# WPV Corp Factor Analysis

**Introduction**

The aim of this analysis was to conduct an exploratory factor analysis (EFA) in order to develop and create a valid scale of workplace harassment and violence. The items included were originally comprised of 12 factors nested into four dimensions. The four dimensions and their respective facets are outlines below:

- **Triangle One – The Organization**

    - Leadership

    - Rewards and Punishments

    - Attitudes and Behaviours

- **Triangle Two – Workplace**

    - Physical safety

    - Emotional bullying

    - External threats

- **Triangle Three – Processes and Procedures**

    - H.R. Processes and procedures

    - Enforcement

    - Communication

- **Triangle Four – Supports**

    - Physical supports

    - Emotional supports

    - Training

Before a scale can be declared valid and reliable certain procedures must be met. Each subscale (or facet) included in the analysis must have adequate internal consistency as determined by Cronbach's alpha ($\alpha > .7$). Furthermore, convergent, divergent, and criterion related validity must also be established. Convergent validity refers to the degree to which two measures of constructs that theoretically should be related, are in fact related. In this analysis, this is achieved by correlating subscales with other scales that are theoretically similar (i.e., measuring the same construct). Divergent validity refers to the degree to which two measures of separate constructs are not related. In this analysis this is achieved by correlating subscales with other scales that are theoretically dissimilar, meaning that the correlation of these scales should not be significant. Finally, criterion related validity refers to the degree to which the subscales measures are related to theoretical outcomes.

In the event that all conditions of reliability and validity are met after the factor analysis has resulted in an interpretable factor structure comprised of non-redundant items, the scale is declared valid.

**Methodology**

*Participants*

In order to carry out the validation of the workplace violence & harassment scale, a Qualtrics panel sample of 315 participants (131 Males and 184 Females; Mean age $M = 38.26$, $SD = 11.75$) from a range of diverse occupations were recruited. On average participants had 8.40 ($SD = 8.05$) years of work experience with their current employer. Five

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data manipulation check questions were included in the survey to account for random responses. Data manipulation check questions were additional questions embedded in the survey requiring participants to respond to that question with a specific response (e.g., "Please select 'Neither Agree nor Disagree'"). Participants who failed the manipulation check questions were not included in the data.

### *Data Cleaning*

Data was cleaned by examining the range of responses and ensuring correct data entry. Missing values on the WPV scale were converted to the midpoint on the scale (3) in order to utilize the full range of data available. Items were reverse coded accordingly in order to simplify the interpretation of the EFA and conduct the subscale reliability analyses.

## Data Analysis

### *Initial Item Reduction Analysis*

Before the initial EFA could be conducted, a reliability analysis was conducted on each of the 12 a priori subscales that were expected. Items were excluded based on a cutoff of Cronbach's $\alpha < .7$, or if the scale reliability was significantly ameliorated as a result of dropping that item. Based on this exclusion criteria, 0 items were deleted from the analyses. All subscales had strong reliability of Cronbach's $\alpha > .7$ with the exception of the scale "Physical Support". As the subscale was inferior to Cronbach's $\alpha < .7$, the items and subscale were flagged but not yet removed.

An additional glance at the variances of all 146 items was conducted. All items met the required variance requirements for inclusion in the EFA.

***Facet Factor Extraction and Rotation***

Due to the high number of items in the overall item by item factor analysis, an

examination of each of the four dimensions was conducted in order to determine the factor

structure. The extraction of the factor structure was done using a principal components

analysis using a Varimax rotation. The principal components analysis establishes whether

linear components exist within the data and how a particular variable might contribute to

that component (Field, 2012), while a Varimax rotation helps the interpretation of factors by

maximizing the variance of square loadings on a factor (Conway & Huffcutt, 2003). It is

considered as one of the most popular and simple methods of orthogonal rotation.

The aim of this step was to determine whether each proposed dimension (The

Organization, Workplace, Processes and Procedures, and Supports) each had the intended

three factor structure proposed. In the event this was not the case, a new factor structure

was proposed.

The first dimension to be analyzed was 'The Organization' dimension consisting of

three a priori theoretical factors (Leadership, Rewards & Punishments, and Attitudes &

Behaviors). An initial scan of the analysis yielded Kaiser-Meyer-Olkin measure of sampling

adequacy (KMO) statistic of .926, far greater than the required .5 ensuring an adequate

sampling distribution (Kaiser, 1970). Furthermore, Bartlett's Test of Sphericity was

significant, $\chi^2$ (990, $N$ = 315) = 9034.479, sig < .00[1], rejecting the null hypothesis that the

respective R-matrix is an identity matrix. An initial glance at the rotated factor structure

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[1] The assumptions of the EFA are only mentioned once, after which they will only be
mentioned in the event of a violation of assumption in order to provide succinctness of the
results.

indicated an uninterpretable 8-factor solution according to Kaiser's (1960) recommendation of pulling factors based on eigenvalues > 1. However, given the amount of variables and sample size included in the data, a factor judgement based on observation of the scree plot was made. The scree plot subsequently indicated a 4-factor solution which guided the analysis of the second EFA for the first dimension. Given the amount of cross-loadings occurring within this 4-factor solution, it was deemed prudent to select the top items, up to a maximum of five in each factor which did not cross load, whenever possible. The list of selected items is located in annex A. All items which did not fit this criterion were subsequently removed. As a result, 29 items were removed from the first dimension.

The second dimension to be analyzed was the "Processes & Procedures" dimension consisting of three a priori theoretical factors (Communication, Enforcement, and HR Processes). Once again, an observation of the scree plot indicated a 3-factor solution upon first examination of the EFA. A second EFA based on a 3-factor solution was subsequently analyzed. Given the amount of cross-loadings observed in the 3-factor solution, the previously mentioned guidelines were established to eliminate items and provide the best items for each factor up to a maximum of five items per factor. The results are located in annex A.

The third dimension to be analyzed was the "Supports" dimension consisting of three a priori theoretical factors (Emotional Support, Physical Support, and Training). Observation of the initial EFA scree plot indicated a five-factor solution. A second EFA based on a five-factor solution was conducted with the previous guidelines for establishing item retention and removal utilized. Despite a five-factor solution being proposed, no items loaded exclusively on factor five. As a result, only four factors were retained. The results are located in factor A.

The fourth dimension to be analyzed was the "Workplace" dimension consisting of three a priori theoretical factors (Emotional Bullying, External Threats, and Physical Safety). An initial EFA analysis indicated a 3-factor solution for both the scree plot and as a result of Kaiser's (1960) guideline of eigenvalues > 1. Nevertheless, interpretation of the factor solution indicated only one factor which did not have any cross-loadings. As a result, only one factor was retained. The results are located in factor A.

### Confirmation of New Factor Structure - (Item Reduction Phase 2)

Having reduced the items comprising each of the original four theoretical dimensions, a second round of EFA analyses were conducted on this smaller subset to confirm the new factor structures. Cross-loading items were retained under one factor if they only cross-loaded with a maximum of two factors with the loading on the first factor > .7 while the loading on the second factor was < .4. Any other cross-loadings that did not comply with the retention criterion were subsequently removed.

An EFA on the first dimension using only the items retained from the previous analyses yielded a 4-factor solution. Although the initial solution was found, two items cross-loaded in a manner that did not comply with the retention criteria. These items were subsequently removed. The remaining items are found in annex B.

An EFA on the second dimension using only the items retained from the previous analyses yielded a 3-factor solution. Although the initial solution was found, one item cross-loaded in a manner that did not comply with the retention criteria. This item was subsequently removed. The remaining items are found in annex B.

An EFA on the third dimension using only the items retained from the previous analyses yielded a 4-factor solution. Although the initial solution was found, one item cross-

loaded in a manner that did not comply with the retention criteria. This item was subsequently removed. The remaining items are found in annex B.

An EFA on the fourth dimension using only the items retained from the previous analyses confirmed a 1-factor solution. No further analysis was necessary.

### New Scale Reliability Analysis

Reliability analyses were conducted on each factor independently in order to ensure adequate psychometric properties. For use in research, scales are suggested to have a Cronbach's $\alpha$ > .7. As such, any new factors which did not meet the requirements were subsequently deleted. Two factors failed to meet the required alpha level and were consequentially removed. One of the scales came from the first dimension, "The Organization", whereas the second scale came from the third dimension, "Supports". A total of nine items were removed as a result, leaving us with 42 items in 10 factors. The remaining factors and items are listed in annex C.

### Validity Analysis

Scale totals were subsequently calculated for each factor in order to establish correlations between the factors themselves (annex D), as well as between other well-known measurement scales for convergent and predictive validity (annex E). Because several factors were not yet named as a result of containing items from different a priori groupings, as well as two factors which contained items within the same a priori grouping, the factor names were changed in the correlation matrix by using the template "D#F#", where '#' referred to the dimension and factor numbers from annex C, respectively.

As items comprising the new factors were all reverse coded to associate higher scores with instances of perceived security and reduced violence, we would expect all factors to negatively correlate with existing scales related to fear, risk or subjugation of violence, sexual harassment, and incivility, while positively correlating with scales assessing general health and well-being. The correlations observed in table 2 (annex D) indicate that this is indeed the case, effectively confirming predictive and convergent validity. As this survey did not include scales that were theoretically unrelated to the construct at hand, divergent validity was not assessed.

**Conclusion**

After several rounds of factor analysis and item reduction, we have successfully identified 10 factors comprised of between three to five items (for a total of 42 items), with each factor assessing various elements of workplace harassment, violence, and general perceived support towards such acts. It is important to note that an EFA mainly reinterprets the variance of a list of items in order to determine inter-correlations which may be caused by underlying factors. As such, caution is warranted when observing the results. The best use of an EFA is one that is guided by sound theoretical development underlying the factor structure. Given the initial large volume of items included in the analysis, the interpretation of the EFA was rendered difficult. Optimal factors comprising a scale should be related to the construct at hand, yet distinct enough to measure different elements of the structure.

As previously mentioned, some of the new factors are unnamed as a result of containing items which span several different groupings originally specified by WPV Corp. The items comprising these factors should be observed and used to guide the development of a factor name which encompasses these items appropriately.

**Bibliography**

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   analysis in organizational research. *Organizational Research Methods, 6*, 147-168.

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Kaiser, H. F. (1970). A second generation little jiffy. *Psychometrika*, *35*(4), 401-415.

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   *and psychological measurement*.

**Dimension 1: The Organization**

Factor 1: "Rewards & Punishments"
- 42, 40, 43, 38, 31
- I have a say in who my employer promotes to become my manager
- My manager is rewarded for helping me
- Objective criteria are provided for advancement
- Rewards such as bonuses and promotions are given fairly.
- Bonuses or recognition are given for team performance

Factor 2: "Attitudes & Behaviors"
- 15, 16, 6
- Safety risks are not tolerated
- I act according to the values of the organization
- Jokes about an employee's race, religion, sexual orientation, nationality are not permitted.

Factor 3: *Unnamed*[2]
- 20, 19, 1, 2, 5
- I am expected to support the person in authority without questioning
- I am expected to accept my manager's goals unconditionally
- I am expected to agree with others
- I am expected to be liked by everybody
- I am expected to conform

Factor 4: *Unnamed*
- 37, 36, 44
- Punishments are more common than rewards
- You need to play politics to get ahead here
- Bullies are promoted

**Dimension 2: Processes & Procedures**

Factor 1: "Communication"
- 50, 47, 51, 48, 49
- I clearly understand my employer's workplace violence policy
- I have seen a written copy of my employer's policy on workplace violence
- I clearly understand what the organization is trying to accomplish with regards to workplace violence
- I am aware of what my employer defines as threatening behavior
- There is a written copy of my employer's policy on harassment posted in the workplace

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[2] Whenever items from different a priori groupings form a factor, the factor is unnamed.

Factor 2: *Unnamed*
- 76, 46, 68
- Essential information flows from senior leaders to staff.
- Promotions are based on merit
- Performance is measured objectively

Factor 3: "Enforcement"
- 65, 66, 64, 63
- People who make derogatory references to a person's race/religion/sexual orientation/nationality are disciplined
- Sexual harassment is punished
- Cyberbullying is not tolerated
- People who engage in threatening behavior will be dismissed

**Dimension 3: Supports**

Factor 1: "Emotional Support"
- 86, 88, 89, 81, 78
- I feel valued as an employee.
- My opinions are respected
- My organization asks what I think.
- I am encouraged to think in unique and independent ways
- I am supported by my colleagues

Factor 2: *Unnamed*
- 100, 93, 92
- I have resources available to me to deal with stress in my life
- If I am having problems in my private life, I know where to get help
- There is an employee assistance program in place

Factor 3: *Unnamed*
- 106, 105, 107, 82
- I know the definition of workplace violence
- I understand what workplace harassment is
- I know how to recognize cyberbullying
- I am good at my job

Factor 4: "Emotional Support"[3]
- 83, 85, 87
- I am often forgetful
- I feel overwhelmed
- I take all criticism personally

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[3] Factor 1 & Factor 4 both contain items in the a priori grouping of emotional support.

**Dimension 4: Workplace**

<u>Factor 1:</u> "Emotional Bullying"
- 114, 116, 113, 119, 118
- I feel like an outsider at work
- I am harassed at work
- I have been subjected to undeserved punishment
- I have had my applications for training, leave or promotion blocked arbitrarily.
- I have had areas of responsibility removed without cause.

**Dimension 1: The Organization**

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- I have had areas of responsibility removed without cause.

Table 1

*Pearson correlations between the factor scale totals, scale means, standard deviations, and reliability alphas.*

|  |  | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | D1F1 | 11.55 | 3.89 | *0.73* | | | | | | | | | |
| **2.** | D1F2 | 11.75 | 3.75 | .148** | *0.81* | | | | | | | | |
| **3.** | D1F3 | 10.58 | 3.25 | .275** | .428** | *0.75* | | | | | | | |
| **4.** | D2F1 | 18.21 | 5.98 | .310** | .170** | .171** | *0.92* | | | | | | |
| **5.** | D2F2 | 10.20 | 3.10 | .669** | .263** | .502** | .363** | *0.77* | | | | | |
| **6.** | D2F3 | 11.47 | 3.11 | .387** | .168** | .385** | .434** | .472** | *0.82* | | | | |
| **7.** | D3F1 | 18.41 | 5.29 | .623** | .284** | .558** | .407** | .772** | .547** | *0.92* | | | |
| **8.** | D3F2 | 11.08 | 3.06 | .361** | 0.099 | .194** | .446** | .386** | .338** | .496** | *0.76* | | |
| **9.** | D3F3 | 12.72 | 2.51 | .156** | .131* | .139* | .413** | .309** | .340** | .352** | .416** | *0.86* | |
| **10.** | D4F1 | 20.24 | 5.03 | .233** | .427** | .627** | .287** | .439** | .429** | .579** | .308** | .299** | *0.88* |

*Note.* ** Correlation is significant at .001 level (2-tailed). * Correlation is significant at the .05 level (2-tailed). Alpha reliabilities are presented in the diagonal in italics

Table 2

*Pearson Correlations for predictive validity analysis between the new factor totals and measures of aggression, health, and prevention.*

| | Workplace Violence & Aggression | Risk for Violence | Workplace Incivility | Sexual Experience Questionnaire | Negative Acts Questionnaire | General Health Questionnaire | Fear of Violence | Violence Prevention Climate Scale |
|---|---|---|---|---|---|---|---|---|
| $\alpha$ | *0.91* | *0.91* | *0.96* | *0.92* | *0.96* | *0.9* | *0.96* | *0.91* |
| D1F1 | -.193** | .131* | -.202** | -.124* | -.318** | .315** | -0.066 | .312** |
| D1F2 | -.134* | -0.085 | -.305** | -.148** | -.337** | 0.075 | -0.093 | .279** |
| D1F3 | -.353** | -.180** | -.404** | -.321** | -.490** | .185** | -.254** | .413** |
| D2F1 | -0.051 | 0.048 | -.255** | -.232** | -.277** | .128* | -0.049 | .541** |
| D2F2 | -.222** | 0.023 | -.390** | -.201** | -.417** | .319** | -0.08 | .461** |
| D2F3 | -.221** | -0.036 | -.382** | -.340** | -.415** | .198** | -.128* | .586** |
| D3F1 | -.321** | -0.011 | -.474** | -.247** | -.533** | .339** | -.180** | .551** |
| D3F2 | -0.099 | 0.033 | -.280** | -.227** | -.352** | .161** | -0.105 | .474** |
| D3F3 | 0.036 | 0.058 | -.139* | -0.11 | -.132* | 0.052 | -0.043 | .431** |
| D3F4 | -0.102 | -.133* | -.269** | -.221** | -.295** | .242** | -.113* | .192** |
| D4F1 | -.263** | -.195** | -.561** | -.338** | -.664** | .178** | -.194** | .497** |

*Note.* ** Correlation is significant at .001 level (2-tailed). * Correlation is significant at the .05 level (2-tailed). Alpha reliabilities are presented in the diagonal in italics