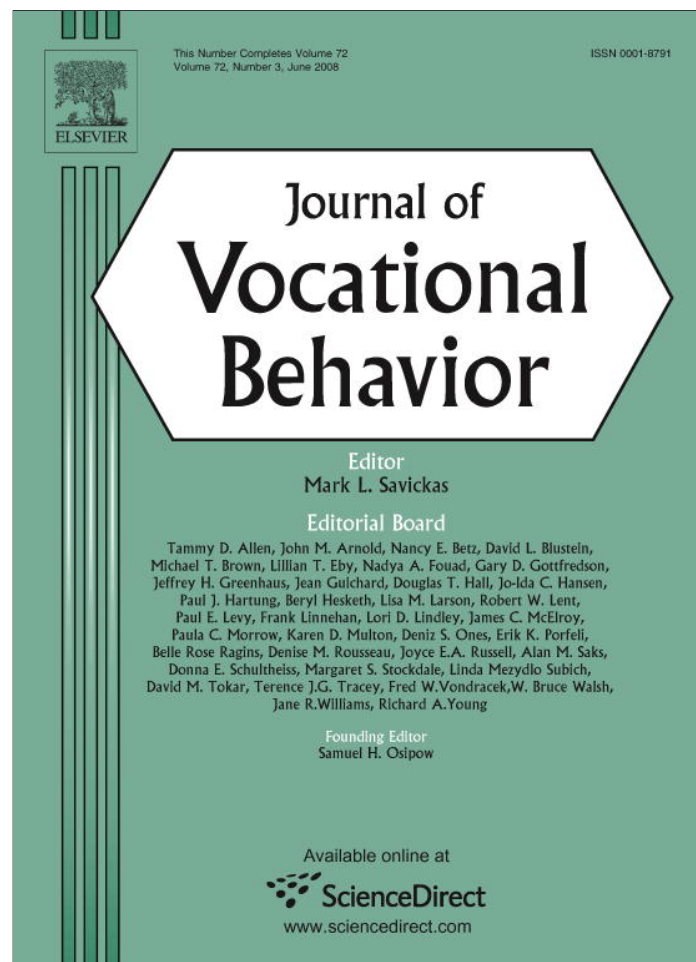


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The work-related flow inventory: Construction and initial validation of the WOLF

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Abstract

The WORK-reLated Flow inventory (WOLF) measures flow at work, defined as a short-term peak experience characterized by absorption, work enjoyment, and intrinsic work motivation. Results of Study 1 among 7 samples of employees (total $N = 1346$) from different occupational groups offer support for the factorial validity and reliability of the WOLF. Study 2 examined the validity of the WOLF in more detail among some of the samples. Positive correlations between a general flow index and the three flow dimensions confirm the convergent validity of the WOLF. In addition, the findings of Study 2 provide evidence for the construct and predictive validity of the WOLF using five job characteristics as predictors of flow, and other-ratings of performance as outcomes.

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1. Introduction

Flow is a state of consciousness where people become totally immersed in an activity, and enjoy it intensely. According to Csikszentmihalyi (1997), such a peak experience may emerge in any situation in which there is activity. Researchers have indeed found evidence for flow during the performance of a large number of different activities, including sports (e.g., golf, athletics and swimming), creating art, and playing music (Catley & Duda, 1997; Csikszentmihalyi & Csikszentmihalyi, 1988; Csikszentmihalyi & LeFevre, 1989; Jackson & Marsh, 1996; Kowal & Fortier, 1999). In the present research, the phenomenon of flow was examined in the work situation. The central aim was to develop a reliable and valid instrument to measure flow-experiences at work.

1.1. Flow at work

The most prominent definitions of flow have three elements in common, namely absorption (i.e., the total immersion in an activity), enjoyment, and intrinsic motivation. These three elements are the core components

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that are usually included in flow research (e.g., Csikszentmihalyi, 1997; Csikszentmihalyi & Csikszentmihalyi, 1988; Csikszentmihalyi, Rathunde, & Whalen, 1993; Larson & Richards, 1994). Accordingly, when flow is applied to the work situation, it can be defined as a short-term peak experience at work that is characterized by absorption, work enjoyment and intrinsic work motivation (Bakker, 2005). *Absorption* refers to a state of total concentration, whereby employees are totally immersed in their work. Time passes quickly, and they forget everything around them (cf. Csikszentmihalyi, 1990). Employees who *enjoy* their work and feel happy make positive judgments about the quality of their working life (cf. Veenhoven, 1984). This enjoyment or happiness is the outcome of cognitive and affective evaluations of the flow experience (cf. Diener, 2000; Diener & Diener, 1996). Finally, *intrinsic motivation* refers to performing a certain work-related activity with the aim of experiencing the inherent pleasure and satisfaction in the activity (cf. Deci & Ryan, 1985). Intrinsically motivated employees are continuously interested in their work (Harackiewicz & Elliot, 1998). Employees who are motivated by the intrinsic aspects of their work tasks want to continue their work; they are fascinated by the tasks they perform.

1.2. What are the possible causes of flow?

Csikszentmihalyi's (1997) experience sampling studies have shown that people more often experience flow during their work than during free time. This means that one has to invest time and energy to experience flow. Researchers generally agree that the occurrence of flow is most likely when people perceive a balance between the challenge of a situation and their own skills to deal with this challenge (e.g., Clarke & Haworth, 1994; Csikszentmihalyi, 1990; Ellis, Voelkl, & Morris, 1994; Massimini & Carli, 1988). For example, a professional tennis player experiences a balance when she is confronted with an opponent who is approximately equally skilled in the game. An exciting game should evolve in this situation because the tennis players have to do their utmost to beat their opponent. In contrast, theoretically, there is a higher probability of boredom if the opponent has fewer skills (low challenge in the situation, higher relative skill level of the individual), and a high probability of stress if the opponent is much better (high challenge, lower relative skill level of the individual). There is some empirical evidence for this pattern of experiences (e.g., Csikszentmihalyi, 1997; Edwards, 1996; Massimini & Carli, 1988).

Applied to the work situation, this means that employees should particularly experience flow when their job demands match their professional skills. There is balance when an experienced personnel selection officer is challenged to find work for an unskilled employee in a tight labor market, or when employees of a wreck removal company are able to remove a shipwreck from the bottom of the sea with intense effort under difficult weather circumstances. These goals will particularly be reached when employees have certain skills (cf. the Person-Environment fit model; Edwards, 1996), or have a sufficient amount of resources in their work, e.g., support from colleagues, performance feedback, good material, and supervisory coaching (Bakker & Demerouti, 2007; see also Csikszentmihalyi, 2003). Research with the Job Demands – Resources (JD-R) model (Bakker & Demerouti, 2007; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001) has shown that job resources make a positive contribution to the engagement and performance of individuals. Moreover, resources such as opportunities for self-development and performance feedback enable employees to better cope with the demands of their work (Bakker, Demerouti, & Euwema, 2005).

The central aim of the present two studies was to develop a reliable and valid instrument for the assessment of work-related flow. The WO^{rk}-reL^{ated} Flow inventory (henceforth, WOLF) will be evaluated regarding several psychometric properties. Study 1 focused on its factorial validity, and its (test–retest) reliability. Study 2 addressed the construct (including convergent) validity, and the predictive validity of the WOLF.

2. Study 1

On the basis of the literature review, it is assumed that it is possible to discriminate between three independent flow-dimensions. Seven samples of employees from different occupational groups were asked to fill out a questionnaire for the measurement of flow at work. The data from the first sample was used for exploratory factor analysis. Next, the factor-structure found in Sample 1 was cross-validated in the other six samples. Fur-

thermore, the reliability of the WOLF was determined by calculating the internal consistencies of the subscales for each sample, and by examining the test–retest reliabilities in one of the samples.

2.1. Method

2.1.1. Participants and procedure

The study was conducted among seven samples of employees from different occupational groups and companies in The Netherlands. All samples were used to examine the reliability and factorial validity of the WOLF. Table 1 gives an overview of the sectors in which the participants work, the sample sizes, response rates, participants' gender, age, organizational tenure, type of contract (i.e., full-time vs. part-time), and educational level. The participants work in different organizations and occupational groups. As displayed in the table, included were employees of an insurance company, a local TV station, an agency for temporary work, self-employed trainers, and the human service professions (e.g., business and health care). Participants of heterogeneous Sample 3 were employed in the following sectors: industrial work (6.9%), construction (.7%), trade (5.6%), pubs and restaurants (1.4%), transportation (8.3%), financial institutions (1.4%), business services (28.5%), communications (6.9%), government (13.2%), education (1.4%), health care (12.5%), culture and recreation services (8.3%), or other (4.9%). Participants of Sample 4 were employed in industrial work (4.0%), trade (2.4%), transportation (1.6%), financial institutions (8.9%), business services (13.7%), communications (4.8%), government (16.9%), education (8.1%), health care (15.3%), culture and recreation services (4.8%), or other (15.5%).

The total sample size was 1346. There are some differences regarding the procedure that was followed for the seven samples. Samples 1, 3, 5 and 7 participated in questionnaire research that was conducted with the help of research assistants. For each sample, we contacted the personnel department of the organization, and discussed how the employees could best be approached. Employees first received newsletters or were informed through personnel magazines, and then received a questionnaire at work. Sample 2 concerned a survey among the employees of a regional TV station in which I collaborated with an occupational health services company. In this research, employees received the questionnaire at home. For Sample 4, people were recruited by means of an announcement in a daily newspaper that is freely distributed in railway stations. Finally, Sample 6 was

Table 1
Demographic characteristics of the participants in the seven samples, total $N = 1346$

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
Sector	Insurance company	TV station	Heterogeneous sample	Heterogeneous sample	Agency for temporary work	Self-employed trainers	Human service professionals
<i>N</i>	275	84	137	118	405	181	146
Response	63%	71%	80%	92%	65%	18%	43%
Age	39.05 (11.00)	36.29 (7.04)	35.77 (9.50)	42.91 (9.70)	29.88 (5.79)	41.61 (8.96)	37.55 (10.66)
Job tenure	16.96 (11.92)	6.08 (4.81)	6.37 (6.40)	10.53 (10.69)	3.61 (3.78)	8.67 (7.24)	13.66 (11.20)
<i>Gender</i>							
Male	60%	67%	69%	46%	26%	63%	45%
Female	40%	33%	31%	54%	74%	37%	55%
<i>Type of contract</i>							
Full-time	87%	88%	85%	64%	83%	100%	64%
Part-time	7%	12%	5%	33%	17%	0%	36%
Other	6%	—	10%	3%	—	—	—
<i>Education</i>							
University degree	38%	7%	35%	31%	27%	45%	36%
Higher vocational training	34%	46%	31%	33%	64%	44%	32%
High school	28%	47%	34%	36%	9%	11%	32%

approached through the Internet; 1000 trainers were approached over e-mail and requested to fill in a short on-line questionnaire. The anonymity and confidentiality of the data was emphasized and guaranteed.

2.1.2. The *Work-reLated Flow inventory (WOLF)*

Flow was operationalized with an original set of 16 items. Items were generated by the author, and checked for face validity by five organizational psychologists who also gave feedback on writing style. On the basis of exploratory factor analyses and reliability analyses, this set was reduced to 13 items. Three flow dimensions are measured, namely absorption (4 items), work enjoyment (4 items), and intrinsic work motivation (5 items). [Appendix 1](#) shows the complete instrument for the measurement of flow at work (the WOLF). Respondents indicated how often they experienced elements of flow on a seven point scale (1 = never, 7 = always). The flow experience refers to a short time period, i.e., the preceding days or weeks.

2.2. Results

2.2.1. Exploratory factor analysis

Flow is best measured with three independent dimensions. An exploratory factor analysis (principal components method) using varimax rotation was carried out on the 16 flow items using the data collected from Sample 1. This analysis resulted in a 4-factor solution, which explained 65% of the variance. The item, “I do my work automatically without thinking”, appeared to load on a separate, fourth factor (on which one absorption item had a double loading as well), and was therefore excluded. Furthermore, two other items were excluded: one item with a low loading on the work enjoyment factor (.25), and one work enjoyment item that showed a high loading on the intended factor, but could be removed for reasons of parsimony. The four remaining work enjoyment items resulted in a clear and reliable factor.

The end result was a three-factor solution with four absorption items, four work enjoyment items, and five intrinsic work motivation items. An additional exploratory factor analysis with SPSS resulted in a clear three-factor solution, indicating no cross-loadings, and explaining 65% of the variance. The first factor, called work enjoyment, explained 46% of the variance. The second factor, called absorption, explained 10% of the variance. Finally, the intrinsic work motivation factor explained an additional 9% of the variance. All items loaded on one of the intended factors, and the factor loadings ranged from .46 to .85.

2.2.2. Confirmatory factor analysis

The data of all employees from the other six samples were used to examine whether the three-factor structure of the flow construct could be replicated. The method of analysis was confirmatory factor analyses (CFAs) using the AMOS computer program (Arbuckle, 2003). More specifically, *multi-group* analyses were used to investigate which model would best fit the data of the six groups of employees. The AMOS analyses used the traditional chi-square value, the goodness-of-fit index (GFI) and the root mean square error of approximation (RMSEA). As a rule of thumb, a GFI $\geq .90$ and RMSEA $\leq .08$ indicate a reasonable fit of the model to the data (Browne & Cudeck, 1989). In addition, we examined the non-normed fit index (NNFI), the incremental fit index (IFI), and the comparative fit index (CFI) as recommended by Marsh, Balla, and Hau (1996). These fit indices should have values of .90 or higher (Hoyle, 1995).

The first row of [Table 2](#) shows that the three-factor model with correlations between the three latent variables fit well to the data. Only the GFI of .88 is somewhat lower than the criterion of .90. However, the NNFI, the CFI and the IFI, which are less dependent on sample size, each exceed .90. Together with the RMSEA of .04, this indicated a good fit between the model and the six data sets. All items loaded only on the intended factors. In the six samples, the factor loadings for absorption, work enjoyment, and intrinsic work motivation ranged from .55 to .91 (absorption), .74 to .95 (work enjoyment), and from .32 to .85 (intrinsic work motivation), respectively. Note that the relatively low factor loading of .32 for one of the intrinsic work motivation items was only found in one sample (the temp agency). In the other samples, .40 was the lowest value for the factor loadings of intrinsic motivation.

The three-factor model is clearly better than the one-factor model, which assumes that all items load on one general flow factor (see [Table 2](#)). The chi-square difference test shows that the increase in fit is significant and substantial [$\Delta \chi^2(18) = 745.48, p < .001$]. The three-factor model is also significantly better than each of

Table 2

Results of multi-group CFAs for six samples: Fit Indices of competing factor-models, standardized maximum likelihood estimates, total $N = 1071$

Model	χ^2	df	GFI	RMSEA	NNFI	CFI	IFI	Model comparison	$\Delta\chi^2$	df	p
Model 1: 3-Factor Model	917.97	372	.88	.04	.91	.93	.93				
Model 2: 2-Factor Model (AB+WE, IWM)	1610.61	384	.79	.06	.80	.84	.84	M2–M1	692.64	12	.001
Model 3: 2-Factor Model (AB+IWM, WE)	1397.05	384	.82	.05	.84	.87	.87	M3–M1	479.08	12	.001
Model 4: 2-Factor Model (WE+IWM, AB)	1022.95	384	.87	.04	.90	.92	.92	M4–M1	104.98	12	.001
Model 5: 1-Factor Model	1663.45	390	.79	.06	.80	.83	.83	M5–M1	745.48	18	.001
Null Model	8048.12	468	.30	.12	—	—	—				

Note. χ^2 , chi-square; df, degrees of freedom; GFI, goodness-of-fit index; RMSEA, root mean square error of approximation; NNFI, non-normed fit index; CFI, comparative fit index; IFI, incremental fit index; $\Delta\chi^2$, chi-square difference; AB, absorption; WE, work enjoyment; IWM, intrinsic work motivation.

the possible two-factor models, although it should be noted that the items assessing work enjoyment and intrinsic work motivation tend to cluster. Nevertheless, the two-factor model collapsing the items for work enjoyment and intrinsic work motivation into one factor, with absorption as a second factor (Model 4), fits less well to the data than the proposed three-factor model [$\Delta\chi^2(12) = 104.98, p < .001$]. The conclusion is that the three factors can be distinguished theoretically, as well as empirically.

2.2.3. Reliability

Table 3 displays the intercorrelations and the reliability coefficients of the three flow dimensions. As can be seen, absorption, work enjoyment, and intrinsic work motivation correlate moderately high with each other. Absorption shows approximately 30% overlap with work enjoyment and intrinsic work motivation. Work enjoyment and intrinsic work motivation are more strongly related (50% overlap), as evident from the result of the CFAs. The correlations range between .44 for absorption and intrinsic work motivation (Sample 2) to .82 for work enjoyment and intrinsic work motivation (Sample 4). The reliability of the three flow dimensions is good. Cronbach's alpha was high for work enjoyment (on average around .90), acceptable for absorption (around .80), and satisfactory for intrinsic work motivation (around .75). The only exception is the intrinsic work motivation scale for Sample 5; here Cronbach's alpha is .63. Given that six other studies show satisfactory reliability coefficients, this finding should most probably be ascribed to the specific sample.

The test–retest reliability of the WOLF subscales was determined using the data from Sample 5 in which 248 employees (61%) filled out the flow questionnaire twice over a six weeks interval. The test–retest correlations were .74, .77, and .71 for absorption, work enjoyment and intrinsic work motivation, respectively. These findings indicate that each flow dimension has good test–retest reliability as well.

3. Study 2

Study 2 investigated the *convergent validity* of the WOLF by calculating correlations between the three flow dimensions and a commonly used, general measure for the assessment of flow (Jackson & Roberts, 1992). In addition, flow was correlated with job satisfaction. Empirical support for the convergent validity of the WOLF was found if each of the three flow-dimensions correlated positively with the general flow index. In addition, I expected that satisfied employees would report the highest levels of flow. It is conceivable that satisfied employees would particularly report more *work enjoyment*, since both variables refer to pleasure at work.

Further, the construct validity of the flow subscales was tested in several of the samples from Study 1. According to Kerlinger and Lee (2000) construct validity seeks the “meaning” of a construct through the relations between that construct and other constructs. In four of the seven samples it was investigated under which conditions individuals experience (facets of) flow during work. For this purpose, the JD-R model (Bakker & Demerouti, 2007) was used. Accordingly, highly demanding jobs cause strain and health problems (e.g., exhaustion, RSI, and psychosomatic complaints), whereas high levels of job resources lead to motivation (Bakker, Demerouti, & Schaufeli, 2003c), work engagement (Schaufeli & Bakker, 2004), and work-related

Table 3
Reliability of and correlations between the three flow-dimensions in the seven studies

Flow Dimension	Sample 1 Insurance company (N = 275)			Sample 2 TV station (N = 84)			Sample 3 Heterogeneous sample (N = 137)			Sample 4 Heterogeneous sample (N = 118)			Sample 5 Agency for temporary work (N = 405)			Sample 6 Self-employed trainers (N = 181)			Sample 7 Human service professionals (N = 146)		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1. Absorption	(.79)			(.82)			(.86)			(.85)			(.75)			(.82)			(.78)		
2. Work enjoyment	.57	(.90)		.45	(.93)		.52	(.91)		.65	(.96)		.53	(.92)		.57	(.93)		.55	(.88)	
3. Intrinsic work motivation	.56	.68	(.75)	.44	.69	(.74)	.54	.67	(.78)	.70	.82	(.82)	.51	.71	(.63)	.59	.69	(.76)	.64	.70	(.77)

Note. All correlations are significant at the $p < .01$ level. Cronbach's alpha's on the diagonals (between brackets).

flow (Bakker, 2005). On the basis of these assumptions in the JD-R model, information was gathered about the *construct* validity of the three flow-dimensions.

Two demands and three resources relevant to most workers were included in the questionnaires for four samples, and were correlated with the three dimensions of flow. It was expected that work pressure and emotional demands correlate positively with absorption and negatively with work enjoyment. The reason for this is that high external effort calls for high concentration, which forms the breeding ground for absorption. However, continuous exposure to a high work pressure and emotionally demanding clients will presumably also evoke strain, which, according to the JD-R model, undermines work pleasure (Demerouti, Bakker, Nachreiner, & Schaufeli, 2000; Leiter, 1993). No unique relationship was expected between the two job demands and intrinsic work motivation (cf. Bakker et al., 2003c; Demerouti et al., 2001). In addition, it was predicted that autonomy, social support, and opportunities for self-growth would correlate positively with each of the three flow-dimensions because job resources enable employees to reach their work-related goals and start a motivational process (see Bakker, Demerouti, De Boer, & Schaufeli, 2003a; Bakker et al., 2003c).

Finally, the *predictive validity* of the flow instrument was examined in Study 2 by relating flow to performance. The idea that happy, intrinsically motivated employees who become absorbed in their work also perform better seems plausible (Csikszentmihalyi, 2003). However, previous research has shown that affective states (e.g., job satisfaction) and job performance correlated weakly (Brayfield & Crockett, 1955; Iaffaldano & Muchinsky, 1985). One possible explanation for this is that researchers and those rating performance (i.e., managers or supervisors) give different meanings to job performance (Organ, 1977). For example, when evaluating their subordinates' performance, managers appear to not only include the formal work performance (i.e., in-role performance), but extra-role performance as well. The latter type of performance concerns behavior that exceeds the normal task fulfillment (Motowidlo & Van Scotter, 1994). In the present research, both types of performance were included. It was predicted that in-role performance would relate significantly to work enjoyment and to absorption because the latter component of the flow experience implies high concentration and dedication to the work activities (Csikszentmihalyi, 1990). In contrast, extra-role performance was expected primarily from intrinsically motivated employees (cf. Bakker, Demerouti & Verbeke, 2004).

3.1. Method

3.1.1. Participants and procedure

The participants were the same as in Study 1, but not all samples were used to test the convergent, construct, and predictive validity of the instrument. See Table 1 for a description of the background of the participants, and see Study 1 for the procedure.

3.1.2. Measures

Job Demands and Resources were assessed in Sample 1, 5, 6 and 7. *Work pressure* was measured with a short three-item scale of Demerouti, Bakker, and Bulters (2004). An example item is, "My work requires working very hard". Items were scored on a five-point scale, ranging from (1 = never, 5 = always). The internal consistency of the scale was acceptable, with Cronbach's alpha's ranging from .76 to .81 in the four samples. *Emotional demands* were assessed with the four-item scale developed by Bakker et al. (2004). An example is: "At your work, are you confronted with people who complain continuously although you do everything to help them?" (1 = never, 5 = always). Cronbach's alpha was .63 in Sample 1 and 6, and .78 and .80 in Sample 5 and 7. *Autonomy* was assessed with the three-item scale developed by Bakker et al. (2004), including: "Can you decide for yourself how to execute your work?" (1 = never, 5 = always). Cronbach's alpha ranged from .68 to .86. *Social support* was defined as the extent to which individuals can count on information, assistance and appreciation from their colleagues at work, and was measured with three items of the scale developed by Van Veldhoven and Meijman (1994); see also Van Veldhoven, De Jonge, Broersen, Kompier, & Meijman, 2002). Examples are: "Can you ask your colleagues for help if necessary?", and, "Can you count on your colleagues when you face difficulties at work?" (1 = never, 5 = always). Cronbach's alpha ranged from .79 to .87. *Opportunities for professional development* included three of the seven items developed by Bakker, Demerouti, Taris, Schaufeli, and Schreurs (2003b). A sample item is: "My work offers me the opportunity to learn new things" (1 = totally disagree, 5 = totally agree). Cronbach's alpha ranged from .79 to .86.

General Flow-Index: Sample 4 and 7 were asked to read a general description of a flow experience, consistent with previous research on flow (Jackson & Roberts, 1992). The description reads: “Perhaps you know this special feeling that everything suddenly seems to go by itself. You are so concentrated on your task that you forget everybody and everything around you. Time flies without noticing it. You can concentrate effortlessly, everything goes smoothly, and you really enjoy what you do. You know exactly where you want to go, and you have the feeling of total control. Nothing seems to be able to stop you, and you are totally immersed in what you are doing. In a way, you have the feeling that you coincide with the activity at hand. At that moment, simply nothing else exists. You feel as if in another reality and that is a very enjoyable experience”. Participants were asked to respond to two questions; “Do you recognize this experience?” (1 = not at all, 2 = barely, 3 = to a certain extent, 4 = to a large extent, 5 = to a very large extent), and, “How often do you have this experience?” (0 = never, 6 = every day).

Job satisfaction is simply how people feel about their jobs and different aspects of their jobs. Job satisfaction was measured among the participants in Sample 6 by the use of three items that closely correspond with those in the Michigan Organizational Assessment Questionnaire (MOAQ; Cook, Hepworth, Wall, & Warr, 1981). The items are: “I am satisfied with my current job”, “I usually enjoy my work a lot”, and, “Everything taken together, I am very satisfied with my job” (1 = totally disagree, 5 = totally agree). The reliability of this scale was good. Cronbach’s alpha was .90.

Performance was assessed only among Sample 7. A distinction was made between in-role and extra-role performance. *In-role performance* was assessed with Goodman and Svyantek’s (1999) nine-item scale, including “Demonstrates expertise in all job-related tasks”, and, “Achieves the objectives of the job”. *Colleagues* of the participants were asked to indicate the extent to which they found each statement characteristic of the participant (0 = not at all characteristic, 6 = totally characteristic). Cronbach’s alpha was .90.

Extra-role performance is defined as actions that go beyond what is stated in formal job descriptions and that increase organizational effectiveness. The instrument utilized in the present research was Goodman and Svyantek’s (1999) measure and included seven items. They based their instrument on Smith, Organ, and Near’s (1983) organizational citizenship behavior measure, and labeled their measure “altruism”. Sample items used by the observers (colleagues) are, “Willingly attends functions not required by the organization, but helps in its overall image”, and, “Takes initiative to orient new employees to the department even though not part of his/her job description.” The same answer categories as for in-role performance were used. Cronbach’s alpha was .88.

3.2. Results

3.2.1. Convergent validity

The convergent validity of the WOLF was investigated by correlating the three flow-dimensions with a general description of flow, using the data collected in Sample 4 (heterogeneous sample) and Sample 7 (human service professionals). The results indicate that absorption in particular is moderately correlated with both the recognition of the holistic description of flow ($r = .59, p < .001$), and with the frequency of this experience ($r = .55, p < .001$). The correlations for work enjoyment and intrinsic work motivation are .51 and .52, and .57 and .48 (all p 's $< .001$), respectively. These findings confirm that each of the three subscales of the WOLF correlated with the general index of flow. In a next step, the data collected among Sample 6 were used to examine the relationships between the three flow dimensions and job satisfaction. The correlations between absorption, work enjoyment, and intrinsic work motivation on the one hand, and job satisfaction on the other were .49, .81, and .58 (all p 's $< .001$), respectively. As predicted, work enjoyment shows the strongest overlap with job satisfaction, even after controlling for the influence of the other flow dimensions; the standardized regression weight was $\beta = .74$ ($t = 12.53, p < .001$). Absorption ($\beta = .00, t < 1, n.s.$), and intrinsic work motivation ($\beta = .10; t = 1.72, p = .09$) were unrelated to job satisfaction when controlling for work enjoyment. Taken together, these findings indicate that the WOLF has good convergent validity.

3.2.2. Construct validity

The construct validity of the three flow dimensions incorporated in the WOLF was determined by examining their relationships with five job characteristics. Structural equation modeling (SEM) was carried out with

Table 4

Unique relationship between job demands, resources, and flow dimensions: fully standardized parameters (maximum likelihood estimates), total $N = 1007$

Job Characteristic	Sample	Absorption	Work enjoyment	Intrinsic work motivation
<i>Job demands</i>				
Work Pressure	1, 5, 6, 7	.18**	.03	(−.03)
Emotional Demands	1, 5, 6, 7	.10**	−.16**	(.01)
<i>Resources</i>				
Autonomy	1, 5, 6, 7	.16**	.16**	.17**
Social support colleagues	1, 5, 6, 7	.06*	.14**	.05
Opportunities for self-growth	1, 5, 6, 7	.34**	.46**	.42**

Note. Sample 1, $N = 275$; Sample 5, $N = 405$; Sample 6, $N = 181$; Sample 7, $N = 146$; * $p < .05$, ** $p < .01$.

the five job characteristics as predictor variables, and absorption, work enjoyment and intrinsic work motivation as the criterion variables. The data of Samples 1, 5, 6, and 7 were combined and used in this analysis (total $N = 1007$). Note that by pooling the data of the four samples, I took care of the unreliability of the emotional demands scale for Samples 1 and 6. The model including the structural relationships, correlations between the job characteristics, and correlations between the three flow components, fitted very well to the data [$\chi^2(2) = 1.17, p = .56$. GFI = 1.000, RMSEA = .000, IFI = 1.000, NNFI = 1.005, CFI = 1.000]. This is not surprising, since many of the possible relationships between the variables were specified. More importantly, the two job demands were significantly and positively related to absorption. Individuals with a high workload and high emotional demands indicate that they often forget the time, and totally immerse themselves in their work (see Table 4). In addition, emotional demands (but *not* work pressure) show a unique *negative* relationship with work enjoyment. Those who are confronted with emotionally demanding clients reported the lowest levels of enjoyment. Furthermore, the three job resources explained a unique proportion of the variance in absorption, work enjoyment, and intrinsic work motivation. However, whereas autonomy and opportunities for self-growth explain a unique proportion of the variance in *each* of the flow components, social support was only related to work enjoyment. Thus, help and appreciation from colleagues coincides with work enjoyment, but not necessarily with absorption and intrinsic work motivation. As predicted, an additional SEM-analysis showed that the two job demands are unrelated to intrinsic work motivation (work pressure $\beta = -.03, t = -1.08, n.s.$) and emotional demands, $\beta = .01, t < 1, n.s.$).

Overall, the job characteristics explain 18.7% of the variance in absorption, 28.3% of the variance in work enjoyment, and 20.9% of the variance in intrinsic work motivation. It should be noted that opportunities for self-growth shows moderately strong relationships with each of the components of flow, whereas all other job demands and resources show *weak* relationships with the three dimensions. However, the relationships presented in Table 4 concern *unique* path coefficients between each of the job characteristics and the flow dimensions, controlling for the influence of all the other job characteristics. It is therefore not surprising that several of the unique effects are small in magnitude.

3.2.3. Predictive validity

The predictive validity of the three flow dimensions incorporated in the WOLF was determined by examining their relationships with two outcomes (i.e., in-role and extra-role performance). Absorption and work enjoyment are expected to show unique, positive relationships with in-role performance, and intrinsic work motivation is expected to show a unique, positive relationship with extra-role performance. The model including these unique relationships fit well to the data of Sample 7 (human service professionals) [$\chi^2(3) = 4.59, p = .21$. GFI = .988, RMSEA = .06, IFI = .995, NNFI = .983, CFI = .995]. The results show that work enjoyment (but *not* absorption) is the most important predictor of in-role performance ($\beta = .22, t = 3.10, p < .01$), whereas intrinsic work motivation is the most important predictor of extra-role performance ($\beta = .27, t = 4.05, p < .001$).

4. General discussion

The central goal of this research was to develop a new instrument for the measurement of flow experiences at work. On the basis of the literature and previous research that primarily took place in other domains (e.g.,

sports, music playing and physical activities), it was argued that a flow experience is characterized by three different, but interrelated aspects; namely, absorption (i.e., total immersion in one's work), work enjoyment, and intrinsic work motivation (cf. Bakker, 2005). Information about the structure of flow and about possible predictors (i.e., job demands and resources) and consequences (i.e., in-role and extra-role performance) was collected among seven samples of employees from different occupational groups.

4.1. Factorial validity and reliability

First, the findings indicate that the three flow dimensions can be distinguished theoretically as well as empirically. As expected, the results of an exploratory factor analysis on the data of employees working for an insurance company produced three clear and independent factors, namely, absorption, work enjoyment, and intrinsic work motivation. After deleting three items that were either inferior or redundant, this three-factor structure could be replicated in six other samples, including reporters, consultants, self-employed trainers, human service professionals, and two heterogeneous groups of employees. More specifically, the results of multi-group CFAs showed that a three-factor model fits significantly better to the data than a one-factor model (with all items of the flow instrument loading on one single factor), and alternative two-factor models that collapsed the items of two dimensions into one. It should be noted that the two-factor model that pooled the work enjoyment and intrinsic work motivation items also showed a reasonable fit to the data. This is consistent with the finding that these two dimensions correlated moderately. These results suggest that employees who enjoy their work are often intrinsically motivated as well (and vice versa). This is consistent with Davis, Bagozzi, and Warshaw (1992), who classified enjoyment as a type of intrinsic motivation. However, the findings of additional analyses show that it is meaningful to make a distinction between each of the three flow dimensions. Taken together, these findings expand previous studies on flow (e.g., Csikszentmihalyi & Larson, 1992; Jackson & Marsh, 1996) by offering an empirical basis for assessing the absorption, enjoyment, and intrinsic motivation components of flow in the workplace.

The internal consistency or reliability of the scales for absorption, work enjoyment and intrinsic work motivation was acceptable. In the seven samples, the coefficients ranged between .75 and .86 for absorption, .88 and .96 for work enjoyment, and .63 and .82 for intrinsic work motivation. Only the scale for the assessment of intrinsic work motivation performed somewhat unsatisfactory in one of the seven samples (the agency for temporary work), with a coefficient of .63. Nevertheless, the test–retest reliability in this sample was very good for each of the scales, with stability coefficients of about .75. This means that flow can be measured reliably, and that the answers of employees to questions about flow correlate strongly with their responses six weeks later.

The present research examined each of the three flow components separately, but it should be noted that employees need to score high on *each* of the components in order to speak of work-related flow. The reason why a distinction was made between the three dimensions is that distinct relationships with other variables are most informative. Nevertheless, researchers and practitioners who are interested in combining the three flow dimensions into one overall flow score are encouraged to do so. For example, Bakker (2005), and Salanova, Bakker, and Llorens (2006) integrated the three flow dimensions in their structural equation model by treating the three flow dimensions as indicators of a latent (unobserved, overall) flow variable.

4.2. Construct validity

Factorial validity and reliability offer a good psychometric basis for the assessment of flow at work. However, equally important when developing a new instrument is its construct (convergent) and predictive validity. To examine the convergent validity of the WOLF, job satisfaction and reactions to a general ('holistic') description of flow, as often used in previous research (e.g., Jackson & Marsh, 1996; Jackson & Roberts, 1992), were correlated with the three flow dimensions in a second study. The results of correlational analyses showed that absorption, work enjoyment and intrinsic work motivation were all positively related to the general description of flow. Employees who recognized themselves in the description or frequently had such an experience also scored higher on each of the three dimensions of the WOLF. Interestingly, additional analyses showed that the absorption dimension in particular was uniquely related to the

general flow index. This suggests that employees consider the total immersion in one's work as an important and recognizable aspect of the flow experience. Whereas absorption showed overlap with the holistic description of flow, work enjoyment shared most unique variance with job satisfaction. This also underscores the construct validity of the new flow instrument, since pleasure at work is both an element of work enjoyment and job satisfaction.

Study 2 also examined which job characteristics increase the probability of flow. Consistent with Csikszentmihalyi's (1990) assumption, job demands such as work pressure and emotional demands had a positive relationship with absorption. This implies that employees who work under pressure and are confronted with demanding clients often lose their perspective of time, and become immersed in their work. Work pressure was unrelated to work enjoyment or intrinsic work motivation; additional analyses showed that there was a *positive* relationship between work pressure and work enjoyment in one of the four studies (the insurance company). Apparently, whether workload leads to enjoyment depends on what one does. Emotional demands showed a consistent, *negative* relationship with work enjoyment. Confrontation with emotionally demanding clients has indeed been found to be an important stressor (e.g., Bakker, Schaufeli, Sixma, Bosveld, & Van Dierendonck, 2000), which may undermine the pleasure in work. Social support from colleagues showed a positive relationship only with work enjoyment. This is consistent with previous research showing that instrumental and emotional support from colleagues can have beneficial effects for well-being (Cohen & Wills, 1985; Karasek & Theorell, 1990). Opportunities for self-growth were positively related to each of the three flow dimensions. This suggests that the possibility to learn at work is an important motivator for employees (cf. Richardson, 2001). Moreover, the finding is consistent with the study of Bakker, Schaufeli and Van Dierendonck (2000), which showed that employees with limited possibilities for self-growth had a four times higher risk of job burnout than employees with many possibilities to grow. Finally, autonomy also showed a positive relationship with each of the three flow dimensions, although less strong than the relationship between opportunities for self-growth and the dimensions of flow. Thus, employees who can decide for themselves how fast they work and which methods they use experience more happiness at work, more often forget everything around them, and are more intrinsically motivated (cf. Bakker, 2005; Houkes, Janssen, De Jonge, & Bakker, 2003).

Overall, the job characteristics explained 18.7% of the variance in absorption, 28.3% of the variance in work enjoyment, and 20.9% of the variance in intrinsic motivation. This is substantial, but it still indicates that several other factors should be considered in future research as possible predictors of flow, including employees' personal resources—e.g. their self-efficacy, optimism, and self-esteem (Salanova et al., 2006; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007).

4.3. Predictive validity

The predictive validity of the intrinsic work motivation component of flow is particularly supported by its unique relationship with extra-role performance. Motivated individuals do more than is formally expected of them (according to their job description), for example by contributing to the positive image of their organization and by helping their colleagues. The latter is exactly what was measured with the extra-role performance measure, and indeed, there was a unique, positive relationship between this index and intrinsic work motivation. This finding is the more meaningful since the source of the information was employees' colleagues. Furthermore, only work enjoyment (not absorption) was positively related to in-role performance, confirming the notion that it is important to make a distinction between in-role and extra-role performance. Employees who enjoyed their work, performed better.

It is unclear why absorption was not related to in-role performance. It is conceivable that the tendency to experience absorption coincides with a lack of self-monitoring, which may be detrimental for in-role performance. High self-monitoring individuals have a conscious desire to construe a stable and predictable social world and they are especially attentive to situational cues to guide their behavior (Snyder, 1979). By contrast, low self-monitors are less concerned about gathering information, about the social correctness of their presentation, acting in accord with their own principles, and enduring personal attributes. Absorption may thus act in one of two different ways; (1) it may facilitate concentration and dedication to the work activities, indirectly *improving* performance; and (2) it may reduce the attentiveness to situational cues, indirectly *worsening*

performance. If both processes are simultaneously active, the overall result is that absorption is unrelated to performance. More research is needed to better understand the relationship between absorption and performance.

4.4. Limitations

A strong point of this research is that the factor structure of the instrument for the assessment of flow was cross-validated in six samples and that evidence for the construct and predictive validity of the subscales was found in several of these samples. However, a limitation of the present research is that we did not include a clear group of employees who can be expected to score extremely high on flow (e.g., members of a music orchestra). In addition, the current research differs from Csikszentmihalyi's (1990) research, in which he uses the *experience sampling* procedure. Instead of using a beeper, where employees are asked to fill out a small questionnaire with their feelings and experiences during random moments of the day, the present research used questionnaires to measure flow *retrospectively*. However, note that this method of research is applied in thousands of studies on several forms of subjective well-being, including work engagement, burnout, depression, psychosomatic health, etc. In addition, it is technically not possible (yet) to measure real-time flow (while it happens), and this makes it difficult to map the precise prevalence of peak experiences. A final limitation is the cross-sectional design of the study relating working characteristics to the three flow dimensions. Since common method variance may have been responsible for part of the results, it is advisable that future studies use different sources of information (e.g., other-ratings of working conditions, in addition to self-reports of flow).

4.5. Avenues for further research

An interesting avenue for future research on flow is to examine *intense* flow-experiences. According to the definition used in the present research, people experience flow when they score high on *each* of the three dimensions (i.e. absorption, work enjoyment, and intrinsic work motivation). Are we able to trace working conditions where employees become totally immersed in their work, experience a lot of enjoyment, *and* are intrinsically motivated? The results of Study 2 suggest that this complete form of flow appears in particular when there is a balance between job demands and resources (cf. the JD-R model; Bakker & Demerouti, 2007).

It would also be relevant to examine the relationship between flow and health. It is conceivable that absorption (frequently becoming totally immersed in one's work) undermines physical health. Suppose that a computer programmer is so engaged in the construction of his new Internet application that he only manages to think about something else at 10 p.m. This probably means that he did not take a break during a very long period of time, did not eat in time, and adopted the same static posture for too long. Such conditions would contribute negatively to health, and, indeed, research has shown that high quantitative demands, static postures, and repetitive movements can result in repetitive strain injuries (RSI; Jensen, Ryholt, Burr, Villadsen, & Christensen, 2002; Tyrer, 1994). Future studies should examine the relationship between flow and health among employees working under different conditions.

Finally, it would be theoretically interesting and practically relevant to examine which of the three aspects of the flow experience comes first. Is there a feeling of enjoyment, followed by the intrinsic motivation to stay happy, which, in turn, increases the possibility that one gets totally absorbed by one's activities? An answer to these questions could present human resource managers with an instrument to monitor flow among their personnel. A related question is how flow correlates with long-term positive experiences at work, such as work engagement (Schaufeli & Bakker, 2004; Schaufeli, Salanova, González-Romá, & Bakker, 2002). Is a regular experience of flow the precursor of engagement at work (i.e., that one feels vital and strong, and dedicated to work)?

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Appendix 1. The Work-Related Flow Inventory (WOLF)

The following statements refer to the way in which you experienced your work during the last two weeks. Please indicate how often you experienced each of the statements. (1 = never, 2 = almost never, 3 = sometimes, 4 = regularly, 5 = often, 6 = very often, 7 = always).

Absorption

1. When I am working, I think about nothing else
2. I get carried away by my work
3. When I am working, I forget everything else around me
4. I am totally immersed in my work

Work Enjoyment

5. My work gives me a good feeling
6. I do my work with a lot of enjoyment
7. I feel happy during my work
8. I feel cheerful when I am working

Intrinsic Work Motivation

9. I would still do this work, even if I received less pay
10. I find that I also want to work in my free time
11. I work because I enjoy it
12. When I am working on something, I am doing it for myself
13. I get my motivation from the work itself, and not from the reward for it

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