

Review

Do We Recover from Vacation? Meta-analysis of Vacation Effects on Health and Well-being

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Abstract: Do We Recover from Vacation? Meta-analysis of Vacation Effects on Health and Well-being: Jessica de Bloom, et al. Department of Work & Organizational Psychology, Behavioural Science Institute, Radboud University Nijmegen, The Netherlands—Objectives: The aim of this meta-analysis is to investigate to what extent vacation has positive effects on health and well-being, how long such effects endure after work resumption, and how specific vacation activities and experiences affect these relationships. **Methods:** Based on a systematic literature search (PsycInfo, Medline) and methodological exclusion criteria, in a stepwise approach, 7 studies were selected and reviewed. Effect sizes (Cohen's *d*) were calculated i) for every outcome variable within every study, ii) for every study by averaging the effect sizes per study, and iii) for homogeneous categories of outcome variables (exhaustion, health complaints, life satisfaction). **Results:** The results suggest that vacation has positive effects on health and well-being (small effect, $d=+0.43$), but that these effects soon fade out after work resumption (small effect, $d=-0.38$). Our research further demonstrated that vacation activities and experiences have hardly been studied. Therefore, their contribution to vacation effect and fade out remains unclear. **Discussion:** Progress in future vacation research will depend on strong research designs that incorporate repeated measurements pre-, inter- and post-vacation.

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Satisfaction, Stress

Time off is crucial for workers to recover from load effects built up at work. A core assumption of Effort-Recovery theory^{1,2} and Allostatic Load Theory^{3–5} is that initial normal load reactions (e.g., accelerated heart rate and fatigue) can develop into more chronic load reactions (e.g., prolonged fatigue, sleep complaints, high blood pressure) in cases of continued exposure to workload and incomplete recovery during time off². The essence of recovery is a process of psycho-physiological unwinding after working, opposite to the activation of the sympathetic-adrenal-medullary system and the hypothalamic-pituitary-adrenal system during effort expenditure (work), particularly under demanding or stressful conditions². Earlier research addressing rest breaks⁶, long work hours^{7–9}, and shift work¹⁰ has acknowledged the role of recovery from work in preserving individual well-being, health and performance capabilities. Furthermore, over the years labour unions have emphasized the importance of sufficient recovery time in their endeavours for a shorter working week, rest breaks and vacation rights, and both national and international working time legislations have been enacted to enable recovery possibilities for employees.

Recent studies have revealed that workers often recover insufficiently during time off work due to, for instance, working overtime, and that day-to-day incomplete recovery may have serious adverse health consequences in the long run (2, for an overview). Sluiter *et al.*¹¹ distinguished 4 different types of recovery based on duration and time span after work: microrecovery (first minutes after task performance), mesorecovery (10 min to 1 h after task performance), metarecovery (1 h to 2 days after work) and macrorecovery (more than 2 days after work).

Vacation as a form of macrorecovery is a prime

candidate for helping workers to recover more completely from work. Vacation is likely to be a more powerful recovery opportunity than regular free evenings and weekends because of two mechanisms underlying the recovery process. The first ‘passive’ mechanism reflects a direct release from daily job demands: vacation is ideally a relatively long period of rest that is mostly spent in a different and more relaxing environment that may help workers to detach psychologically from work and from other daily demands and routines. The second ‘active’ mechanism reflects the active engagement in potentially recovering activities: vacation is a pre-eminent opportunity to spend time on valued non-work activities of one’s own choice, such as hobbies and family activities.

This article reviews the empirical literature with regard to the recovering impact of this prototypical recovery possibility, i.e. a vacation from work. The term ‘vacation’ stems from the Latin ‘vacatio’: ‘being free from work, being at leisure, having time for’. We hypothesize that vacation, as a relatively long and uninterrupted period of respite from work may be a major contributor to the recovery process, and therefore may be beneficial for health and well-being.

Following a vacation, employees return to work, and we are also interested in how long potential vacation effects last, assuming that due to this renewed exposure to work demands vacation effects will be temporary and thus ‘fade out’.

Thirdly, from a work psychological point of view it is important not to treat a vacation as a black box, but rather to find out whether vacation activities (e.g., sports or exercise) and vacation experiences (e.g., vacation satisfaction) play a role in the relationship between vacation and well-being.

In sum, this meta-analysis aims to answer 3 related research questions:

- 1) What empirical evidence exists for an improvement of health and well-being due to a vacation from work (vacation effect)?
- 2) In the case of a positive effect of vacation, how long does this last (fade out)?
- 3) a. Do vacation activities play a role in these potential relationships?
b. Do vacation experiences play a role in these potential relationships?

Methods

A systematic literature search was carried out in 2 bibliographical databases: PsycInfo and Medline. No publication year limits were set and the final search date was June 15th, 2008.

We used the following search terms within the fields ‘title’ or ‘keywords’:

- 1) vacation OR holiday (1,702 hits), and
- 2) well-being OR health OR quality of life OR

satisfaction OR stress OR burnout OR recovery OR sleep OR mood OR affect (829,536 hits)

The combination of these 2 searches resulted in 125 hits (see Fig. 1). In a first selection round, the following exclusion criteria were used:

- Language: non-English papers (minus 22)
- Publication type: dissertations, short communications, letters, non-empirical and/or non-peer-reviewed papers (minus 38)

After application of these criteria 65 hits remained. All 65 abstracts were retrieved and read by the first 3 authors. Exclusion criteria in this second round were:

- Sample: papers not dealing with healthy, working sample (e.g. school children, psychiatric patients): minus 14
- Research purpose: studies irrelevant for the research questions, i.e. studies not investigating vacation effects and/or fade out on health and/or well-being (e.g. weight gain during vacation, holiday shopping intentions, sleepiness in drivers during summer vacation): minus 35
- Design: studies not using an interrupted time series design with at least a pre-test, i.e. before vacation and a post-test, i.e. after vacation per subject as such studies do not permit the evaluation of a vacation (e.g. only post-vacation measure during annual doctor visit): minus 5

Based on these criteria, 54 articles were excluded, and 11 papers remained. Studies that were referred to in the 11 selected papers were also examined but no additional, relevant papers were detected. The first 3 authors of the present article studied the remaining 11 papers and excluded 4 more papers. In 2 cases, papers were written by the same authors^{12–15}, based on the same sample with the second paper not offering extra information for our research purposes. Therefore the second paper was excluded in both cases^{13, 15}. A third paper was excluded¹⁶ because it investigated cross-over and thus compared outcome variables on pre- and post-vacation in spouses instead of vacationers themselves. Finally, a fourth paper had to be excluded¹⁷ as it did not fit our research purposes: the ‘vacation’ in this study was a compulsory off work period, ‘a brief interlude during an acutely stressful computer crisis’¹⁸. This resulted in a final selection of 7 studies (see Table 1).

To mathematically quantify the empirical evidence for vacation effects in the 7 different studies we calculated the effect size d for paired observations as described in Cohen¹⁹. First we calculated, within every study, effect sizes for all outcome variables in that study. Secondly, we calculated average effect sizes for all studies by averaging all effect sizes within each study.

Thirdly, in order to obtain a more detailed picture for specific homogeneous outcome categories, we computed a mean d for those outcome variables that were used in 3

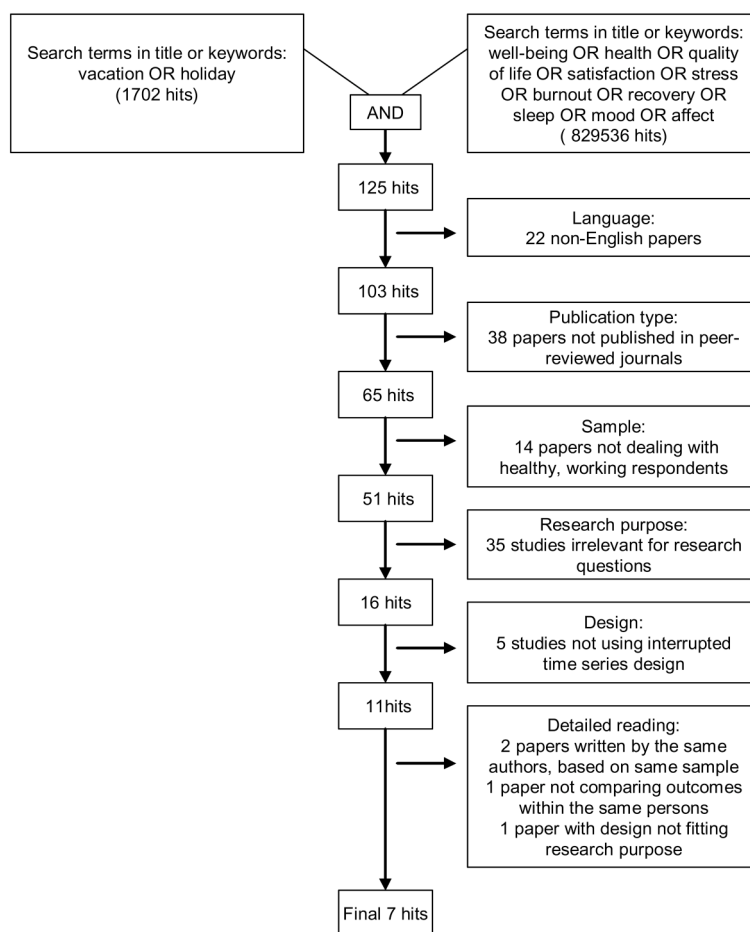


Fig. 1. Systematic literature search on vacation and health or well-being from 125 to final 7 studies.

or more different studies. This fine-grained analysis was performed for the following outcome categories: exhaustion (4 studies), health complaints (3 studies), and life satisfaction (3 studies).

Following Cohen¹⁹⁾ we distinguished among small (0 to 0.5), medium (0.5 to 0.8) and large effect sizes (>0.8). Positive effect sizes indicate a beneficial effect of vacation (improvement of health and well-being), whereas negative effects denote the opposite (decrease in health after vacation as compared to pre-vacation levels).

Results

Table 1 provides an overview of the 7 studies, by characterizing sample and design characteristics, pre-vacation measurement(s), measurements during vacation, post-vacation measurement 1, and post vacation measurement 2.

Sample and design characteristics

Number of participants: Sample sizes of the reviewed studies were mostly small. Attrition from the pre-vacation

to the first post-vacation measurement varied between 5%²⁰⁾ and 59%¹²⁾. The loss of participants from the pre-vacation to the post-vacation 2 measure varied between 5%²⁰⁾ and 86%¹²⁾.

Sex, age and occupation: The distributions of sex, age and occupation were diverse in the reviewed studies.

Control group: 5 studies^{12, 14, 18, 22, 23)} did not include a control group. Gilbert and Abdullah²¹⁾ incorporated a non-vacationing control group of 249 respondents (opposed to 355 holiday-takers) that reported a lower well-being than the holiday-takers on pre-vacation. Etzion²⁰⁾ used a matched-pairs technique to create a comparable control group of 55 respondents (age, marital status and job function). This control group's pre-vacation scores on exhaustion resembled the vacation group's scores.

Duration: 3 of the 7 studies²⁰⁻²²⁾ did not report the duration of the vacation of their respondents. The average duration of the vacation in the other studies was 9¹⁴⁾, 10²³⁾, and 14 days^{12, 18)}.

Timing: In 2 studies, the timing of the vacation was not

Table 1. Design characteristics of the 7 reviewed studies

Author(s), year of publication*	Sample and design characteristics	Pre-vacation measurement(s)	During vacation measurement	Post-vacation measurement 1	Post-vacation measurement 2
Lounsbury & Hoopes, 1986 ⁽⁴⁾	N pre-vac: 168 N post-vac 1: 128 N post-vac 2: – Country: USA σ : 28% Age: 39 yr Occ: variety Contr.group: No Vacation features Duration: 9 days on average Timing: summer vacation Location: NR	1–14 days before vacation, median 7 days <i>Outcome variables</i> Life satisfaction Job involvement/ central life interest Job involvement/valued self Organizational commitment Turnover intention Job satisfaction	–	1st wk after vacation, median 3 days <i>Outcome variables</i> Same as pre-vacation <i>Activities:</i> Activities during vacation <i>Experiences:</i> Overall vacation satisfaction Satisfaction with aspects of vacation	–
Westman & Eden, 1997 ⁽⁸⁾	N pre-vac1: 88 N pre-vac2: 76 N post-vac 1: 76 N post-vac 2: 76 Country: Israel σ : 59% Age: NR Occ: Administrative clerks Contr. group: No Vacation features Duration: 14 days Timing: summer vacation Location: 87% at home, 13% away from home	6 wk before vacation 3 days before vacation <i>Outcome variables</i> Exhaustion (physical, emotional, mental)	2nd wk of vacation <i>Outcome variables</i> Same as pre-vacation <i>Activities:</i> – <i>Experiences:</i> –	3 days after vacation <i>Outcome variables</i> Same as pre-vacation <i>Activities:</i> – <i>Experiences:</i> Vacation satisfaction	3 wk after vacation (18 days after post-vacation 1) <i>Outcome variables</i> Same as pre-vacation <i>Activities:</i> – <i>Experiences:</i> –
Strauss-Blasche, Ekmekcioglu & Marktl, 2000 ⁽²⁾	N pre-vac: 130 N post-vac 1: 53 N post-vac 2: 18 Country: Austria σ : 70% Age: 34 yr Occ: 57% manual workers, 43% white collar workers Contr.group: No Vacation features Duration: 14 days Timing: summer vacation Location: 76 % at home, 24 % at holiday resort	10 days before vacation <i>Outcome variables</i> Life satisfaction Physical complaints Quality of sleep Positive mood Negative mood	–	3 days after vacation <i>Outcome variables</i> Same as pre-vacation <i>Activities:</i> Activities during vacation <i>Experiences:</i> Recuperation	5 wk after vacation (32 days after post-vacation 1) <i>Outcome variables</i> Same as pre-vacation

Table 1. Continued

Author(s), year of publication*	Sample and design characteristics	Pre-vacation measurement(s)	During vacation measurement	Post-vacation measurement 1	Post-vacation measurement 2
Westman & Etzion, 2001 ²³⁾	N pre-vac: 126 N post-vac 1: 87 N post-vac 2: 87 Country: Israel σ^2 : 61% Age: 41 yr Occ: blue collar industrial workers Contr. group: No Vacation features Duration: 10 days Timing: Passover vacation (spring) Location: NR	10 days before vacation <i>Outcome variables</i> Exhaustion (physical, emotional, mental) Absenteeism for health reasons Absenteeism for other reasons (Company records, on aggregate level, not individually)	–	3 days after vacation <i>Outcome variables</i> Same as pre-vacation <i>Activities:</i> – <i>Experiences:</i> –	4 wk after vacation (25 days after post-vacation 1) <i>Outcome variables</i> Same as pre-vacation
Etzion, 2003 ²⁰⁾	N pre-vac: 58 N post-vac 1: 55 N post-vac 2: 55 N control: 55 Country: Israel σ^2 : 49% σ^2 control: 49% Age: 45 yr Age control: 43 yr Occ: employees at industrial enterprise Contr. group: Yes Vacation features Duration: NR, at least 1 wk Timing: summer vacation Location: NR	NR ((“(...)before the individual (...) went on vacation”) <i>Outcome variables</i> Exhaustion (physical, emotional, mental)	–	NR ((“immediately after he/she returned to work”) <i>Outcome variables</i> Same as pre-vacation <i>Activities:</i> – <i>Experiences:</i> Vacation satisfaction Detachment from workplace	3 wk after vacation <i>Outcome variables</i> Same as pre-vacation

Table 1. Continued

Author(s), year of publication*	Sample and design characteristics	Pre-vacation measurement(s)	During vacation measurement	Post-vacation measurement 1	Post-vacation measurement 2
Gilbert & Abdullah, 2004 ²¹⁾	N pre-vac: NR N post-vac 1: 355 N post-vac 2: – N control: 249 Country: United Kingdom σ^2 : 50% σ^2 control: 50% Age: 16–24:14%; 25–34:22%; 35–44:17%; 45–54:21%; 55–64:14%; 65–x:13% Age control: 16–24:16%; 25–34:18%; 35–44:16%; 45–54:15%; 55–64:11%; 65–x: 23% Occ: variety Occ control: variety Contr.group: Yes Vacation features Duration: NR, at least 4 nights Timing: whole year round Location: NR	NR (“...3,541 questionnaires were distributed at 2 points in time, during a 12-mo period”) <i>Outcome variables</i> Life satisfaction Satisfaction with... Interpersonal relationships Self Services and facilities Nation Economic situation Leisure Friends Family Home Neighborhood Health Positive affect Negative affect Current affect Job satisfaction	–	2–6 mo after first questionnaire (“(...) within a period of 2–6 mo after completion of the first questionnaire”) <i>Outcome variables</i> Same as pre-vacation <i>Activities:</i> – <i>Experiences:</i> –	–
Fritz & Sonnentag, 2006 ²²⁾	N pre-vac: 414 N post-vac 1: 221 N post-vac 2: 221 Country: Germany σ^2 : 15% Age: 46 yr Occ: Non-academic University employees Contr.group: No Vacation features Duration: NR, at least 1 wk Timing: NR Location: NR	7 days before vacation <i>Outcome variables</i> Exhaustion Disengagement Health complaints Work effort Task performance	NR (“The survey booklet had to be filled in (...) during vacation”) <i>Activities:</i> – <i>Experiences:</i> Relaxation experience Mastery experience Negative work reflection Positive work reflection Non-work hassles (e.g. conflicts, financial problems)	1–2 days after vacation <i>Outcome variables</i> Same as pre-vacation	2 wk after vacation (12–13 days after post-vacation 1) <i>Outcome variables</i> Same as pre-vacation

Studies presented in order of publication date, * = Number in brackets refers to number in reference list, NR = Not reported, – = Not measured, Occ = Occupation of participants, Contr. group: Control group.

reported^{21, 22}). In 1 case, vacation time of the respondents was in spring²³. In the remaining 4 studies^{12, 14, 18, 20}, participants went on vacation in summertime.

Location: In 5 of the 7 studies^{14, 20–23}, vacation location of the respondents was not reported^{14, 20–23}. In 2 studies, more than 75% of the participants stayed at home during their vacation (76%¹² and 87%¹⁸).

Pre-vacation measure

Timing of measurement: Two studies^{20, 21} did not report when the pre-vacation measure took place. Of the remaining 5 studies, Westman and Eden¹⁸ was the only study that collected measures at 2 pre-vacation time points (6 wk, and 3 days before vacation; they found no evidence for major differences between these 2 time points). In the study of Lounsbury and Hoopes¹⁴ data were collected 1 to 14 days (7 days on average) prior to vacation, and the 3 remaining studies fell into the same time range: 10^{12, 23}, and 7 days²².

Outcome variables: All studies measured the same health and well-being parameters pre- and post-vacation but the type of variables used varied: 4 studies measured exhaustion^{18, 20, 22, 23}, 3 measured health complaints^{12, 21, 22} and 3 measured general life satisfaction^{12, 14, 21}. Job satisfaction was measured in 2 different studies^{14, 21}, and several parameters were measured in only one study: e.g., negative mood¹², turnover intention¹⁴, and self-reported work effort²².

During vacation measure

Timing of measurement: Only 2 papers^{18, 22} incorporated a during vacation measurement. Westman and Eden¹⁸ scheduled their during vacation measure in the second week of the vacation. Fritz and Sonnentag²² did not report when exactly their vacation measurement took place.

Activities and experiences during vacation: Only Fritz and Sonnentag²² asked their respondents about their vacation experiences when actually on vacation. They investigated experiences during vacation in a detailed way, by gathering information on relaxation and mastery experiences, positive and negative work reflection and non-work hassles.

Post-vacation measure 1

Timing of measurement: Etzion²⁰ did not report when the first post-vacation measure took place. Gilbert and Abdullah²¹ took their only post-vacation measure 2 to 6 months after the pre-vacation measure. The remaining 5 studies^{12, 14, 18, 22, 23} scheduled their first post-vacation measure within the first week of returning to work (3 days on average).

Activities during vacation: At post-vacation 1, i.e. retrospectively, 2 studies collected information about vacation activities^{12, 14}.

Experiences during vacation: 3 papers^{21–23} gathered no information about vacation experiences post hoc. Three of the remaining studies^{14, 18, 20} asked respondents about their vacation satisfaction in retrospect. Strauss-Blasche *et al.*¹² and Etzion²⁰ included questions about recuperation during vacation and detachment from the workplace respectively.

Post-vacation measure 2

Timing of measurement: Five studies^{12, 18, 20, 22, 23} adopted a second post-vacation measure. Post-vacation 2 measures were collected 2 wk after vacation (12–13 days after post vac 1) in Fritz and Sonnentag²², 3 wk (18 days after post-vacation 1) in Westman and Eden¹⁸ and Etzion²⁰, and 4 wk (25 days after post-vacation 1) in Westman & Etzion²³. Strauss-Blasche *et al.*¹² had the longest time interval: 5 wk after vacation (32 days after post-vacation 1).

Research question 1: Vacation effect?

We calculated the pre-vacation–post-vacation 1 difference in health and well being indicators (‘vacation effect’) in all 7 studies. The time span between these 2 time points was unknown in 3 studies: there was no data available on vacation duration²² or pre-vacation time point, vacation duration and post vacation 1 time point^{20, 21}. The time span between the pre- and post-vacation 1 time points in the other 4 studies ranged between 19¹⁴, 20¹⁸, 23²³ and 27 days¹².

First we calculated, within every study, effect sizes for every outcome variable in that study. Then, we calculated general effect sizes for every study, i.e. averaged the number of effect sizes in each study (Table 2).

The minimum number of outcome variables per study was 1^{18, 20, 23} and the maximum number was 17²¹. Within the 7 papers 36 outcome variables were studied, hence 36 effect sizes were calculated. Thirty of these of these were positive (improvement in well-being) and 6 negative (decrease in well-being). The 6 negative effect sizes were small (mean $d = -0.18$) and of the positive effect sizes, 21 were small, 6 were medium, and 3 were large.

Large effect sizes were found for health complaints ($d = +1.01$ ¹⁹) and exhaustion ($d = +0.92$ ¹⁸). The average effect sizes per study varied from -0.05 ¹⁴ to $+0.92$ ¹⁸. The overall mean d across 7 studies was $+0.43$, indicating a small positive vacation effect.

In the 2 control group studies, Etzion²⁰ found a small “pre–post vacation 1” increase in exhaustion in the control group ($d = -0.12$). The “post-vacation 1” difference in exhaustion between vacationers and non-vacationers was small ($d = +0.35$), with non-vacationers reporting more exhaustion. Gilbert and Abdullah²¹ found negative changes for the control group on all outcome variables, indicative of deterioration in well-being (mean $d = -0.27$). The difference between non-holiday and holiday takers

Table 2. Means, standard deviations and effect sizes for vacation effect on all outcome variables for each study

Study *	Outcome variable	Mean pre-vac	SD pre-vac	Mean post-vac 1	SD post-vac 1	Cohen <i>d</i>	Mean <i>d</i>
Lounsbury & Hoopes, 1986 ¹⁴⁾	Life satisfaction	24.87	5.68	23.83	6.36	+ 0.40	– 0.05
	Job involvement/interest	21.17	4.88	22.10	4.61	– 0.48	
	Job involvement/valued self	11.43	3.18	11.68	3.21	+ 0.16	
	Organizational commitment	10.51	2.56	10.65	2.69	+ 0.10	
	Turnover intention	3.80	0.98	3.67	0.99	– 0.26	
	Job satisfaction	22.08	5.71	21.51	5.69	– 0.23	
Westman & Eden, 1997 ¹⁸⁾	Exhaustion	3.30	0.60	3.03	0.62	+ 0.92	+ 0.92
Strauss–Blasche, Ekmekcioglu & Marktl, 2000 ¹²⁾	Life satisfaction	NR	NR	NR	NR	+ 0.04	+ 0.53
	Physical complaints	NR	NR	NR	NR	+ 0.82	
	Quality of sleep	NR	NR	NR	NR	+ 0.45	
	Positive mood	NR	NR	NR	NR	+ 0.66	
	Negative mood	NR	NR	NR	NR	+ 0.67	
Westman & Etzion, 2001 ²³⁾	Exhaustion	2.89	0.65	2.70	0.99	+ 0.35	+ 0.35
Etzion, 2003 ²⁰⁾	Exhaustion	2.59	0.54	2.44	0.59	+ 0.46	+ 0.46
Gilbert & Abdullah, 2004 ²¹⁾	Life satisfaction (1 item)	6.99	1.23	7.11	1.20	+ 0.23	+ 0.33
	Life satisfaction (scale)	30.78	7.12	31.78	7.59	+ 0.31	
	Positive affect	60.47	12.24	63.58	11.79	+ 0.45	
	Negative affect	31.22	14.28	30.21	14.44	+ 0.12	
	Current affect	29.30	22.77	33.29	23.13	+ 0.30	
	Satisfaction friends	7.25	1.15	7.24	1.07	–0.01	
	Satisfaction family	7.22	1.50	7.20	1.42	–0.03	
	Satisfaction home	6.85	1.31	6.94	1.26	+0.16	
	Satisfaction relationships	6.80	1.06	7.02	1.02	+0.49	
	Satisfaction econ. situation	6.75	1.43	6.97	1.22	+0.37	
	Satisfaction leisure	6.34	1.45	6.53	1.22	+0.33	
	Satisfaction neighborhood	6.29	1.36	6.49	1.30	+0.34	
	Satisfaction self	6.22	1.22	6.55	1.20	+ 0.62	
	Satisfaction services	6.12	1.23	6.39	1.11	+0.54	
	Satisfaction health	5.97	1.42	6.22	1.44	+0.21	
	Satisfaction nation	4.75	1.19	5.15	1.32	+0.73	
	Job satisfaction	6.42	1.29	6.67	1.19	+0.47	
Fritz & Sonnentag, 2006 ²²⁾	Health complaints	1.94	0.47	1.59	0.35	+1.01	+0.46
	Exhaustion	2.18	0.55	2.05	0.55	+0.45	
	Disengagement	2.10	0.53	2.06	0.53	+0.15	
	Task performance	4.51	0.49	4.49	0.54	–0.05	
	Work effort	2.90	1.14	2.26	1.15	+ 0.74	
Total							+0.43

*= Number in brackets refers to number in reference list, + = positive effect, improvement in health and/or well-being, – = negative effect, decrease in health and/or well-being, Mean pre-vac= mean at pre-vacation, SD pre-vac= standard deviation at pre-vacation, Mean post-vac 1= mean at post vacation 1, SD post-vac 1= standard deviation at post-vacation1, NR= Not reported in study.

Table 3. Effect sizes for vacation effect in homogeneous outcome variables used in 3 or more different studies

Outcome variables	Study*	Cohen <i>d</i>	Mean Cohen <i>d</i> corrected for more than 1 indicator per study	Mean Cohen <i>d</i>
Exhaustion (4 studies)				+ 0.55
Exhaustion	Westman & Eden, 1997 ¹⁸⁾	+ 0.92	+ 0.92	
Exhaustion	Westman & Etzion, 2001 ²³⁾	+ 0.35	+ 0.35	
Exhaustion	Etzion, 2003 ²⁰⁾	+ 0.46	+ 0.46	
Exhaustion	Fritz & Sonnentag, 2006 ²²⁾	+ 0.45	+ 0.45	
Health complaints (3 studies)				+ 0.68
Physical complaints	Strauss-Blasche <i>et al.</i> , 2000 ¹²⁾	+ 0.82	+ 0.82	
Satisfaction with health	Gilbert & Abdullah, 2004 ²¹⁾	+ 0.21	+ 0.21	
Health complaints	Fritz & Sonnentag, 2006 ²²⁾	+ 1.01	+ 1.01	
Life satisfaction (3 studies)				+ 0.24
Life satisfaction	Lounsbury & Hoopes, 1986 ¹⁴⁾	+ 0.40	+ 0.40	
Life satisfaction	Strauss-Blasche <i>et al.</i> , 2000 ¹²⁾	+ 0.04	+ 0.04	
Life satisfaction (item)	Gilbert & Abdullah, 2004 ²¹⁾	+ 0.23		
Life satisfaction (scale)	Gilbert & Abdullah, 2004 ²¹⁾	+ 0.31	+ 0.27	

*= Number in brackets refers to number in reference list, + = Positive effect, improvement in health and/or well-being, – = Negative effect, decrease in health and/or well-being.

at “post-vacation 1” was small (mean $d = +0.50$), the former reported a lower well-being.

Next, a fine-grained analysis for the homogenous outcome categories exhaustion, life satisfaction, and health complaints was conducted (Table 3). Effect sizes for the category *exhaustion* (4 studies) varied from +0.35²³⁾ to +0.92¹⁸⁾. The average d was +0.55, indicating a medium vacation effect.

Concerning *health complaints*, effect sizes were +1.01²²⁾, +0.21²¹⁾ and +0.82¹²⁾. The average effect size was +0.68, indicating a medium effect.

Finally, a small average effect size ($d = +0.24$) was found for the category *life satisfaction*. Cohen’s d ranged between +0.04¹²⁾, +0.27²¹⁾ and +0.40¹⁴⁾.

Research question 2: Fade out?

The concept of ‘fade out’ supposes the a priori existence of an effect. Vacation effects can only disappear when they were present in the first place, i.e. at post-vacation 1. Our analysis was thus based upon those 4 studies that employed 2 post-vacation measures, and found a positive vacation-effect^{18, 20, 22, 23)}. Note that Strauss-Blasche *et al.*¹²⁾ included a post-vacation 2 measure too, but they neither compared their outcome variables at this time point with those at post-vacation 1, nor reported means and standard deviations at the different measurement occasions.

In 4 studies that compared post-vacation 1 and 2^{18, 20, 22, 23)} effect sizes could be calculated for exhaustion. In addition,

in the study of Fritz and Sonnentag²²⁾ also 3 other effect sizes could be calculated. Single outcome effect sizes per study were –0.02²⁰⁾, –0.12²²⁾, –0.28²³⁾ and –1.08¹⁸⁾. In the study of Fritz and Sonnentag²²⁾ effect sizes ranged from +0.08 to –0.49.

From the total of 7 different outcome variables, 1 had a positive sign, 1 was 0, and 5 had a negative sign meaning that in most cases well-being decreased between post-vacation 1 and 2. The positive effect size was negligibly small ($d = +0.08$). Within the 5 negative effect sizes, 4 were small and 1 large. This large effect size was found for exhaustion ($d = -1.08$ ¹⁸⁾).

The overall mean d across 4 studies was –0.38, indicating a small fade out effect. Table 4 further shows the time span between the 2 post-vacation measures that varied between approximately 2 to 4 wk. As there were only 2 post-vacation measures in all 4 studies and the minimum fade out interval was 12–13 days after vacation²²⁾, it was impossible to study the specific course of fade out and to determine when fade out began and when pre-vacation base levels were reached again.

Only Etzion²⁰⁾ compared scores on 2 measures in a non-vacation group taken at the same time as post-vacation 1 and 2 in the vacation group. She found a small positive effect ($d = +0.22$) meaning that exhaustion decreased in the control group in the time between the second and the third measurement occasion. The difference between vacationers and non-vacationers was +0.19 on “post-vacation 2”, meaning that non-vacationers

Table 4. Means, standard deviations and effect sizes for fade out on all outcome variables for each study

Study*	Outcome variable	Time span post 1-post 2	Mean post-vac 1	SD post-vac 1	Mean post-vac 2	SD post-vac 2	Cohen <i>d</i>	Mean <i>d</i>
Westman & Eden, 1997 ¹⁸⁾	Exhaustion	18 days	3.03	0.62	3.35	0.62	-1.08	-1.08
Westman & Etzion, 2001 ²³⁾	Exhaustion	25 days	2.70	0.99	2.92	0.94	-0.28	-0.28
Etzion, 2003 ²⁰⁾	Exhaustion	21 days (post-vacation 1 immediatly after returning to work)	2.44	0.59	2.45	0.66	-0.02	-0.02
Fritz & Sonnentag, 2006 ²²⁾	Health complaints	12-13 days	1.59	0.35	1.71	0.42	-0.49	-0.12
	Exhaustion		2.05	0.55	2.03	0.56	+0.08	
	Disengagement		2.06	0.53	2.06	0.54	0.00	
	Work effort		2.26	1.15	2.31	1.15	-0.07	
Total								-0.38

* =Numbers in brackets refer to number in reference list, time span post 1–post 2= time span between post-vacation 1 and post-vacation 2, + =Positive effect, improvement in health and/or well-being, – =Negative effect, decrease in health and/or well-being, Mean post-vac 1=mean at post-vacation 1, SD post-vac 1= standard deviation at post-vacation 1, Mean post-vac 2=mean at post-vacation 2, SD post-vac 2=standard deviation at post-vacation 2.

were slightly more exhausted than their vacation taking fellows.

Again, we performed a fine-grained analysis of homogeneous outcome variables, measured in 3 or more different studies. Only exhaustion met this criterion (4 studies). The average effect size was small ($d = (-0.02) + (-1.08) + (-0.28) + 0.08/4 = -0.33$).

Research question 3a: Activities on vacation?

Only 2 of 7 studies collected data during vacation. However, neither study^{18, 22)} collected information about what vacationers actually did during their holiday. Two other studies^{12, 14)} collected information on vacation activities in retrospect, i.e. at post vacation 1. These studies reported percentages that were spent on certain activities (e.g., traveling, reading, sight seeing) but did not relate these percentages to the outcome variables. This means that research question 3a could not be addressed.

Research question 3b: Experiences on vacation?

One study²²⁾ collected information on vacation experiences during the vacation itself. Four other studies^{12, 14, 18, 20)} collected information on vacation experiences at post vacation 1 when respondents had already resumed working.

Vacation satisfaction was measured in 3 studies^{14, 18, 20)} and appeared to be positively related to job satisfaction and life satisfaction¹⁴⁾ and negatively to exhaustion¹⁸⁾,

whereas Etzion²⁰⁾ found no such relationship with exhaustion. Etzion²⁰⁾ also retrospectively collected information on detachment from work during the vacation and did not find a relationship with post-vacation exhaustion, whereas Strauss-Blasche *et al.*¹²⁾ found that well-being at post-vacation was higher among those respondents who reported sufficient recuperation during vacation as compared to those who indicated that recuperation during vacation was insufficient.

In the only 'during vacation study' Fritz and Sonnentag²²⁾ tested the effect of vacation experiences on health indicators after vacation. Positive (e.g. relaxation) as well as negative experiences (e.g. negative work reflexion) were related to almost all outcome variables. Within these experiences, negative work reflexion seemed to play a major role: respondents engaging in negative work reflexion during vacation reported also lower well-being on post-vacation 1.

In sum, only 1 study²²⁾ measured vacation experiences when actually on vacation. This study found evidence in support of a temporal relation between vacation experiences and outcome variables: positive experiences were related to improved well-being after vacation whereas negative experiences had the opposite effect. Of the 4 studies that collected information on vacation experiences after returning to work (mostly vacation satisfaction), 2 studies reported positive cross-sectional associations between vacation satisfaction and outcome variables^{14, 18)}, whereas 1 study²⁰⁾ did not.

Discussion

The aim of this meta-analysis was to find out if vacation had a positive impact on health and well-being, how long such beneficial effects would last, and whether vacation activities and experiences were related to these outcomes. In a stepwise approach 7 studies were identified that could shed light on these questions.

Vacation effect

There was evidence for a small effect of vacation on health and well-being. The average d was + 0.43, indicating that well-being improved slightly following a vacation. In accordance with effort-recovery theory^{1,2}, the vacation effect was more prominent among outcome variables that were closer to the core of the concept 'health and well-being', than among more distal variables. Thus, health complaints and exhaustion as proximal health indicators improved more than life satisfaction as a more distal indicator.

As only 4 studies reported the duration of the vacation, the relation between the magnitude of effects and vacation length could not be determined. Future research should address this relation, eventually pointing to an "optimum point of recovery". Subsequently, such knowledge could be applied to develop guidelines for the scheduling and duration of vacations.

Fade out

There was also evidence for the post-vacation disappearance of vacation effects 2 to 4 wk post-vacation. The average d was -0.38. Regrettably the available information was too limited to evaluate the precise course of fade out and hence the duration of vacation effects. It seems that (entire or partial) fade out took place within 2 to 4 wk post-vacation but since the second post-vacation measure was scheduled at least 2 wk after vacation in all 4 studies, we were not able to determine when beneficial effects on different variables exactly started to diminish and were erased. Simple and frequent measures from the day of return until 8 wk after vacation would contribute to a better understanding of the course of fade out.

Another interesting question is which factors might prolong vacation effects and delay fade out²⁴. Methods borrowed from cognitive therapy (e.g., brief daily writing about positive vacation experiences) could be useful for this purpose.

Vacation activities and experiences

The role of vacation activities and experiences on vacation effects remains unclear hitherto. Vacation activities as moderators of vacation effects have not been studied yet, while they may be important behavioural determinants of positive and negative vacation outcomes.

The few results regarding vacation experiences suggest that vacation satisfaction as well as negative work reflection do play a major role in influencing vacation outcomes in a positive or negative way respectively. But until now most reports on vacation experiences were potentially biased because data were collected after returning home. To overcome this problem, researchers need to include measurement occasions during vacation and ask respondents about vacation expectations, activities (e.g. active versus passive, voluntary versus involuntary activities), uplifts, hassles and (dis)satisfaction.

Surprisingly there was even very limited information on basic vacation features like timing and location available. Even the (average) vacation duration was not reported in 3 cases. Most studies dealt with summer vacations. Furthermore, it remains unclear in 5 studies if participants stayed at home during their vacation or 'left their house and went away'^{14,20-23}. As spending time at a holiday resort may well differ from spending time in one's regular surroundings, future vacation research should report vacation timing and location, to interpret findings in this light and to compare different vacation features.

Methodological considerations

An intriguing issue in vacation research is the question of causality, i.e. were differences in outcome variables before and after vacation indeed due to vacation? In many cases there were plausible rival hypotheses, e.g., that pre-post vacation changes in work demands may account for pre-post differences in health outcomes. Eden²⁴ called this tendency of attributing changes in outcomes to vacation the "*post hoc ergo propter hoc* inference fallacy". Only an intensified repeated measure strategy can overcome this problem of limited internal validity in the future.

Another frequent problem of earlier studies is the small number of respondents and the accompanying attrition, possibly due to difficult recruitment and low compliance. This might be counteracted by close collaborations with travel agencies, attractive rewards for participants and devoted respondent care. The use of different kinds of attractive new media (e.g. palm pilots, online surveys, mobile phones) could also support participant compliance and prevent attrition.

The absence of a control group in most of the studies is also problematic. This deficiency may partly be due to the fact that randomization into experimental and control groups is difficult, if not impossible in vacation research. Accordingly holiday and non-holiday takers will differ anyway because non-vacationers may have many reasons for not going on vacation like illness, lack of funds or abundance of work. The use of an internal referencing strategy instead of a control group might be

a better way to strengthen internal validity²⁵). In this approach, additional variables are included that are similar to the outcome variables but that are theoretically not expected to change because of a treatment (i.e. vacation in our example). If these control variables do not change, whilst 'real' outcome variables do, this is interpreted as empirical support for a true vacation effect. An example for such a variable is teamwork competency.

A final shortcoming is the use of only self-reports in vacation research. With most reviewed authors we agree that the use of other 'objective' measures like performance ratings and physiological measures would be desirable.

Suggestions for future vacation research

Vacation research will profit from better designs, which boils down to the principle of repeated measurements. Vacation research necessarily requires research on vacation: the assessment of vacation activities and experiences during vacation itself. A suitable framework for structuring diverse measurement occasions around a vacation period was developed by Westman and Eden¹⁸) and consists of 2 pre-, 1 inter- and 2 post-vacation measurements. Its application may well contribute to the comparability of future vacation research findings.

As discussed above, resolutions for earlier methodological problems, the detailed investigation of the fade out process by means of brief daily measures, studies on optimal vacation duration, frequency and timing, and the design and evaluation of interventions to prolong positive vacation effects, deserve a place on the vacation research agenda.

Although in general neuroendocrine and cardiovascular measures are quite difficult and costly to apply in field settings, applications in vacation research may even be more difficult as participants are out of sight of the researcher for a relatively long period and daytime activity cannot be controlled for. However, as chronic incomplete recovery may manifest itself in a disturbed balance of sympathetic and parasympathetic activity, also during sleep^{e.g. 26-30}), a possibility for collecting physiological measures during a vacation period would be, for instance, during night time. During sleep, parasympathetic activation with its main restorative function should be dominant, but high blood pressure levels, high heart rate, low heart rate variability and high levels of catecholamine in morning urine would be strong markers of high sympathetic and low parasympathetic activation, and thus, indicative of disturbed restorative functions and incomplete recovery.

Typically, moderators of vacation effects have hardly been studied. Still, vacation research will benefit from the inclusion of moderators in the work context (e.g., job stressors, job type), the non-work context (e.g., culture, relational problems, economic hardship) and person characteristics (e.g., self-efficacy, workaholism).

Moreover, different vacation features (duration, timing and location) should be investigated and reported accurately to compare the effect of different vacation types on outcome variables.

In conclusion, much has been learned from previous vacation studies. The general picture that emerges from these pioneering studies is that vacation positively, though weakly, impacts well-being but that those positive effects do not last long. Future vacation research may benefit from multiple measurements: pre-vacation and post-vacation but especially during vacation.

References

- 1) Meijman TF, Mulder G. Psychological aspects of workload. In: Drenth PJD, Thierry H, De Wolff CJ, editors. *Handbook of Work and Organizational Psychology*. East Sussex (UK): Psychology Press, Hove; 1998. p.5-33.
- 2) Geurts SAE, Sonnentag S. Recovery as an explanatory mechanism in the relation between acute stress reactions and chronic health impairment. *Scand J Work Env Hea* 32, 482-492 (2006)
- 3) Clow A. The physiology of stress. In: Jones F, Bright J, editors. *Stress, Myth, Theory, and Research*. Harlow (UK): Prentice Hall; 2001. p.47-61.
- 4) McEwen BS. Stress, adaptation, and disease: allostasis and allostatic load. *Ann NY Acad Sci* 1998; 840: 33-44.
- 5) Sterling P, Eyer J. Allostasis: a new paradigm to explain arousal pathology. In: Fisher S, Reason J, editors. *Handbook on Life Stress, Cognition, and Health*. Chichester (UK): Wiley; 1990. p.629-49.
- 6) Tucker P. The impact of rest breaks upon accident risk, fatigue and performance: a review. *Work Stress* 2003; 17: 123-137.
- 7) Härmä MD. Workhours in relation to work stress, recovery and health. *Scand J Work Env Hea* 2006; 32: 502-514.
- 8) Van der Hulst M. Long work hours and health. *Scand J Work Env Hea* 2008; 29: 171-88.
- 9) Beckers D, Van der Linden D, Smulders PGW, Kompier M, Van Veldhoven MJPM, Van Yperen NW. Working overtime hours: relations with fatigue, work motivation, and the quality of work. *J Occup Environ Med* 2004; 46: 1282-9.
- 10) Totterdell P, Spelten E, Smith L, Barton J, Folkard S. Recovery from work shifts: how long does it take? *J Appl Psychol* 1995; 80: 43-57.
- 11) Sluiter JK, Frings-Dresen MH, Meijman TF, Van der Beek AJ. Reactivity and recovery from different types of work measured by catecholamines and cortisol: a systematic literature review. *Occup Environ Med* 2000; 57: 289-315.
- 12) Strauss-Blasche G, Ekmekcioglu C, Marktl W. Does vacation enable recuperation? Changes in well-being associated with time away from work. *Occup Med* 2000; 50: 167-72.
- 13) Strauss-Blasche G, Ekmekcioglu C, Marktl W. Moderating effects of vacation on reactions to work

- and domestic stress. *Leisure Sci* 2002; 24: 237–49.
- 14) Lounsbury JW, Hoopes LL. A vacation from work: changes in work and nonwork outcomes. *J Appl Psychol* 1986; 71: 392–401.
 - 15) Hoopes LL, Lounsbury JW. An investigation of life satisfaction following a vacation: a domain specific approach. *J Community Psychol* 1989; 17: 129–40.
 - 16) Etzion D, Westman M. Job stress, vacation, and the crossover of strain between spouses- stopping the vicious cycle. *Man and Work* 2001; 11: 106–18.
 - 17) Eden D. Acute and chronic job stress, strain, and vacation relief. *Organ Behav Hum Dec* 1990; 45: 175–93.
 - 18) Westman M, Eden D. Effects of a respite from work on burnout: vacation relief and fade-out. *J Appl Psychol* 1997; 82: 516–27.
 - 19) Cohen J. *Statistical power analysis for the behavioral sciences*. Hillsdale (New Jersey): Lawrence Erlbaum Associates; 1988.
 - 20) Etzion D. Annual vacation: duration of relief from job stressors and burnout. *Anxiety Stress Copin* 2003; 16: 213–26.
 - 21) Gilbert D, Abdullah J. Holidaytaking and the sense of well-being. *Ann Tourism Res* 2004; 31: 103–21.
 - 22) Fritz C, Sonnentag S. Recovery, well-being, and performance-related outcomes: the role of workload and vacation experiences. *J Appl Psychol* 2006; 91: 936–45.
 - 23) Westman M, Etzion D. The impact of vacation and job stress on burnout and absenteeism. *Psychol Health* 2001; 16: 95–106.
 - 24) Eden D. Vacations and other respites: studying stress on and off the job. In: Cooper C, Robertson IT, editors. *Well-being in organizations*. West Sussex (UK): John Wiley & Sons, Ltd; 2001. p.305–30.
 - 25) Haccoun RR, Hamtiaux T. Optimizing knowledge tests for inferring learning acquisition levels in single group training evaluation designs: the internal referencing strategy. *Pers Psychol* 1994; 47: 593–604.
 - 26) Akerstedt T. Psychosocial stress and impaired sleep. *Scand J Work Environ Health* 2006; 32: 493–501.
 - 27) Dahlgren A, Kecklund G, Akerstedt T. Overtime work and its effects on sleep, sleepiness, cortisol and blood pressure in an experimental field study. *Scand J Work Environ Health* 2006; 32: 318–27.
 - 28) Hall M, Vasko R, Buysse D, et al. Acute stress affects heart rate variability during sleep. *Psychosom Med* 2004; 66: 56–62.
 - 29) Brosschot JF, Van Dijk E, Thayer JF. Daily worry is related to low heart rate variability during waking and the subsequent nocturnal sleep period. *Int J Psychophysiol* 2007; 63: 39–47.
 - 30) Rau R, Triemer A. Overtime in relation to blood pressure and mood during work, leisure, and night time. *Soc Indic Res* 2004; 67: 51–73.