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Psychological Test Adaptation and Development

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# Who is Flexible and Adaptive in Everyday Life?

## Three Facets of Flexibility and Development of the Flexibility Scale (FS-24)

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**Abstract:** *Background:* How flexible people react to changes, and adapt their behavior and plans, seems to be crucial in modern society. Nevertheless, no common conceptualization of flexibility exists in the psychological literature. Our work contributes to the scientific understanding of flexibility as a personality trait and offers a novel flexibility questionnaire. *Methods and Results:* An explorative study ( $N = 279$ ) examined three individual-difference concepts of flexibility and their relations with the Big Five personality traits. The results suggested that flexibility consists of predictability, adaptability, and orderliness can be assessed with 24 items (FS-24) and is distinguishable from the Big Five. A confirmatory study ( $N = 188$ ) replicated the three flexibility components and showed good test–retest reliability for the FS-24. Convergent and discriminant validity of the instruments need further scrutiny. *Limitations:* The present study is limited due to self-reports, and the specificity and size of the sample, which could be addressed in future studies. *Conclusions:* The FS-24 showed promising psychometric properties. The questionnaire has useful applications in personality research, organizational development, and counseling.

**Keywords:** personality, adaptability, flexibility, Big Five, questionnaire, assessment



Flexibility, sometimes also called adaptability, is one of the core competencies of the 21st century (Ananiadou & Claro, 2009; Lavy, 2020) and refers to the personal disposition toward changes and novelty. Due to the changes in the world of work from the last decades (Peiró, 2019), flexibility appears to be a crucial personal characteristic at the workplace and in private life in the modern challenging world. This research hence contributes to the scientific understanding of flexibility as a personality trait and offers a comprehensive, initially validated, and easy-to-use flexibility questionnaire, for use in research and applications.

In the psychological literature, flexibility, and related constructs are research topics of several disciplines (for an overview, see Table S1 in supplementary materials). These psychological subdisciplines study flexibility in regard to cognitive, psychological, behavioral, or personality aspects. To our knowledge, no common definition of flexibility exists in the psychological literature. Accordingly, different flexibility conceptualizations have been suggested, which contain performance, cognitive, and dispositional aspects,

and recent attempts have been undertaken to integrate some of these components (Zhang et al., 2020). For the present research, the less-studied conceptualization of flexibility in the context of dispositions and individual differences is relevant. Our aim is to explore the flexibility construct using related self-report questionnaires and to offer an integrative approach to flexibility from the view of personality psychology. From different flexibility concepts, displayed in supplementary Table S1, we selected three that in our opinion describe flexibility from the dispositional perspective; specifically, *flexibility of action* (Bitterwolf, 1992), *individual adaptability* (Ployhart & Bliese, 2006), and *flexibility as an aspect of workplace behavior* (Hossiep & Paschen, 1998). To be able to define the concept of flexibility as a personality trait and to examine the components of flexibility, it is important to establish the distinction to other constructs that are related to flexibility. One approach is *psychological flexibility*, which refers to the adaptability of cognitive processes, that is, dealing with unpleasant thoughts and feelings (Hayes et al., 2006). Psychological flexibility is primarily studied within clinical psychology. A further related construct is flexibility in regard to construing one's career (*career adaptability*; Savickas, 1997), which is studied from a vocational behavior perspective (for an overview of flexibility/adaptability in the work context, see

Schmitt & Chan, 2014). Flexibility as a personality trait should also not be confused with *interpersonal flexibility* (Paulhus & Martin, 1988), which focuses solely on the interpersonal context and describes the ability to adjust one's behavior to suit interpersonal situations. Furthermore, *cognitive flexibility*, which refers to the awareness of different behavioral alternatives as well as willingness and self-efficacy in acting flexibly and adapting to the situation (Martin & Rubin, 1995; for different approaches, see Ionescu, 2012), describes a quality of a cognitive system. Finally, *adaptability* (Martin et al., 2012) describes the cognitions and behaviors in response to new situations.

Rather than the conceptualizations above, we combined in our research three broad approaches to flexibility as an individual difference construct: *flexibility of action* (Bitterwolf, 1992), *individual adaptability* (Ployhart & Bliese, 2006), and *flexibility as an aspect of workplace behavior* (Hossiep & Paschen, 1998). These conceptualizations contain dispositional components of flexibility (in contrast to adaptive performance, quality of cognitive processes or abilities), describe flexibility as having one or more facets, and assess flexibility with self-reports. Bitterwolf (1992) argues that flexibility is a personality trait or behavioral characteristic. He also refers to the principles of variability and stability; that is, flexible individuals should be both, adaptive and proactive in changing situations (variability principle), and stable enough (e.g., planful, committed to the rules) to be able to balance and deal with these changes. Therefore, his flexibility of action concept is a personality trait and describes individuals who are able to deal with or initiate change processes. Furthermore, such individuals are also high on stability, which is important for the ordinary and purposeful implementation of changes. In summary, a person could be inflexible in two ways: (1) If orderliness overwhelms, a person is too rigid and not open to changes, or (2) if a person is widely exposed to change processes and is lacking stability, a person is also inflexible (Bitterwolf, 1992).

Ployhart and Bliese (2006) proposed the I-ADAPT Theory and described the composite trait of individual adaptability. Individual adaptability refers to a person's set of abilities and dispositional and motivational characteristics. Although the authors describe individual adaptability first in the work context, they also highlight the importance of this trait for different social environments. Regarding measurement, previous research suggested that the uncertainty subscale can be used as a short version of the I-ADAPT-M (Hamtiaux et al., 2013).

The last relevant conceptualization of flexibility was introduced by Hossiep and Paschen (1998), who described and measured personality traits that are relevant in the work context. One such trait is flexibility, which refers to the willingness and ability to adapt to unforeseen and unpredictable situations, being open to new ideas and being ready

to change. Flexibility according to Hossiep and Paschen (1998) is also seen as a composite personal trait. Additionally, as outlined by Schmitt and Chan (2014), ability and willingness in regard to adaptable action, described as *can do* and *will do*, are crucial for understanding the nature of flexibility. Accordingly, we understand flexibility to be a composite trait, including dispositional (as relevant for the present study), willingness, and ability aspects.

We are not aware of research examining the relationships between those three conceptualizations, but recent studies on the overlap between other flexibility-related constructs (e.g., Waldeck et al., 2021; Zhang et al., 2020) suggest these conceptualizations to be distinct from each other. In our research, we aim to integrate the three concepts of flexibility at the theoretical and measurement-related levels. As the three concepts describe flexibility as having one or two components, we aim to integrate the concepts to comprehensively examine the components of flexibility. Furthermore, the knowledge of flexibility components allows us to propose a more inclusive definition of the concept than has been available thus far in the field. At the measurement level, we aim to integrate the three flexibility measurements to propose a comprehensive and concise version of flexibility assessment for use in research and praxis.

As many flexibility-related conceptualizations are studied within industrial and organizational psychology, and two of the three conceptualizations for this work describe work-related personality characteristics, flexibility seems to be especially important for vocational environments. To broaden this scope, one of the aims of the present research is to adapt these three flexibility measures for general use in many different applied contexts. We can imagine different ways for using the adapted measure: personal use to assess one's degree of flexibility, use in personality and positive psychology research in the broader adult population, and use by trainers/coaches to assess the flexibility of clients. Further, we hope our work to be useful in setting of large organizational transformations and development to screen the readiness and willingness to change among the employees and to identify the agents of change inside the working teams and organizational divisions.

In sum, the aim of the present research was to add to the scientific understanding of flexibility as personality trait and to offer a more comprehensive and general measurement to assess flexibility. To achieve this aim, we explore the three described flexibility scales and their interrelationships in Study 1. Further, we apply an exploratory factor analysis (EFA) to detect the latent dimensions behind these flexibility scales and to reduce the number of items. In the next step, we study the relationships of this more comprehensive and concise Flexibility Scale with the Big Five personality traits (openness to experience, conscientiousness, extraversion,

agreeableness, and neuroticism) to determine the nomological network of flexibility within personality more broadly. To initially validate the suggested flexibility measure, we explore its discriminant and convergent validity. In Study 1, we conduct a joint EFA across the flexibility dimensions and the Big Five facets. In Study 2, we test the latent structure of the Flexibility Scale with confirmatory factor analysis and further examine the reliability and convergent and discriminant validity of the scale scores. For this purpose, we study the test-retest reliability of the flexibility scale over the course of one week and conduct correlation analyses with a proactive personality (convergence) and psychological flexibility measure (discriminant validity).

## Study 1: Exploring the Components of Flexibility

In the first step, we aim to explore the flexibility construct and its dimensionality, based on the three conceptualizations of flexibility. Two of the three flexibility conceptions (individual adaptability and flexibility as described by Hossiep & Paschen, 1998) describe flexibility as unidimensional construct with one variability aspect. Bitterwolf (1992) suggests that the flexibility construct includes two negatively correlated aspects, variability and stability. Based on this and on our understanding of flexibility as a composite trait, we assume the common conceptualization of flexibility to have a multidimensional structure at the latent level.

The next step is to locate flexibility in the nomological net of other personality variables. To achieve this, we study the relations between flexibility and broader Big Five personality traits. As the variability aspect describes the willingness and openness for change, we assume this aspect of flexibility to be more closely related to openness to experiences. The second flexibility factor could be stability, which is more strongly related to the planned implementation of the changes. We assume this flexibility component to be positively related to conscientiousness.

## Materials and Methods

We report how we determined our sample size, all data exclusions, all data inclusion criteria, which were established prior to data analysis, all measures in the study, and all analyses including all tested models. As we used inferential tests, we report effect sizes and 95% confidence intervals (CIs).

The first part of the study was explorative. We conducted Pearson correlations between the three flexibility

measures and studied their interrelations. Further, we applied an EFA across the items of the three instruments and explored the dimensionality of flexibility construct using 11 criteria. We decided on how many factors to retain based on the majority of the results from these indices, as well as how well the contents of the factors could be interpreted (see Costello & Osborne, 2005).

Based on the number of components, we conducted an EFA with a principal factor solution (Revelle, 2020). The extracted flexibility factor scores were used to explore the relationships of the flexibility construct with the Big Five personality traits. Moreover, as further evidence for discriminant validity (for this idea, we thank the editor), we conducted a common EFA with the three flexibility factors and the 15 Big Five facets.

## Participants

As flexibility seems to be especially important for the world of work, the target population for the present study were middle-aged working individuals. The sample consisted of 283 employees from Switzerland, Germany, and Austria. Four participants were excluded from the analysis due to missing data or lack of variance in the answers. The final sample consisted of 279 participants, where 74.5% were women. The age of participants ranged from 18 to 71 years ( $M_{\text{age}} = 40.86$  years,  $SD = 11.92$ ). The majority of participants were Swiss (62.0%), followed by German (34.4%), and Austrian (3.2%). Almost half of the participants (48.7%) were not married, 35.5% were married, 11.5% were divorced, and 1.1% were widowed. The sample was rather well educated: 60.2% of participants held a university degree, 7.8% held a PhD, and 14.7% completed an apprenticeship. Various occupational fields were presented in the sample, with the largest group from social occupations (21.9%), followed by HR (21.5%), service sector (12.9%), scientific occupations (12.5%), and management (11.5%). As the participation criterion was minimum workload of 50%, most of the participants worked full-time (workload  $M = 86.1\%$ ,  $SD = 15.9\%$ ).

## Instruments

To measure flexibility, three instruments were used. First, the questionnaire for flexibility of action (FIB; Bitterwolf, 1992) consists of 18 items and assesses flexibility and stability of action in an overall score. It uses a 5-point Likert scale from 1 (*disagree*) to 5 (*agree*). An example item of the FIB is “I think from time to time one should give up the usual and do something completely new.” The internal consistency of the FIB scale in the sample was Cronbach’s  $\alpha = .85$ .

Second, the uncertainty subscale of the Individual Adaptability Measure (I-ADAPT-M; Ployhart & Bliese, 2006) was used. The I-ADAPT-M assesses general

adaptability in social and work environments and consists of the eight subscales. The uncertainty subscale consists of nine items and assesses how a person deals with uncertain and novel situations. Items were translated into German by a native speaker using a standardized back translation procedure (International Test Commission, 2017). The example item of the uncertainty subscale is “I can handle changing circumstances well.” Participants give their agreement on the items on the 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The internal consistency of the uncertainty scale in the sample was Cronbach’s  $\alpha = .82$ .

Finally, the slightly adapted flexibility scale of the BIP (Hossiep & Paschen, 1998) was used. The BIP is a German questionnaire that consists of 14 scales and 210 items and assesses different work-related personality dimensions, such as performance motivation, emotional stability, or sociability. The flexibility subscale consists of 14 items. An example item is “I rather engage in tasks where I know what to expect” (reversed). Participants give their agreement on the items on the 6-point Likert scale from 1 (*strongly disagree*) to 6 (*strongly agree*). The internal consistency of the flexibility subscale in the sample was Cronbach’s  $\alpha = .90$ .

To assess the Big Five personality traits, the German version of the Big Five Inventory 2 was used (BFI-2; Soto & John, 2017; German version by Danner et al., 2019). The BFI-2 assesses the five personality domains extraversion, neuroticism (negative emotionality), conscientiousness, agreeableness, and openness to experience (open-mindedness), including 15 facets (three facets per domain) with a total of 60 items. Participants provided their agreement with the items on the 5-point Likert scale between 1 (*disagree strongly*) and 5 (*agree strongly*). The internal consistency of the BFI-2 in the present sample was between Cronbach’s  $\alpha = .80$  (agreeableness) and  $.89$  (neuroticism). An example item for extraversion is “I am someone who is outgoing, sociable.”

To reduce the length of the survey with minimum impact on validity of the measurement, a planned missing design was applied to the BFI-2 (SAPA; Revelle et al., 2017). In this design, each participant completed 20 (instead of 60) BFI-2 items (randomly assigned two pages out of six with 10 items each, two per personality domain). This type of data (missing completely at random due to the randomized design) allows the unbiased estimation of the parameters. Indeed, McDonald’s Omegas for BFI-2 domains ( $M = .84$ ) and facets ( $M = .74$ ), assessed with SAPA in the present study, were comparable to the previous research, using all items of the scales ( $M_d C .84$ ;  $M_f = .78$ ; Danner et al., 2019). SAPA is recently gaining more attention in the psychological literature and has been successfully used in past research (e.g., Dworak et al., 2021; Stahlmann & Ruch, 2020; Vylobkova et al., 2023).

## Sample and Procedure

German-speaking adults who had at least a 50% workload were recruited for participation in the study. Recruitment occurred via e-mail, professional social media platforms, such as LinkedIn, and via invitation letters to different companies in Switzerland, Germany, and Austria. The necessary sample size was chosen regarding statistical power and considerations on the stability of correlation coefficients (Schönbrodt & Perugini, 2013). After the advertisement resources were exhausted, we looked at the sample size. Regarding the expected missing data of 25%–30%, the sample size was considered sufficient. As an incentive for the larger research project, participants received individual feedback on their personality, character, and work-related well-being. An additional incentive for participants was a small donation (of 1 Swiss Franc) for a social or environmental project chosen by the participant. The donation was made by research team for every completed survey.

This study was a part of a larger research project; the research project was not preregistered. Of note, some of the sample overlaps with Vylobkova and Heintz (2023); however, none of the current results have been previously reported. The research project was exempt from ethics approval in line with the guidelines of the ethics committee of the Faculty of Arts and Social Sciences of the University. All questionnaires were self-reports and were completed online (<https://unipark.com>). Participants first provided demographical information and then completed the flexibility measures and BFI-2.

## Statistical Analyses

The data were analyzed with R software version 4.0.0 (R Core Team, 2020), using the packages *psych* (Revelle, 2020), *dplyr* (Wickham et al., 2020), *GPArotation* (Bernaards & Jennrich, 2005), and *BayesFactor* (Morey & Rouder, 2021). As the data seemed to be normally distributed (see supplementary Table S2), we computed Pearson correlations between the three flexibility scales.

Next, we explored the latent structure behind the scales with EFA. To determine the number of factors to retain in the data, we employed 11 different criteria, including parallel analysis (Horn, 1965), Very Simple Structure (Revelle & Rocklin, 1979), the MAP test (Velicer, 1976), and several fit indices (for details, see supplementary Table S4). In addition, Costello and Osborne (2005) described the following criteria for defining the number of factors to extract: (a) item loadings  $> |.30|$ , (b) no or few cross-loadings (item loads with  $\geq |.32|$  on two or more factors), and (c) no factors with less than three items.

Further, we used the principal factor solution method with oblique factor rotation (i.e., factors were allowed to intercorrelate) to explore the proposed three-factor solution with cumulative variance explained, factors' stability, and double-loadings. In the last step, the correlations between the flexibility factors and the Big Five personality traits, including the 95% CIs and Bayes factors (BFs), were computed. We used the default BF hypothesis tests, which assumes noninformative priors for populations and scaled beta priors for the sample (1/3; see Jeffreys, 1961; Ly et al., 2015). BFs > 3 can be seen as evidence for the alternative hypothesis, while BFs < 1/3 can be seen as evidence for the null hypothesis; values > 1/3 and < 3 are interpreted as inconclusive (Wetzels et al., 2011). To consider a correlation as meaningful, three conditions need to be fulfilled: a small effect size of  $|\cdot 10|$  (Gignac & Szodorai, 2016), a 95% CI not including zero, and a BF > 3 (Wetzels et al., 2011).

## Results

The descriptive statistics and reliability estimates of the study variables can be found in supplementary Table S2. The normal distribution of the study variables can be assumed. All correlations between the three flexibility scales were positive and relatively large. The largest correlation was between BIP and IAM ( $r = .71$ , 95% CI [.64; .77], BF > 100), followed by the correlation between BIP and FIB ( $r = .65$ , 95% CI [.56; .72], BF > 100). The smallest correlation was found between FIB and IAM ( $r = .49$ , 95% CI [.38; .59], BF > 100). The large correlation coefficients (Gignac & Szodorai, 2016) between the flexibility measures suggest a certain amount of shared variance.

An EFA was adopted to explore the latent dimensions of flexibility. In the first step, we evaluated solutions from 1 to 6 factors according to a range of criteria. As shown in Supplementary Tables S3 and S4 as well as in Supplementary Figures S1 and S2, the majority of indices (9 out of 11) suggested the extraction of three factors/components. Furthermore, only five items showed double loadings larger than  $|\cdot 32|$ , and only three items did not show any loadings higher than  $|\cdot 32|$ . This mostly conforms with Costello and Osborne's (2005) criteria for factor interpretability. Hence, the three-factor solution was found to be the best fitting and the easiest to interpret in comparison to the five other solutions tested. The correlation of the factor scores with the true values (factor determinacy index) ranged from .93 to .96, which exceeds the thresholds for research and individual studies (Ferrando & Lorenzo-Seva, 2018). All further analyses were conducted with these three regression-based flexibility factor scores.

The factor loadings on the three factors can be found in supplementary Table S3. The eigenvalues of the three

factors were 7.34, 4.50, and 4.03, respectively, and the three factors explained 39% of the items' variance. The three factors were named *predictability*, *adaptability*, and *orderliness*. The predictability factor contained statements on fixed daily plans, concrete tasks, and stable situations. The adaptability factor contained statements on the ability to change the own plans and behaviors if something unexpected would happen. The orderliness factor consisted of items related to the conformity of the rules, making clear plans and finishing the tasks one has started. The predictability factor was negatively correlated with the adaptability factor ( $r = -.59$ , 95% CI [-.67; -.49], BF > 100) and positively related to the orderliness factor ( $r = .45$ , 95% CI [.33; .55], BF > 100); the adaptability and orderliness factors were uncorrelated.

To determine the position of flexibility factors in a broader nomological net, we conducted Pearson correlations with the Big Five personality traits and facets. The results are displayed in Table 1.

Table 1 shows that relationships between the three flexibility factors and the Big Five were varied. The predictability factor was negatively related to extraversion (and its two facets, assertiveness and energy level) and to one facet of openness to experiences (creative imagination) and positively related to neuroticism, including all three neuroticism facets. The adaptability factor was most strongly related to extraversion and its facets, was positively related to conscientiousness and its two facets, and positively related to one facet of openness to experiences (creative imagination). Adaptability was negatively related to neuroticism and its facets. The orderliness factor was strongly positively related to the three facets of conscientiousness and negatively related to one facet of agreeableness (respectfulness) and to openness to experiences (and its facet intellectual curiosity).

As an additional exploratory analysis, we conducted a joint EFA over the three flexibility dimensions and the 15 Big Five facets, which provides information about the discriminant validity between flexibility and personality traits. We explored five-factor solutions (in case flexibility is integrated with the Big Five, suggesting a lack of discriminant validity) and six-factor solutions (in case flexibility forms a separate factor). In both solutions, the three flexibility dimensions loaded on the first factor and the Big Five facets on the remaining four or five factors, delivering initial support for the distinguishability of these constructs.

## Discussion

This first study aimed to explore the facets of flexibility based on the three conceptualizations of flexibility as

**Table 1.** Pearson correlations between flexibility factors and Big Five personality traits and facets

Big Five personality traits	Flexibility factors								
	Predictability			Adaptability			Orderliness		
	<i>r</i>	95% CI	BF	<i>r</i>	95% CI	BF	<i>r</i>	95% CI	BF
Extraversion	-.34	[-.46, -.22]	>100	.39	[.27, .50]	>100	-.04	[-.17, .10]	0.18
Sociability	-.17	[-.31, -.02]	2.15	.22	[.07, .35]	11.21	-.12	[-.26, .03]	0.61
Assertiveness	-.38	[-.49, -.25]	>100	.34	[.20, .46]	>100	-.03	[-.17, .11]	0.18
Energy level	-.19	[-.32, -.05]	5.68	.26	[.12, .38]	98.85	-.03	[-.17, .11]	0.18
Agreeableness	-.08	[-.22, .06]	0.32	.16	[.03, .29]	2.35	.00	[-.14, .13]	0.16
Compassion	-.06	[-.21, .08]	0.25	.21	[.07, .35]	10.88	.00	[-.14, .15]	0.17
Respectfulness	.06	[-.08, .20]	0.23	.07	[-.08, .21]	0.25	.18	[.04, .31]	3.10
Trust	-.14	[-.28, .00]	1.21	.12	[-.02, .25]	0.62	-.14	[-.27, .01]	0.93
Conscientiousness	.08	[-.05, .22]	0.32	.21	[.08, .34]	14.37	.53	[.42, .62]	>100
Organization	.17	[.02, .30]	1.95	.09	[-.05, .23]	0.37	.49	[.37, .59]	>100
Productiveness	.06	[-.09, .20]	0.22	.23	[.09, .36]	20.18	.41	[.28, .52]	>100
Responsibility	-.03	[-.17, .11]	0.18	.21	[.07, .34]	10.16	.27	[.13, .39]	>100
Neuroticism	.40	[.28, .51]	>100	-.38	[-.49, -.25]	>100	.00	[-.14, .13]	0.16
Anxiety	.37	[.24, .49]	>100	-.30	[-.42, -.16]	>100	.08	[-.07, .22]	0.29
Depression	.26	[.12, .39]	95.87	-.33	[-.45, -.20]	>100	.02	[-.12, .17]	0.18
Emotional volatility	.29	[.16, .41]	>100	-.21	[-.34, -.07]	11.46	.02	[-.12, .16]	0.17
Openness	-.16	[-.29, -.02]	1.86	.24	[.10, .36]	46.57	-.22	[-.35, .09]	26.94
Aesthetic sensitivity	.05	[-.09, .20]	0.22	.08	[-.06, .23]	0.32	-.05	[-.19, .10]	0.21
Intellectual curiosity	-.16	[-.30, -.02]	1.77	.12	[-.02, .26]	0.67	-.28	[-.41, -.15]	>100
Creative imagination	-.26	[-.39, -.13]	>100	.24	[.10, .36]	34.14	-.14	[-.27, .00]	1.05

Note. *N* = 184–205, Openness = openness to experience, *r* = Pearson correlation, CI = confidence interval, BF = Bayes factor.

personality trait and to locate flexibility in the nomological network of broader personality traits. The three flexibility instruments showed relatively large intercorrelations (Gignac & Szodorai, 2016), suggesting a certain amount of shared variance. The results of the EFA suggested the multidimensionality of flexibility. The three factors predictability, adaptability, and orderliness were well interpretable. This finding supported the hypothesis of multidimensionality of flexibility. The initially hypothesized two dimensions, variability and stability, could be found in the extracted factors and were named adaptability and orderliness. The third factor, predictability, expanded the initially predicted two flexibility dimensions by adding some aspects of stability (following a fixed plan) and the opposite of adaptability (unwillingness to change) to the flexibility components.

The Pearson correlations between the three flexibility factors and the Big Five personality traits showed differential relationships, further supporting the multidimensionality of the flexibility construct. Predictability was related to introversion and neuroticism, and orderliness was strongly related to conscientiousness. Adaptability was the broadest factor and related to facets of all Big Five traits.

The results of joint EFA over flexibility dimensions and Big Five facets delivered initial support for the discriminant validity of the flexibility construct. The Big Five served for the initial validation of flexibility and determination of its place in the nomological network of broader personality traits. As Big Five traits and facets describe personality in relatively broad aspects, further studies could study flexibility in regard of the network of narrower aspects of personality, such as resilience, coping, or positive personality traits (character strengths). Further validation of the flexibility scale will be continued in Study 2.

## Study 2: Structure and Psychometric Properties of the Flexibility Scale

The results of Study 1 suggested that flexibility consists of three facets: predictability, adaptability, and orderliness. We found these facets to relate differentially with the Big Five. Study 2 aimed to replicate and expand the results of

Study 1. Using a new sample, we first sought to replicate latent structure of a shortened Flexibility Scale. Secondly, we sought to validate the Flexibility Scale by studying its test-retest reliability and convergent and discriminant validity.

We used proactive personality to examine the convergent validity of the flexibility scale. A proactive person actively constructs and affects the environment to implement meaningful changes (Seibert et al., 1999). Proactive personality was found to be positively related to desirable outcomes, such as subjective and objective career success, and to involvement in community activities (Seibert et al., 1999).

We used psychological flexibility to examine the discriminant validity of the flexibility scale. Psychological flexibility refers to the ability of a person to act according to situational needs and one's goals in the presence of negative psychological events, such as negative thoughts and feelings (Bond et al., 2013). By definition, psychological flexibility only refers to dealing with inner challenges in form of negative thoughts and destructive feelings to act according to situational needs. Flexibility as a personality trait refers to the adaptation to the environment by dealing with all kinds of circumstances (internal and external nature), and hence, it should be broader than psychological flexibility.

## Materials and Methods

We report how we determined our sample size, all data exclusions, all data inclusion criteria, which were established prior to data analysis, all measures in the study, and all analyses including all tested models. As we used inferential tests, we report effect sizes and 95% CIs.

### Participants

We collected data from 188 participants with a minimum workload of 50% from Switzerland, Germany, and Austria. The mean age was 39 years ( $SD = 10.93$ , range 19–63), and 65.4% were women. The majority of participants (76.6%) were Swiss and were married/in a relationship (61.7%). The sample was rather well educated, the majority (79.3%) had a PhD, a master's or bachelor's degree, or comparable education. Study 2 was embedded in a larger research project and included a daily diary study. Therefore, the sample size was defined by the recommendations for diary research (Ohly et al., 2010).

### Instruments

To assess flexibility, we adapted and shortened the Flexibility Scale, constructed in Study 1. First, we removed all items with factor loadings less than  $|\cdot 40|$  and high

double-loadings in the EFA from the initial item pool (41 items; all items are shown in the supplementary materials). As we tried to balance the length of the three subscales, we removed more items with loadings on the predictability factor. Then, we rephrased some items to make them more suitable for general social situations. For example, if the content of an item was related to work situations, we used more general terms, such as *activities* instead of *working tasks*. Further, we removed items with highly similar item contents, based on content inspection and discussion by the authors. The final version of the flexibility scale consisted of 24 items across three subscales: predictability (10 items), adaptability (7 items), and orderliness (7 items). For item examples, see supplementary Table S5. Participants rated every item on a seven-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). The internal consistency in the present study was  $\alpha = .86$  (predictability),  $\alpha = .79$  (adaptability), and  $\alpha = .85$  (orderliness).

We used the shortened version of the Proactive Personality Scale to assess proactive personality (PPS; Seibert et al., 1999). Two bilinguals translated the scale into German using a standardized back translation procedure (International Test Commission, 2017). The scale consists of 10 positively keyed items. Participants rated every item on a seven-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). An example item is "I am always looking for better ways to do things." The internal consistency in the present study was  $\alpha = .88$  and test-retest reliability was  $r_{tt} = .74$ .

We used the Work-related Acceptance and Action Questionnaire to assess work-related psychological flexibility (WAAQ; Bond et al., 2013). Two bilinguals translated the scale into German using as standardized back translation procedure (International Test Commission, 2017). The WAAQ consists of seven positively keyed items. Participants rated every item on a seven-point Likert scale from 1 (*never true*) to 7 (*always true*). An example item is "My thoughts and feelings do not get in the way of my work." The internal consistency in the present study was  $\alpha = .86$  and test-retest reliability was  $r_{tt} = .68$ .

We altered the answer scales of all used instruments for consistency reasons. As participants were asked to answer a large number of different questionnaires, homogenizing the answer scales reduced the cognitive effort for switching between different answer scales.

### Procedure

Study 2 was a part of a larger research project, and project preregistration including an analysis plan is available online (<https://aspredicted.org/blind.php?x=cs85rh>). As the focus of the current manuscript differs from the focus of the research project, only the research question on the



test-retest reliability of the flexibility scale was preregistered. Of note, some of the sample overlaps with Vylobkova and Heintz (2023); however, none of the current results have been previously reported. In line with Study 1, we recruited German-speaking participants with at least a 50% workload via social media (e.g., LinkedIn, Facebook) or personal contacts in Swiss, German, and Austrian companies. Participants completed all questionnaires online (<https://www.sosicurvey.de>). After registering for the research project, participants received an invitation to the first questionnaire (pretest). Participants gave their answers to the demographic questions above and completed the flexibility scale, the PPS, and the WAAQ. In the following seven evenings, participants received an e-mail invitation to answer some questions online (daily diary). After seven days, we invited participants to complete the Flexibility Scale, the PPS, the WAAQ again, and to answer questions about their experiences with the daily diary (posttest). In this study, we only used data from the pretest and the posttest Flexibility Scale for test-retest reliability.

## Statistical Analyses

We used version 4.0.0 of R (R Core Team, 2020) with the packages *lavaan* (Rosseel, 2012), *psych* (Revelle, 2020), *BayesFactor* (Morey & Rouder, 2021), and *dplyr* (Wickham et al., 2020). First, we conducted a confirmatory factor analysis (CFA) using *lavaan* to study and to further evaluate the Flexibility Scale's latent structure. We evaluated model fit following the recommendations of Schermelleh-Engel et al. (2003). For an acceptable model fit, the root-mean-square error of approximation (RMSEA) should be less than .08, the standardized root-mean-square residual (SRMR) should be less than .10, and the comparative fit index (CFI) should be higher than .95. Due to the large number of items per factor, we expected the CFI to be rather low, as described by Kenny and McCoach (2003). Prior to specifying the model for confirmatory factor analysis, we recoded the negatively keyed items of the flexibility scale (FLEX10 and FLEX15). We used the MLR estimator and allowed the factors to intercorrelate.

We conducted correlational analyses of the pretest and posttest data to measure the test-retest reliability of the Flexibility Scale (preregistered research question). We conducted correlational analyses between the Flexibility Scale, the PPS, and the WAAQ from the pretest to study convergent and discriminant validity. We expected the convergent correlations between the Flexibility Scale and the PPS to exceed the cut-off of .30 and to be higher than the discriminant correlations with the WAAQ, which we

expect to be lower than .20 (effect sizes based on Gignac & Szodorai, 2016). For all correlations, we computed the 95% CIs and BFs.

## Results

Descriptive statistics of the variables in Study 2 can be found in supplementary Table S6. The CFA model indicated an acceptable fit:  $\chi^2(188) = 588.37$  ( $p < .001$ ), CFI = .85, RMSEA = .08 (90% CI [.067, .086], and SRMR = .09). The specified model was better than the null model (RMSEA<sub>null</sub> = .19). Except for two items, the loadings were high for each factor, ranging from .47 to .83 (see supplementary Table S7). Two recoded, negatively keyed items showed the lowest factor loadings of .33 (FLEX15 on adaptability dimension) and .39 (FLEX10 on predictability dimension), which is to be expected (Dueber et al., 2022; Weijters & Baumgartner, 2012).

The median test-retest reliability of the Flexibility Scale was .84 after one week (predictability: .84, 95% CI [.78, .88], BF > 100, adaptability: .73, 95% CI [.65, .80], BF > 100, and orderliness: .86, 95% CI [0.82, 0.90], BF > 100; preregistered analysis). The results of the convergent and discriminant correlations are displayed in Table 2.

The BFs in two of three convergent correlations and in one of three discriminant correlations showed substantial evidence for the effect (Wetzels et al., 2011). As CIs overlapped, convergent and discriminant correlation coefficients did not differ significantly.

## Discussion

Study 2 aimed to further inspect the psychometric properties of the Flexibility Scale. The model showed an acceptable fit, and except for the two recoded items, all items loaded high on the expected factors. The results of the CFA, therefore, supported the initial EFA regarding the latent structure of flexibility. Test-retest reliability for the three flexibility scales after 1 week was good and comparable with results from the study of other personality traits, such as character strengths (Ruch et al., 2010). The Flexibility Scale also showed initial support for convergent and discriminant validity: The convergent correlations were numerically higher than the discriminant correlations, and they fulfilled our criteria in two of three flexibility dimensions, in comparison to just one dimension in terms of discriminant correlations. However, as the 95% CIs of the correlations were overlapping, the construct validity of the Flexibility Scale requires further scrutiny.

**Table 2.** Convergent and discriminant coefficients

Flexibility subscales	PP			WAAQ		
	<i>r</i>	95% CI	BF	<i>r</i>	95% CI	BF
Predictability	-.29	[-.41, -.15]	>100	-.15	[-.29, -.01]	1.39
Adaptability	.46	[.33, .56]	>100	.23	[.09, .36]	22.80
Orderliness	-.05	[-.19, .09]	0.22	.01	[-.13, .15]	0.17

Note. *N* = 188. PP = Proactive Personality scale, convergent validity; WAAQ = Work-related Acceptance and Action Questionnaire, discriminant validity, *r* = Pearson correlation, CI = confidence interval, BF = Bayes factor.

## General Discussion

The aim of the present research was to add to the scientific understanding of flexibility as a personality trait and to offer a more comprehensive and general measurement to assess flexibility. We explored the latent structure behind three flexibility concepts. In the EFA, flexibility was found to be a multidimensional construct, consisting of three facets: predictability, adaptability, and orderliness. In the next step, we investigated the relationships of these flexibility facets with the Big Five personality traits. Our assumption regarding the relationship of adaptability with openness to experience was supported, and orderliness was found to be positively related to conscientiousness. Furthermore, predictability was found to be positively related to neuroticism and negatively to extraversion. The joint EFA over the 3 flexibility dimensions and 15 Big Five facets delivered initial support for the discriminant validity of the Flexibility Scale scores. These results support the complex nature of flexibility and suggest the importance of the assessment of its facets separately.

In Study 2, we further investigated the psychometric properties of the shortened Flexibility Scale. The initial latent structure of the flexibility scale was established by CFA. All items except for two showed high loadings on the corresponding factor. The exceptions were two recoded, initially negatively keyed items that showed loadings < .40 on the corresponding factors, which is in line with previous research on method effects of reversely recoded items (Dueber et al., 2022; Weijters & Baumgartner, 2012). In Study 2, the Flexibility Scale showed sufficient test-retest reliability after 1 week, suggesting the stability of flexibility as personality trait. The convergent correlations of the Flexibility Scale were higher than the discriminant correlations, but they did not exceed the cut-off. One explanation could be the specificity of the proactive personality questionnaire used to test convergent validity. Flexibility refers to the disposition and willingness toward novelty and contains both, the adaptation of own plans and behaviors as well as actively changing the environment to achieve desirable goals (Ployhart & Bliese, 2006). Furthermore, flexibility contains both aspects, variability (adaptability), to initiate changes, and stability (orderliness) to balance the change processes and implement the changes in a planned fashion (Bitterwolf, 1992). Comparably, proactive

personality describes the personality disposition to actively influence the environment to achieve the desirable changes (Seibert et al., 1999). Therefore, proactive personality reflects partially only one of the three facets of flexibility, namely adaptability. Future research could adopt other concepts for further testing the convergent validity of the flexibility scale, such as orderliness as a facet of the Big Five in the Big Five Aspect Scales (BFAS, DeYoung et al., 2007) or the Adaptability Scale (van Dam & Meulders, 2021).

## Limitations and Directions for Future Research

The present study is limited due to self-reports and the specificity and size of the sample. Although self-reports are a common practice in a number of psychological research fields, such as personality, and positive and organizational psychology, future research could adopt peer or supervisor ratings to achieve a more holistic understanding of the facets of flexibility. Adoption of an objective flexibility assessment in a workplace and comparison with the results from self-reports could be a promising extension of the current research. As the sample consisted of mostly women, future research could adopt a broader recruiting strategy to motivate men to take part in the study. Additionally, the sample size in the current study needs to be considered when interpreting the results. Based on Schönbrodt and Perugini (2013), we assumed that correlations stabilize at a sample size between 150 and 250. However, it needs to be considered that instruments with less-than-perfect reliabilities, as typically used in psychological research, would require even larger samples to produce stable correlations (Kretzschmar & Gignac, 2019). Furthermore, our sample sizes were somewhat small for factor analyses, with the participant/item ratio ranging from 7:1 (Study 1) to 8:1 (Study 2), which is below the recommended ratio 10:1 (Kline, 2011). As Cronbach's  $\alpha$  is considered to be the lowest bound of reliability, we computed McDonald's Omegas that were sufficiently high (see supplementary Tables S2 and S6). Due to the sample size, our tests are underpowered (Faul et al., 2007) to detect small effects ( $\leq .10$ ), power range .27-.30), but we have sufficient power to detect middle-sized effects ( $\leq .20$ ), power range .79-.83). Furthermore, the Flexibility Scale and its items

should be tested for longitudinal measurement invariance in a larger sample when conducting future longitudinal studies. Therefore, it is desirable to replicate the current findings in a larger sample.

Further, the data collection of Study 2 took part during the introduction of COVID-19 pandemic restrictions. The extreme changes in the work and social life, such as work from home, restrictions for social life, and balancing work and private life at the same time and in the same place, could affect the responses on the questionnaires and the participants' dispositional flexibility. Therefore, replications of the results of Study 2 without pandemic restrictions would be desirable. Furthermore, the cut-off criteria for the model fit for CFA were rather lenient, although recommended and widely used (Schermele-Engel et al., 2003). Future studies could adopt stricter criteria for evaluating model fit (West et al., 2012).

The current research focused on the exploration of the components of flexibility and initial validation of the 24-item Flexibility Scale (FS-24). Therefore, the scope of the validation criteria is rather limited, and little is known about the relationships with other relevant outcomes. One idea for future research would be a more comprehensive empirical delimitation of flexibility as a personality trait from related constructs, such as cognitive flexibility, cognitive ability, problem-solving skills, and motivational aspects. As Schmitt and Chan (2014) outlined, both cognitive and motivational aspects are crucial aspects of flexibility, which is why we would expect overlaps between these constructs. Together, this would show flexibility as a composite trait, which includes dispositional (focus of the present study), motivational, and ability aspects.

As psychological flexibility in a specific context (work) was used to determine discriminant validity of the flexibility scale, and the Flexibility Scale was generalized for broader contexts, this could have resulted in overestimated discriminant correlations. A further idea for future research would be to adopt a more general measure for psychological flexibility (e.g., Acceptance and Action Questionnaire, Hayes et al., 2006) for discriminant analyses. Another idea would be to inspect the relationships between flexibility and general and work-related well-being and its components, including subjective and psychological well-being. Furthermore, considering the fast development of the positive psychology field, it could be interesting to study flexibility in regard of its relationships with positively valued personality traits (character strengths). This could reveal whether flexibility can be seen as a positive personality trait.

## Theoretical and Practical Implications

Considering different concepts of flexibility, the present study makes a contribution to the common conceptualization

of flexibility and its elements, as suggested previously (Baard et al., 2014; Zhang et al., 2020). Furthermore, the FS-24, based on the three flexibility concepts and adapted for general social situations, is a valuable contribution to the assessment of flexibility in different settings.

The current study has therefore several practical implications and offers a wide range of opportunities for application. As the FS-24 is a rather short self-report questionnaire, it could be used by human resource managers in preparation of organizational transformation and large-scaled organizational development. Assessing employees' flexibility employees prior to organizational change could be beneficial for planning organizational change activities or for defining the agents of change inside the teams. Furthermore, assessing how flexible the employees are could help to create new working teams, which should consist of members with both dispositions: With high flexibility, to be open for changes, and high stability, to implement changes and to transform them into the working routine (for further details, see Bitterwolf, 1992). Furthermore, the use of the FS-24 in the coaching and counseling practice would give the opportunity to tailor possible counseling solutions regarding the client's disposition toward novelty and changes. For example, for the clients who are open to changes, one could suggest trying new behaviors or ways of thinking. Comparably, for a client with high scores in predictability and orderliness, best practices and their adaptation to current life circumstances would be advisable. Another possible implication of having the FS-24 available could be a private use for a broader self-reflection. Indeed, by knowing one's dispositions towards novelty and changes, a person can better explain their emotions, thoughts, and behaviors.

## Conclusion

In the modern, rapidly changing world, flexibility as a dispositional characteristic could be important as a personal resource in dealing with demands from different life domains. The current study contributes to the scientific understanding of flexibility as a personality trait. The results of the study suggest the dimensionality of flexibility, consisting of the three facets – predictability, adaptability, and orderliness. Furthermore, the proposed measure, the FS-24, was found to have acceptable psychometric properties and offers a wide range of applications in different fields.

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## Conflict of Interest

The authors declare no conflict of interest.

## Authorship

Valentina Vylobkova: conceptualization, formal analysis, investigation, writing - original draft, writing - review & editing. Sonja Heintz: conceptualization, writing - review & editing. Both authors approved the final version of the article.

## Open Science

The supporting data of Study 1 are not available due to ethical reasons (study participants were not asked for their agreement to share the data publicly). The information needed to reproduce all of the reported methodology (materials and code) for Study 1 is therefore not openly accessible. The study materials are available on request from the authors.

Open Data: The authors confirm that there is sufficient information for an independent researcher to reproduce all of the reported results of the Study 2, including codebook. The data from Study 2 and analysis code are publicly available at <https://osf.io/u43hp/> (Vylobkova, 2023).

Preregistration and Analysis Plan: Study 2 was part of a larger research project. A blinded version (without author names) of the project preregistration and analysis plan is available at <https://aspredicted.org/blind.php?x=cs85rh>

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