instrument, and the CFA supported the factor structure of the AVEM. The analyses of predictive validity suggest that work behaviour and mental health characteristics, that involve the tendency to feel overwhelmed and less motivated at work, might lead to an increased level of occupational stress one year post-rehabilitation.

Discussion. The AVEM can be used during rehabilitation to assess the extent to which patients report work behaviours associated with occupational stress and dissatisfaction. Patients who exhibit the tendency to feel overwhelmed and helpless in stressful work situations should be identified early so they can be offered support.

Work is a very important issue for cancer patients of working age because being able to return to professional life often allows them to feel that life has returned to normal [1]. Although some cancer survivors report that their work seems less meaningful after experiencing a life-threatening disease [2], others emphasise the importance of being needed within an occupational setting, returning to fulfilling tasks and being appreciated by colleagues and supervisors [3,4]. An international review indicates that approximately 62% of cancer patients return to work [5], although a substantial number report decreased working ability [6]. To prepare patients to handle potential stress at work due to physical or cognitive barriers, occupation-oriented programmes are an essential component of rehabilitation [7]. In Germany, inpatient rehabilitation lasts 3–4 weeks, with multidisciplinary teams providing different types of therapeutic programmes [8]. Patients have the opportunity to discuss work-related issues and problems during psychological, physiotherapy or occupational therapy sessions. The German Pension Insurance Agency, which normally pays the costs for a cancer patient's rehabilitation, recommends a number of questionnaires [9], including the Occupational Stress and Coping Inventory (German abbr. AVEM), to assess work-related behaviour patterns in response to occupational demands and

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(Received 10 September 2013; accepted 8 June 2014)

ISSN 0284-186X print/ISSN 1651-226X online © 2014 Informa Healthcare
DOI: 10.3109/0284186X.2014.933873

stressors and to determine the need for occupation-related counselling [10]. The instrument classifies behaviours based on how the individual handles problematic situations at work. The authors of the AVEM adopted a salutogenic approach in developing the questionnaire [10,11] to assess how people protect their health when confronted with stress in the work context. Following resource-oriented theories such as Lazarus' 'transactional model of stress and coping' [12] or Antonovsky's model of 'sense of coherence' [13], they claim that the resources available to the individual play an important role in responding occupational stress. Resources, such as traits, attitudes or behaviour enable a person to cope actively with demands. Resources can include positive emotions, such as optimism or self-efficacy or a sense of coherence. For instance, the authors of the AVEM argue that an optimistic outlook contributes to the resolution of work-related problems, while negative emotions, such as resignation, increase the risk of feeling overwhelmed and helpless [11]. The theories cited above [12,13] claim that these types of resources protect the individual's health, which suggests that the absence of resources might endanger health.

The AVEM is used in the fields of human resources development and rehabilitation. Although there is considerable literature exploring typical work behaviour patterns and the psychometric validity of the AVEM for different professions (e.g., physicians, teachers and nurses) [14–16], the literature investigating the AVEM's validity for clinical populations is limited [17]. In three studies the questionnaire was used in samples of mentally ill or psychosomatically ill patients [18–20]. Two of these studies evaluated the reliability and validity of the AVEM in these groups of patients and found Cronbach's α for subscales ranging from 0.74 to 0.90 [18,19]. One of the studies also performed a principal component analysis that supported the factor structure of the AVEM [18]. Both of the above studies examined the construct validity of the AVEM by comparing it to other work- and health-related questionnaires and found that the AVEM assesses the relationship between the resources available to the individual and psychological distress. However, the third study reported weak or statistically not significant correlations between the work behaviours assessed by the AVEM and impaired capacities due to mental disorders (e.g., planning and structuring tasks, adherence to regulations, competence to judge and decide) [20]. Finally, the rehabilitation sample studied by the authors of the AVEM consisted of orthopaedic, cardiology, oncology and psychosomatically ill patients [21]. However, their findings were limited in regard to specific diagnoses because most of the analyses were based on the entire sample rather than specific patient groups. An analysis of the psychometric properties in a cancer population has not been performed yet but is strongly needed [17], because cancer is one of the three most frequent diagnoses for which patients receive inpatient rehabilitation in Germany [22]. Above that, reference data for a population of cancer patients do not exist. Consequently, we defined the following study goals: 1) to analyse the reliability and validity of the instrument; 2) to provide representative reference data for the AVEM subscales; and 3) to explore the work profiles of cancer patients.

Material and methods

Study design

The study was performed in an inpatient oncological rehabilitation setting with measurements collected at three time points (t1, t2, and t3). At the onset of rehabilitation (t1), patients provided demographic and medical information and responded to several occupation-related and mental health questionnaires. Questionnaires were administered again at six months after the end of rehabilitation treatment (t2) and again 12 months after the end of rehabilitation treatment (t3). Analysis of the psychometric properties of the AVEM was primarily based on data from t1, the first measurement time point. To examine predictive validity, regression analyses were used to examine the association between work behaviour and mental health measures obtained at t1 and work-related outcomes obtained at t3, 12-months post-rehabilitation. For reports of additional analyses of data collected at the second and third measurement time points, see [23,24].

The study protocol was approved by the Department of Data Security of the German Pension Insurance Agency and the local ethics committee.

Measures

Occupational Stress and Coping Inventory (AVEM). The AVEM assesses an individual's work behaviour in three domains relevant to professional demands and health: work commitment, resistance to stress and emotions, i.e., subjective well-being [10]. These domains are measured with 11 subscales, with each subscale consisting of six items [10]. Table I presents the subscales and provides examples of items. The AVEM was originally developed in Germany but has since been translated

Table I. The 11 subscales of the AVEM categorised by the three domains and the four types of work behaviour patterns and coping styles.

Three domains of the AVEM with examples of items for each subscale

1 Commitment to work

(1) Perceived significance of work
Work is the most important part of my life.[A]

(2) Career ambition
I want to be more successful in my job in comparison to my friends.[A]

(3) Commitment
If necessary, I work until I am exhausted.[A]

(4) Striving for perfection
No matter what I do, it has to be perfect.[A]

(5) Emotional distancing
I do not have a problem relaxing after work.[A]

2 Resistance to stress

(6) Tendency to resignation
When I am not successful, I give up.[A]

(7) Active coping
When I fail, I tell myself: Now I will try to succeed even more![A]

(8) Balance and emotional stability
It is easy for me to remain calm.[A]

3 Emotional or subjective well-being

(9) Work satisfaction
My professional life has been successful so far.[A]

(10) Life satisfaction
On the whole, I am happy and content.[A]

(11) Perceived social support
My partner shows understanding for my work.[A]

Four types of work behaviour patterns and coping styles

Type G	**Healthy-ambitious** • Ambitious at work • Emotionally distant from work • Highly resistant to stress • Positive emotionality	**Type S**	**Unambitious** • Unambitious at work • Low engagement with work • Highly balanced • Positive emotionality
Risk Type A	**Excessively ambitious** • Excessive commitment & striving for perfection • Inability to emotionally distance from work • Negative emotionality • High effort and low reward	**Risk Type B**	**Resigned** • Unambitious at work • Unable to emotionally distance from work • Diminished stress resistance • Negative emotionality

[A]Items were translated by the authors of the manuscript from the German version of the AVEM.

into eight languages, including English, Swedish, Chinese, and French.

Items are rated on a Likert scale from 1 (strongly disagree) to 5 (strongly agree), with a maximum score of 30 points per subscale. Higher scores indicate higher levels of a characteristic. For example, higher scores on the *perceived significance of work* subscale reflect the greater importance a person attaches to work.

In addition, the authors claim that each person can be assigned to one of the following work-related behaviour patterns and coping styles: healthy-ambitious (Type G), unambitious (Type S), excessively ambitious (Risk Type A) and resigned (Risk Type B) [10]. Further details regarding these work-related behaviour patterns are presented in Table I. Both Type G and Type S represent work-related behaviour patterns that are hypothesised to promote resilience, while the Risk Type A and Risk Type B patterns are expected to be detrimental to the individual's health in the long run. A computer programme categorises individuals into one of the four types of work-related behaviour patterns and coping styles (Table I) by developing a work profile based on the individual's scores on the 11 subscales and comparing the individual profile to the four behaviour patterns [25]. An individual profile that matches one of the four pattern types with a likelihood of $p \geq 0.95$ is defined as a clear affiliation, which is typically found in approximately 20% of the sample. In the remaining cases, the individuals are assigned to the behaviour pattern that most closely matches their profile [11].

The authors of the questionnaire report an acceptable to good reliability, with Cronbach's α for the AVEM subscales ranging from 0.79 to 0.87 [11]. The validity of the AVEM has been examined in different groups, and exploratory factor analysis has supported the factorial structure of the instrument [11,18,21].

Work-related outcomes. Patients provided information regarding their occupational status one year post-rehabilitation. If they reported that they had returned to work, they were categorised as *returned to work*. Furthermore, patients who had returned to work were asked how long it took them to return to work. Based on the median response value for the item 'weeks taken to return to work', patients who returned to work in less than nine weeks were categorised as *early returners*, and patients who took additional time were classified as *late returners*. The third outcome measure, *occupational stress*, was assessed one year post-rehabilitation (t3). This item is part of the Screening Instrument Work and Occupation (German abbr. SIBAR) [26].

Mental health. To explore the well-being of the patients, they were asked to fill out the Hospital Anxiety and Depression Scale (HADS). This instrument is frequently used to assess anxiety and depression of patients who are somatically ill [27]. A score of 8 points or more on one of the two subscales indicates a moderate to clinically relevant mental strain.

Patients

Rehabilitation physicians recruited clinic patients during their initial examination and informed them of study goals and procedures. Participants were included if they were of working age (≤ 60 years) with a good medical prognosis (i.e., a presumed life expectancy of more than 6 months based on physician assessment). In addition, patients had to be employed, only temporarily unable to work or actively looking for work. Patients were excluded if they had applied for pension. Other criteria for excluding participants were severe psychological or physical stress, cognitive limitations, inability to speak or understand German or refusal to participate. Overall, 477 of 618 patients were included in the study. One year post-rehabilitation, 336 patients remained in the study.

Statistical analyses

Descriptive analyses present the scores on the AVEM subscales for different subgroups (i.e., men and women, different age groups and cancer sites). The scores for women and men were compared to scores of a German reference sample using one-sample t-tests [11]. The reference sample included 1430 women (mean age 40 years, range 18–62 years) and 1636 men (mean age 43 years, range 19–64 years). The reference sample was recruited in 2002 from individuals employed in different professions (e.g., teachers, policemen and policewomen, physicians, nurses and students). To measure group differences, standardised effect sizes were calculated (Cohen's d; computed by dividing through the pooled standard deviation of the respective groups).

In addition, each patient was assigned to one of the four behaviour patterns using the computer programme of the AVEM authors. To explore the extent to which cancer patients exhibit different behaviour patterns from the reference sample [28], patient profiles were compared to profiles of a reference sample obtained in Germany and Austria in 1996. This sample included 1589 participants (68% women) with a mean age of 36 years (range 18–69 years). χ^2-tests were used to identify differences between groups.

We also analysed item discrimination for the 11 subscales to determine whether item discrimination was acceptable using the recommended threshold of 0.40 for minimum and maximum item-total correlations. In addition, reliability of the 11 subscales was analysed using Cronbach's α.

To explore the factorial validity of the AVEM, we conducted a confirmatory factor analysis (CFA) using the Mplus 7.2 statistical programme [29]. We defined a model with 11 correlated factors and ordered categorical indicators (logistic link). We restricted all possible cross-loadings and covariances between error terms to be zero. The following global goodness-of-fit measures were calculated: the discrepancy χ^2 statistic, the normed χ^2 statistic, the Bentler comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA) and the weighted root mean square residual (WRMR). We obtained modification indices to identify possible sources of local misfit.

Logistic regression analyses were performed to assess the predictive validity of the AVEM and the extent to which work-related behaviour patterns predict work-related outcomes. We defined the following three outcomes one year post-rehabilitation: returned to work versus not returned to work, late return to work (more than 9 months after the end of rehabilitation) versus early return to work as well as occupational stress versus no occupational stress. Altogether, we ran two regression analyses for each outcome. In both analyses we included the following demographic and medical characteristics of the patients to adjust for differences: age, gender, education, type of occupation, cancer site and tumour stage. In the second regression analyses we added the results of the HADS as a covariate to additionally adjust for mental health. This is due to the fact that the authors of the AVEM claim that a good mental health can be an important resource when dealing with stressful situations at work [11]. Mental strains might be negatively associated with successful occupational outcomes one year after rehabilitation. As the results of the two subscales anxiety and depression correlated with a value > 0.6, we excluded anxiety in favour of depression to avoid multicollinearity. As a measure of the strength of association, we report odds ratios (OR) with corresponding confidence intervals (CI) and p-values.

Results

Sample characteristics

Most of the 477 patients were female (73%), with an average age of 49 years. At the onset of rehabilitation, significantly more women than men were employed

and significantly more men reported being employed in blue-collar jobs. In regard to medical diagnosis, 54% of the women were diagnosed with breast cancer, whereas 36% of the men were diagnosed with cancer of the digestive organs and 23% with tumours of lymphoid, haematopoietic or related tissue (Table II).

Descriptive statistics for subscales and items

Women and men in the study sample differed significantly from the German reference sample [11] on certain subscales. Compared to women in the German reference sample, female cancer patients reported significantly less *career ambition* (Cohen's d = −0.47) and greater *ability to distance themselves emotionally from work* (Cohen's d = 0.38). Although differences for the *perceived significance of work, commitment, tendency to resignation, active coping and work and life satisfaction* subscales were significant, the effect sizes were modest (Cohen's d = −0.25 – −0.13, Table III). Compared to men in the German reference sample, male cancer patients reported lower levels of *career ambition* (Cohen's d = −0.35). Although differences for the *commitment, tendency to resignation, active coping and life satisfaction* subscales were significant, the effect sizes were modest (Cohen's d = −0.23–0.20, Table III).

For the study sample, scores on most subscales did not appear to vary with age. Patients between the ages of 45 and 50 years exhibited the lowest scores

Table II. Characteristics of the study sample at the beginning of inpatient rehabilitation (N = 477).

	Entire sample (N = 477)	Women (N = 348)	Men (N = 129)	p
Age (M, SD)	48.9 (7.7)	48.9 (7.1)	48.6 (9.1)	0.698[A]
Gender	%	%	%	
Female	73.0	–	–	–
Education	%	%	%	
< 10 years	21.1	20.8	26.8	0.224[B]
10 years	52.0	53.4	44.9	
12–13 years	27.0	25.8	28.3	
Occupation	%	%	%	
Employed	88.5	91.0	81.6	**0.007[B]**
Unemployed	8.0	6.9	11.2	
Other	3.5	2.1	7.2	
Type of occupation	%	%	%	
Blue-collar job	22.1	18.4	32.3	**0.007[B]**
White-collar job	70.2	74.0	59.7	
Self-employed	4.9	4.4	6.5	
Public servant	2.8	3.2	1.6	
Household income per month	%	%	%	
Up to 1000 €/up to $1357[C]	9.1	10.1	6.5	0.399[B]
1000–2000 €/$1357–2713[C]	34.0	33.0	36.6	
2000–3000 €/$2713–4070[C]	32.0	33.3	28.5	
3000–4000 €/$4070–5427[C]	15.8	15.6	16.3	
More than 4000 €/more than $5427[C]	9.1	8.0	12.2	
Cancer site	%	%	%	
Breast	39.6	54.3	–	**< 0.001[B]**
Digestive organs	20.1	14.1	36.4	
Lymphoid, haematopoietic and related tissue	10.5	6.0	22.5	
Female/male genital organs	11.7	11.8	12.4	
Endocrine glands and related structures	3.4	2.9	4.7	
Respiratory system and intrathoracic organs	3.8	2.9	6.2	
Other	10.9	8.0	17.8	
Tumour stage (UICC)	%	%	%	
Stage 0	2.5	3.2	0.8	**< 0.001[B]**
Stage 1	28.7	32.2	19.4	
Stage 2	21.4	24.7	12.4	
Stage 3	13.6	14.7	10.9	
Stage 4	7.3	5.5	12.4	
Other[D]	9.6	6.0	19.4	
Time since diagnosis in months (M, SD)	10.5 (11.5)	11.2 (12.3)	8.6 (8.6)	**0.029[A]**

The bold numbers are the significant values.
[A]t-test; [B]χ^2-test; [C]Conversion rate as of 18 June 2014; [D]Because the UICC does not classify tumours of lymphoid, haematopoietic and related tissue, these cancers are classified as 'other'.

Table III. Comparison of sample scores on the AVEM subscales (N = 477) with scores from a German reference sample (N = 3066).

	Sample[A]	Female				Male			
Occupational behaviour - AVEM	(N = 477) M (SD)	Study sample (n = 348) M (SD)	Reference sample[B] (n = 1430) M (SD)	p[C]	d[D]	Study sample (n = 129) M (SD)	Reference sample[B] (n = 1636) M (SD)	p[C]	d[D]
Commitment to work									
Perceived significance of work	16.1 (4.9)	16.1 (5.0)	16.7 (4.5)	**0.019**	−0.13	16.3 (4.8)	16.0 (4.9)	0.467	–
Career ambition	15.8 (4.6)	15.2 (4.4)	17.4 (4.9)	**<0.001**	−0.47	17.4 (4.6)	19.1 (4.9)	**<0.001**	−0.35
Commitment	18.1 (5.0)	18.1 (5.1)	19.1 (4.4)	**<0.001**	−0.21	18.1 (4.5)	19.0 (4.4)	**0.031**	−0.20
Striving for perfection	22.2 (4.5)	22.1 (4.5)	22.5 (4.1)	0.147	–	22.4 (4.5)	22.6 (4.0)	0.623	–
Emotional distancing	19.0 (5.1)	19.0 (5.0)	17.1 (5.0)	**<0.001**	0.38	18.8 (5.5)	18.1 (5.1)	0.184	–
Resistance to stress									
Tendency to resignation	15.7 (4.4)	15.8 (4.4)	16.5 (4.4)	**0.006**	−0.15	15.3 (4.2)	14.5 (4.2)	**0.033**	0.20
Active coping	21.4 (3.7)	21.2 (3.6)	21.9 (3.6)	**0.001**	−0.18	21.7 (3.7)	22.5 (3.5)	**0.014**	−0.23
Balance and emotional stability	19.3 (4.4)	19.0 (4.5)	19.4 (4.5)	0.144	–	20.1 (4.2)	20.6 (4.2)	0.194	–
Emotions, i.e., subjective well-being									
Work satisfaction	21.4 (4.0)	21.3 (4.1)	22.3 (3.8)	**<0.001**	−0.25	21.5 (3.6)	21.9 (3.9)	0.224	–
Life satisfaction	20.9 (4.0)	21.0 (4.1)	21.8 (4.0)	**<0.001**	−0.20	20.8 (3.9)	21.5 (3.9)	**0.039**	−0.19
Perceived social support	23.1 (4.1)	23.1 (4.3)	22.9 (4.6)	0.459	–	23.0 (3.7)	22.5 (4.1)	0.172	–

The bold numbers are the significant values.
[A]For original analyses, see [32]; [B]German reference sample [11]; [C]t-test; [D]Cohen's d, standardised effect size.

on the *perceived significance of work* subscale, while patients between the ages of 55 and 60 years exhibited the highest scores on the *work and life satisfaction* subscales (Table IV).

Comparisons of the subscale scores of breast cancer patients and patients with other types of tumours found only modest differences (Table IV).

Behaviour patterns and coping styles

Slightly more than one third of the sample (36%) exhibited the unambitious behaviour pattern (Type S); another 29% were categorised as resigned (Risk Type B; Figure 1). Compared to the reference sample [28], the Risk Type B profile occurred significantly more often (29% vs. 21%) and the Risk Type A (excessively ambitious) profile occurred significantly less often (20% vs. 32%, $p < 0.001$) in the study sample (Figure 1).

More women than men exhibited Type S behaviour (37% vs. 32%), and more women than men exhibited Risk Type B behaviour (32% vs. 22%). Fewer women than men were categorised as Risk Type A (17% vs. 28%).

Reliability and item discrimination

Reliability analyses of the 11 subscales found that Cronbach's α ranged from 0.76 for *perceived social support* to 0.89 for *emotional distancing* (Table V). Table V

Table IV. AVEM subscale scores presented separately for gender, age and cancer site.

	Women				Men				Cancer site	
Occupational behaviour - AVEM	≤ 45 years (n = 88) M(SD)	> 45–≤ 50 years (n = 92) M(SD)	> 50–≤ 55 years (n = 91) M(SD)	> 55–≤ 60 years (n = 77) M(SD)	≤ 45 years (n = 34) M(SD)	> 45–50 years (n = 23) M(SD)	> 50–≤ 55 years (n = 40) M(SD)	> 55–≤ 60 years (n = 32) M(SD)	Breast (n = 189) M(SD)	Other (n = 288) M(SD)
Commitment at work										
Perceived significance of work	16.3 (4.6)	15.4 (4.4)	16.6 (5.5)	16.0 (5.4)	16.6 (5.4)	15.2 (5.0)	16.5 (4.2)	16.6 (4.9)	16.0 (4.9)	16.2 (5.0)
Career ambition	16.1 (4.4)	15.4 (4.0)	15.0 (4.8)	14.2 (4.4)	19.0 (4.4)	17.2 (4.6)	17.2 (4.8)	16.1 (4.3)	15.0 (4.2)	16.3 (4.8)
Commitment	18.6 (4.9)	18.1 (5.6)	18.3 (5.0)	17.3 (4.9)	18.0 (4.9)	18.2 (4.1)	18.1 (4.7)	18.1 (4.3)	18.0 (4.9)	18.2 (5.0)
Striving for perfection	22.1 (4.0)	22.0 (4.6)	22.2 (4.9)	22.3 (4.6)	22.4 (4.7)	22.0 (4.5)	22.5 (4.6)	22.6 (4.7)	21.9 (4.5)	22.4 (4.5)
Emotional distancing	19.1 (5.2)	19.1 (5.1)	18.9 (4.5)	19.0 (5.3)	19.4 (5.7)	18.5 (5.1)	17.2 (5.2)	20.1 (5.7)	19.1 (4.8)	18.9 (5.4)
Resistance to stress										
Tendency to resignation	15.9 (4.0)	16.3 (4.2)	15.4 (4.5)	15.8 (5.0)	16.3 (4.8)	16.1 (4.1)	16.1 (4.1)	15.0 (3.9)	15.8 (4.2)	15.6 (4.5)
Active coping	20.8 (3.4)	20.8 (3.5)	21.9 (3.9)	21.5 (3.7)	20.0 (4.0)	21.8 (2.8)	21.8 (2.8)	22.3 (3.7)	21.0 (3.5)	21.6 (3.8)
Balance and emotional stability	18.4 (4.5)	18.6 (4.9)	19.6 (3.9)	19.6 (4.6)	19.3 (4.8)	20.1 (4.1)	20.1 (4.1)	20.5 (3.8)	19.0 (4.2)	19.6 (4.6)
Emotions, i.e., subjective well-being										
Work satisfaction	21.5 (4.0)	20.7 (4.0)	21.3 (4.6)	22.0 (3.7)	20.1 (4.7)	21.8 (3.1)	21.8 (3.1)	22.0 (3.2)	21.1 (4.2)	21.5 (3.8)
Life satisfaction	20.3 (3.7)	20.6 (4.1)	21.5 (4.6)	21.6 (3.9)	19.4 (4.6)	20.5 (3.5)	20.5 (3.5)	21.6 (4.0)	20.8 (4.1)	21.0 (4.0)
Perceived social support	22.4 (4.2)	22.5 (4.2)	24.0 (4.2)	23.5 (4.4)	23.3 (4.1)	22.6 (2.8)	22.6 (2.8)	23.5 (3.5)	23.0 (4.4)	23.1 (4.0)

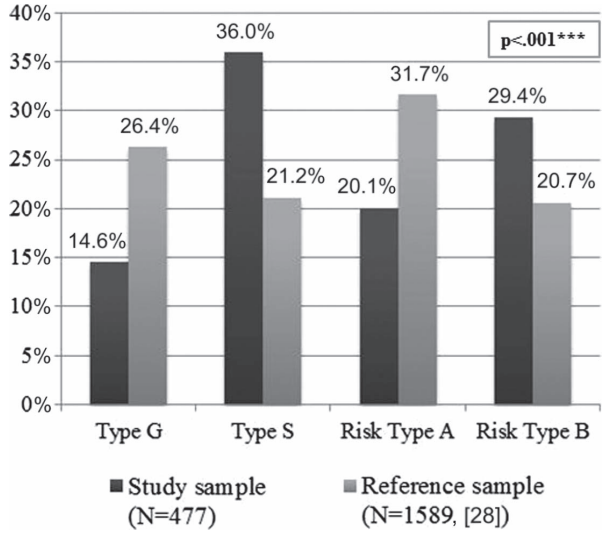

Figure 1. Comparison of the four types of behaviour patterns and coping styles (AVEM) in the entire sample (N = 477) with a German reference sample (N = 1589, [28]).

presents the minimum and maximum corrected item-total correlations for the subscales. Although the values for 10 of the 11 subscales exceeded the recommended threshold of 0.40, item discrimination for the *active coping* subscale displayed a minimum score of 0.34.

Factorial validity

To analyse the factorial validity of the AVEM, we conducted a confirmatory factor analysis with ordered categorical indicators. The patients rated the 66 items on a scale ranging from 1 to 5, with mean scores on the items ranging from 1.96 to 4.10 and standard deviations ranging from 0.81 to 1.24. Skewness values ranged from −1.13 to 1.05 and kurtosis values ranged from −0.79 to 1.21. Factor loadings on the 11 subscales (expressed as logarithmised ORs) ranged from 0.45 to 0.87 for *perceived significance of work*; from 0.47 to 0.79 for *career ambition*; from 0.65 to 0.83 for *commitment*; from 0.66 to 0.88 for *striving for perfection*; from 0.73 to 0.88 for *emotional distancing*; from 0.63 to 0.81 for *tendency to resignation*; from 0.68 to 0.75 for *active coping*; from 0.64 to 0.82 for *balance and emotional stability*; from 0.59 to 0.84 for *work satisfaction*; from 0.50 to 0.83 for *life satisfaction*; and from 0.55 to 0.79 for *perceived social support*. All loadings were statistically significant at $p < 0.001$ and exceeded the threshold of 0.40 (corresponding to an OR of 1.5). The factor correlations are reported in Table VI. The *life satisfaction* and *perceived social support* subscales exhibited the highest correlation ($r = 0.75$). The lowest correlations were found between the *perceived significance of work* and *life satisfaction* subscales ($r = 0.01$) and between the *emotional distancing* and *work satisfaction* subscales ($r = -0.01$)

Table V. Item discrimination (min/max) and reliability (Cronbach's α) of the 11 AVEM subscales (N = 477).

Occupational behaviour - AVEM	Item discrimination (min/max)	Cronbach's α
Commitment at work		
Perceived significance of work	0.43/0.74	0.85
Career ambition	0.49/0.66	0.82
Commitment	0.47/0.70	0.84
Striving for perfection	0.57/0.75	0.85
Emotional distancing	0.66/0.75	0.89
Resistance to stress		
Tendency to resignation	0.52/0.69	0.83
Active coping	0.34/0.65	0.79
Balance and emotional stability	0.45/0.64	0.82
Emotions, i.e., subjective well-being		
Work satisfaction	0.43/0.67	0.80
Life satisfaction	0.41/0.70	0.81
Perceived social support	0.44/0.61	0.76

The discrepancy χ^2-test revealed a statistically significant lack of fit between the observed and defined models ($\chi^2 = 5323.24$; $df = 2024$; $p < 0.001$). The normed χ^2 score of 2.63 was less than 3.00, indicating that the cancer patients' data provided an acceptable fit to the model. The Bentler CFI score of 0.85 and the TLI score of 0.85 were suboptimal (< 0.90) but acceptable for a high-dimensional model. Although the RMSEA score of 0.06 did not meet the threshold (< 0.05) for good fit, it was still acceptable (< 0.08). The WRMR was 1.97. Modification indices suggested that the model could be substantially improved by omitting five items (item 18, 19, 40, 55 and 62) that were not specific to the factor they were allocated but were associated with all factors of the AVEM ($\chi^2 = 3648.25$; $df = 1714$; normed $\chi^2 = 2.13$; CFI = 0.91; TLI = 0.90; RMSEA = 0.05; WRMR = 1.69).

Predictive validity

The results of the regression analyses including demographic and medical variables as covariates revealed significant associations between the predictor variable of work-related behaviour pattern and the outcome variables of late return to work and occupational stress one year post-rehabilitation (Table VII). In particular, being categorised as Risk Type B (resigned) was associated with an increased probability of late return to work (OR = 2.93, p = 0.017) and feeling occupational stressed (OR = 4.36, p = 0.016) compared to Type G (healthy-ambitious).

When including depression (HADS) as a covariate, none of the predictors were significantly associated with the outcome no return to work: Type S

Table VI. Factor correlations between the 11 AVEM subscales.

	Subscale 1	Subscale 2	Subscale 3	Subscale 4	Subscale 5	Subscale 6	Subscale 7	Subscale 8	Subscale 9	Subscale 10	Subscale 11
Subscale 1 - Perceived significance of work	1.00	0.67	−0.43	−0.27	−0.30	−0.15	−0.35	−0.07	0.22	0.01	−0.12
Subscale 2 - Career ambition		1.00	−0.50	−0.41	−0.35	−0.25	−0.37	−0.08	0.34	−0.05	−0.19
Subscale 3 - Commitment			1.00	0.64	0.65	0.42	0.20	0.38	−0.19	0.31	0.32
Subscale 4 - Striving for perfection				1.00	0.34	0.32	0.48	0.16	−0.26	0.09	−0.02
Subscale 5 - Emotional distancing					1.00	0.55	−0.11	0.48	−0.01	0.41	0.34
Subscale 6 - Tendency to resignation						1.00	−0.38	0.57	0.33	0.52	0.46
Subscale 7 - Active coping							1.00	−0.38	−0.49	−0.52	−0.40
Subscale 8 - Balance and emotional stability								1.00	0.39	0.54	0.41
Subscale 9 - Work satisfaction									1.00	0.60	0.44
Subscale 10 - Life satisfaction										1.00	0.75
Subscale 11 - Perceived social support											1.00

(OR = 0.920, 95% CI 0.325–2.608, p = 0.876); Risk Type A (OR = 1.358, 95% CI 0.422–4.369, p = 0.607); Risk Type B (OR = 1.433, 95% CI 0.455–4.510, p = 0.539); depression (OR = 1.074, 95% CI 0.966–1.194, p = 0.186). With regard to occupational stress, only depression (HADS) was significantly associated with the outcome: Type S (OR = 0.871, 95% CI 0.231–3.278, p = 0.838); Risk Type A (OR = 2.440, 95% CI 0.653–9.122, p = 0.185); Risk Type B (OR = 2.446, 95% CI 0.665–8.499, p = 0.178); depression (OR = 1.131, 95% CI 1.013–1.262, p = 0.028). No statistically significant associations were found when analysing the outcome late return to work: Type S (OR = 1.455, 95% CI 0.626–3.378, p = 0.383); Risk Type A (OR = 1.516, 95% CI 0.547–4.202, p = 0.424); Risk Type B (OR = 2.494, 95% CI 0.931–6.679, p = 0.069); depression (OR = 1.024, 95% CI 0.935–1.120, p = 0.613).

Discussion

The goal of this study was to determine the extent to which the AVEM is a valid and reliable instrument for cancer patients in inpatient rehabilitation, provide clinical age- and gender-specific reference data in comparison with reference samples [11,28] and analyse differences in the work behaviour patterns of female and male cancer patients.

The results indicate that the AVEM is a reliable questionnaire, with Cronbach's α ranging from 0.76 to 0.89, which is comparable to those reported for reference samples [11,18,21]. With regard to item discrimination, the minimum corrected item-total

Table VII. Regression analyses of the associations between the four types of work behaviour patterns and the three outcomes (return to work, time to return to work and occupational stress) one-year post-rehabilitation (t3).

	No return to work (N = 336)		Late return to work (N = 264)		Occupational stress one-year post-rehabilitation (N = 264)	
	Odds ratio (95% confidence interval)	p[A]	Odds ratio (95% confidence interval)	p[A]	Odds ratio (95% confidence interval)	p[A]
Type G - healthy-ambitious[B]	Ref		Ref		Ref	
Type S - unambitious	0.95 (0.34–2.68)	0.925	1.55 (0.67–3.57)	0.306	0.91 (0.25–3.37)	0.886
Risk Type A - excessively ambitious	1.66 (0.55–5.02)	0.373	1.78 (0.69–4.65)	0.236	3.48 (0.99–12.26)	0.052
Risk Type B - resigned	2.07 (0.75–5.70)	0.160	2.93 (1.21–7.09)	**0.017**	4.36 (1.32–14.39)	**0.016**

The bold numbers are the significant values.
[A]Wald Test; [B]adjusted for age, gender, education, type of occupation, cancer site, and tumour stage.

correlations for all but one subscale (*active coping*) were above the 0.40 threshold. Therefore we assume that the items of the AVEM accurately represent the scale they belong to, although in the CFA some items were identified that performed suboptimally.

With regard to factorial validity, most of the goodness-of-fit measures found an acceptable to good fit of the model to the data. Although the discrepancy χ^2 statistic was an exception, this measure is oversensitive when the sample size exceeds 300 people [30]. Thus, we primarily relied on the other goodness-of-fit indexes in interpreting study results and conclude that the AVEM is a factorially valid instrument for use with cancer patients during rehabilitation. Factor intercorrelations were rather low, showing that the AVEM dimensions are fairly distinct. Still, some items were shown to measure rather global than specific aspects of coping and offer room for further improvement of the instrument.

We also examined the predictive validity of the AVEM with regard to work-related factors post-rehabilitation, as the authors of the AVEM showed an association between the Risk Types A and B and longer sick leaves, an increased risk of early retirement and more symptoms of burn-out [28]. When adjusting for different demographic and medical variables, the analyses revealed an association between the type of work-related behaviour pattern and the time needed to return to work. Patients categorised as resigned (Risk Type B) had a higher risk of a late return to work compared to patients categorised as healthy-ambitious (Type G). In addition, the pattern of Risk Type B behaviour was associated with more occupational stress one year after rehabilitation. When including depression (HADS) as a covariate, only the association between the outcome occupational stress one year after rehabilitation and a higher level of depression (HADS) at the beginning of rehabilitation remained statistically significant. This result supports the assumption of the authors of the AVEM that mental health and work-related behaviour determine each other, because the mental constitution can be an important resource or burden in dealing with stress in the working context. However, the aetiological association between work behaviour and mental health could not be clearly defined by the authors. Based on our results, we cannot undoubtedly decide whether exploring the work-related behaviour of a patient leads to valid results regarding future work-related outcomes or the behaviour pattern is just another way to express mental strains. However, the analyses show that symptoms indicating poor mental health, which the authors of the AVEM also describe as being part of Risk Type B, are likely to lead to problems in the long run. Therefore they need to be taken seriously.

Altogether, 29% of the patients were categorised as exhibiting the Risk Type B behaviour pattern. Cancer patients were more likely to display this type of behaviour and increased risk of suffering from 'burn-out' in the long run [10] compared to the reference sample [28]. It is plausible that patients with less work motivation and a tendency to feel overwhelmed by occupational tasks would tend to postpone returning to work rather than returning as soon as possible. As the data also suggest that these patients are more likely to feel stress when they have returned to work, this reveals the importance of identifying at-risk patients early in the rehabilitation process. Providing professional support and opportunities to discussing fears and work experiences could provide these individuals with new strategies for coping with work-related stress. Tendencies toward risk-related behaviours might be especially detrimental for cancer patients, who often report that they are less able to concentrate, experience decreased self-confidence when handling daily tasks and feel more overwhelmed by stressful situations than they did before becoming ill [6,31]. These patients face the dual stress of struggling with the side effects of the disease and the fears related to the problem of coping with those side effects at work. The data indicate that women are more affected. It would be worthwhile to determine the extent to which patients exhibiting Risk Type B tendencies displayed these characteristics before their illness. Feelings of being overwhelmed and less able to cope with stress in daily working situations are similar to the feelings some patients report when learning of their diagnosis. Being confronted with a life-threatening disease and having to face the fears created by this situation might have influenced some patients' memories of their ability to cope with stress. Prospective studies are required to answer these questions.

The study results allow us to conclude that the AVEM can be used with cancer patients to assess the need for special occupational counselling and support the German Pension Insurance's recommended use of this instrument in inpatient rehabilitation [9].

In addition to the psychometric analyses, we were interested in obtaining reference data. In previous analyses of our study sample [32], we examined the risk that cancer patients would retire early due to cancer and compared the scores of our study sample on the AVEM subscales (N = 477, Table III) to those of a German reference sample [11]. The analyses indicated that cancer patients' scores were significantly lower than those of the reference sample for the *career ambition, commitment, active coping, balance and emotional stability and satisfaction with work and life* subscales (Cohen's d = −0.52–−0.18), while cancer patients' scores on the *emotional distancing* subscale were sig-

nificantly higher than those of the reference sample (Cohen's d = 0.27) [32]. In this study we concentrated on gender-specific aspects. The subscale scores indicate that female and male cancer patients differ from women and men in a German reference sample [11] on some of the subscales, although most of the differences were modest and not clinically relevant. The most notable difference was found regarding the *career ambition* subscale, with both female and male cancer patients reporting significantly less career ambition than the reference sample. This might be a consequence of the disease because some patients reported that the significance of work decreased after their cancer diagnosis [2]. Comparisons of subscale scores for different age groups and patients with different types of cancer did not reveal clinically relevant differences.

We have explored the psychometric characteristics of the AVEM from different perspectives. We have analysed the structure of the subscales of the AVEM as well as the suggested work-related behaviour typology. When running the analyses we treated them as two different approaches. It might be interesting to integrate the typology and the subscales into a multilevel model. However, as this was not the approach of the authors of the AVEM, we concentrated on investigating their defined model. The results show that the typology seems to be less valid in comparison to the subscales of the AVEM. Nonetheless, it would be interesting for future research to follow upon the idea of an integrated model and run further analyses.

Study analyses were based on a sample of 477 cancer patients participating in inpatient rehabilitation. The study sample covers a wide variety of demographic and clinical subgroups as can be found within the rehabilitation setting. However, because the sample is based on a subgroup of the cancer patient population – patients who enrol in a rehabilitation programme – individuals who decide against rehabilitation might display different behaviour patterns.

In conclusion, our findings indicate that the AVEM is a reliable and valid instrument for assessing the extent to which cancer patients participating in inpatient rehabilitation exhibit problematic work behaviours. Almost half of the study sample displayed risk-related behaviours, which suggests that a substantial number of patients might benefit from counselling that provides successful work strategies to facilitate their return to work.

Acknowledgements

We thank the Society for the Promotion of Rehabilitation Research in Hamburg, Mecklenburg-Western Pomerania and Schleswig-Holstein e.V. (Verein zur Förderung der Rehabilitationsforschung in Hamburg, Mecklenburg-Vorpommern und Schleswig-Holstein e.V., vffr, Grant ID 117) for funding the project. We also thank the two anonymous referees who helped us to improve the paper by giving us valuable and constructive advice. Finally, we thank the patients who participated in the study.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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