The Mediating and Moderating Effects of Workplace Social Capital on the Associations between Adverse Work Characteristics and Psychological Distress among Japanese Workers

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Abstract: Our current study investigated how workplace social capital (WSC) mediates and moderates the associations between adverse work characteristics and psychological distress among Japanese workers. We collected cross-sectional data (N=9,350) from a baseline survey of an occupational Japanese cohort study. We focused on individual WSC and considered job demands/control, effort/reward, and two types (i.e., procedural and interactional) of organizational justice as work-characteristic variables. We defined psychological distress as a score of ≥5 on the Kessler Psychological Distress Scale (K6 scale). Multivariate logistic regression analyses predicted a binary variable of psychological distress by individual WSC and adverse work characteristics, adjusting for individual-level covariates. Individual WSC mediated the associations between adverse work characteristics and psychological distress in almost all model specifications. Additionally, individual WSC moderated the associations of psychological distress with high job demands, high effort, and low interactional justice when we used a high WSC cutoff point. In contrast, individual WSC did not moderate such interactions with low job control, reward, or procedural justice. We concluded that individual WSC mediated the associations between adverse work characteristics and psychological distress among Japanese workers while selectively moderating their associations at high levels of WSC.

Key words: Workplace social capital, Psychological distress, K6 scale, Organizational justice, Logistic regression

Introduction

Workplace social capital (WSC) refers to the contextual psychological conditions in a workplace. This construct has multifold aspects, including the extent and intensity of associational links or activities, as well as perceptions of support, reciprocity, and trust in the workplace1–9).
Specifically, WSC has gained attention as a key variable associated with workers’ health, and empirical studies have found associations of low WSC with depression, hypertension, poor self-rated health, smoking, and high mortality. However, it is possible that WSC serves as a moderator of the impact of job stressors and other adverse work characteristics on individual health outcomes. Indeed, WSC has been found to buffer the association between high job demands and smoking, suggesting that it moderates the effects of various types of adverse work characteristics on a wide range of health outcomes. Furthermore, WSC is likely to serve as not only a moderator but also a mediator of the associations between adverse work characteristics and psychological distress, an issue that has been largely unexplored. Indeed, some studies have found that social capital, in general, mediates the associations between adverse work characteristics and psychological distress, as suggested by preceding studies that focused on work characteristics, considering that it is an individual assessment of social capital and is not exogenously given to individuals in nature.

Regarding adverse work characteristics, we considered the levels of job demand and control, effort and reward, and two types of organizational justice (i.e., procedural and interactional). We used these variables because they are well-supported in existing models that address the association between adverse work characteristics and health. First, the job demands-control (JD-C) model argues that workers with high job demands and/or low job control have a higher risk of psychological distress. This model has been generally supported by empirical studies. Second, the effort-reward imbalance (ERI) model claims that an imbalance between effort expended at work and the rewards received leads to health risks. Empirical studies have provided evidence in support of this model, and some studies have jointly investigated the validity of both the JD-C and the ERI models. Third, it is well established that lack of organizational justice is negatively associated with workers’ mental health status. Researchers have often treated procedural and interactional justice as the two primary aspects of organizational justice.

We tested three hypotheses regarding the potential roles played by individual WSC in workers’ mental health:

1) Low individual WSC will be positively associated with psychological distress (H1), as has been suggested by many previous studies that focused on different health outcomes.

2) Individual WSC will mediate the associations between adverse work characteristics and psychological distress (H2), as suggested by preceding studies that found that social capital serves as a mediator of the associations between external shocks and health.

3) Individual WSC will moderate the associations between adverse work characteristics and psychological distress (H3), since it has been found that individual WSC moderates the effects of job demand and strain on smoking behavior.

We attempted to examine whether the same is true for the effects of a wider variety of adverse work character-
istics and psychological distress. We further predicted that individual WSC will moderate the effects of adverse work characteristics selectively, rather than uniformly. In general, job demands and control, effort and reward, and organizational justice are different characteristics in terms of their situational levels and/or sources; thus, it is reasonable to predict that individual WSC would moderate some, but not all, of these work characteristics.

One possible suspicion is that the results may be sensitive to the choice of cutoff points for the individual WSC scores. Previous studies have used the mean\(^3\)-\(^6\), \(^9\), \(^10\) or another reasonable, but tentative, criterion\(^11\), \(^12\) as a cutoff point when using individual WSC as a binary variable, while the observed associations between individual WSC and mental health were quite different across WSC levels\(^1\), \(^2\), \(^7\). Hence, in the current study, we alternatively used high and low WSC cutoff points to examine the sensitivity of the results to their choices.

### Subjects and Methods

#### Study sample

We used cross-sectional data from the baseline survey of an occupational cohort study on social class and health in Japan (Japanese Study of Health, Occupation, and Psychosocial Factors Related Equity; J-HOPE), which was conducted from October 2010 to December 2011. The study population consisted of employees representing several different industries and a wide variety of occupations. The original sample included 10,807 workers from 12 companies (the companies employed between 8 and 3,462 of the respondents, with a mean corporation size of 901 employees, as represented by our sample). The response rate was 77.4%. The basic composition of the sample is summarized in Table 1.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number</th>
<th>Firm code and type of industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>7,268</td>
<td>1. Information technology 1,080</td>
</tr>
<tr>
<td>Women</td>
<td>2,082</td>
<td>2. Hospital 129</td>
</tr>
<tr>
<td>Educational attainment</td>
<td></td>
<td>3. Manufacturing 2,163</td>
</tr>
<tr>
<td>High school or below</td>
<td>3,610</td>
<td>4. Information 125</td>
</tr>
<tr>
<td>Junior college</td>
<td>1,626</td>
<td>5. Pharmaceutical 249</td>
</tr>
<tr>
<td>College or above</td>
<td>4,113</td>
<td>6. Service 34</td>
</tr>
<tr>
<td>Job classification</td>
<td></td>
<td>7. Veterinary 6</td>
</tr>
<tr>
<td>Managerial workers</td>
<td>1,663</td>
<td>8. Medical 24</td>
</tr>
<tr>
<td>Researchers and professionals</td>
<td>1,317</td>
<td>9. Service 797</td>
</tr>
<tr>
<td>Engineers and technicians</td>
<td>1,031</td>
<td>10. Manufacturing 3,085</td>
</tr>
<tr>
<td>Clerical workers</td>
<td>1,031</td>
<td>11. Transportation 1,040</td>
</tr>
<tr>
<td>Service workers</td>
<td>509</td>
<td>12. Real estate 618</td>
</tr>
<tr>
<td>Manufacturing workers (technical)</td>
<td>585</td>
<td></td>
</tr>
<tr>
<td>Manufacturing workers (operational)</td>
<td>1,003</td>
<td>N 9,350</td>
</tr>
<tr>
<td>Manufacturing workers (manual)</td>
<td>796</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1,106</td>
<td></td>
</tr>
</tbody>
</table>

Household income (annual, equivalized, million yen)  \(M=183.2; \ SD=221.7; \ Min=1.9; \ Max=2,100\)

Age:  \(M=40.7; \ SD=10.5; \ Min=18; \ Max=64\)
Measures

Workplace social capital

We assessed WSC specifically at an individual level using the following three items scored on a four-point scale (1 = disagree, 2 = somewhat disagree, 3 = somewhat agree, and 4 = agree): (i) “We have a ‘we are together’ attitude,” (ii) “People keep each other informed about work-related issues in the work unit.” These three items were adapted from Kouvonen et al. and were intended to measure the degrees of the WSC bonding aspects. Whereas Kouvonen and her colleagues used five-point scales, we used a four-point scale. Cronbach’s alpha coefficients for these three items was 0.83 in this study sample. We combined the responses to these items into a single index (range: 3 – 12) and constructed two types of binary variables that allocated a one to low WSC scores and a zero to high scores—one with a low cutoff point (8) that divided the sample into low (24.6% of the respondents) and high (75.4% of the respondents) WSC, and the other with a high cutoff point (10) that divided the sample into low (79.4% of the respondents) and high (20.6% of the respondents) WSC. We chose these two thresholds, 8 and 10, considering that more than a half (54.9%) of the respondents reported 8 or 9 as WSC scores (17.2% for 8 and 37.7% for 9).

Job demands and control

We utilized the items investigating job demands and control from the Japanese version of the JCQ. The JCQ, developed by Karasek, is based on the JD-C and includes scales for job demands (five items) and job control (nine items) rated on a four-point scale (1 = disagree to 4 = agree). The internal consistency, reliability, and validity of the Japanese version of the JCQ are acceptable, as shown by Kawakami et al. In the present study’s sample, Cronbach’s alpha coefficients were 0.69 and 0.76 for the job demands and control scales, respectively. We summed the responses to these items into single indices of job demands (range: 12 – 48) and control (range: 24 – 96), according to the weights established by Karasek. We also calculated the job demands/control ratio to measure the extent of job strain, as did Landsberger et al. We used the medians as the cutoff points of the binary variables that classified each worker as having either high or low job demands, job control, and job strain.

Effort and reward

To assess effort and reward, we utilized data collected from a simplified Japanese version of the ERIQ. A simplified version of the original ERIQ was developed by Siegrist et al. based on their ERI model. Tsutsumi et al. reported that the Japanese version of the ERIQ had acceptable internal consistency, reliability, and validity scores. Siegrist et al. developed a simplified version of the ERIQ; we used its Japanese version in the current study. This version includes scales for effort (three items) and reward (seven items) rated on a four-point scale (1 = strongly disagree to 4 = strongly agree). Cronbach’s alpha coefficients were 0.78 and 0.74 for the effort and reward scales, respectively. We summed the responses to these items into single indices for effort (range: 3 – 12) and reward (range: 7 – 28). We also calculated the effort/reward ratio and adjusted for differences between the two items to measure the extent of the ERI. We used the medians as the cutoff points for the binary variables classifying each worker as exhibiting either high or low efforts, rewards, and ERI scores.

Procedural and interactional justice

Two aspects (i.e., procedural and interactional) of organizational justice were measured by the Japanese version of the OJQ. The OJQ was developed by Moorman and was modified by Elovanio et al. The reliability and validity of the Japanese version were largely confirmed by Inoue et al. The OJQ comprises a seven-item scale for measuring procedural justice and a six-item scale for measuring interactional justice, both of which are rated on a five-point scale (1 = strongly disagree to 5 = strongly agree). In this sample, Cronbach’s alpha coefficients were 0.88 and 0.94 for procedural and interactional justice scales, respectively. For each justice type, we summed all item scores and divided that number by the number of items in that category to yield a variable with a range of 1–5. We used the medians as the cutoff points for the binary variables classifying each worker as either high or low in procedural and interactional justice.

Psychological distress

We measured psychological distress using the K6 six-item psychological distress questionnaire, which is rated on a five-point scale (0 = none of the time to 4 = all of the time). Cronbach’s alpha coefficient for this sample was 0.89. We calculated the total score (range: 0–24) and adopted ≥5 as the threshold for psychological distress, since scores ≥5 on this scale have been correlated to mood/anxiety disorders in Japanese people. The proportion of those with K6 ≥5 in this sample was 51.2%.
Covariates

We used gender, age group (20s–60s), educational attainment (high school or below, junior college, or college and above), and nine job types as covariates. Further, the J-HOPE asked respondents to report their pre-tax annual household income according to six brackets (≤2.99 million yen, 3–4.99 million yen, 5–7.99 million yen, 8–9.99 million yen, 10–14.99 million yen, and ≥15 million yen). We divided the mean values in each bracket by the number of family members to adjust for household size. Subsequently, we categorized the respondents into quintiles.

Analytic strategy

We employed multivariate logistic regression models to predict a binary variable capturing psychological distress by individual WSC and adverse work characteristics, adjusting for individual-level covariates. To complete our statistical analysis, we used the Stata data analysis software (version 11; StataCorp). Ideally, we would conduct multilevel analyses to examine both individual and contextual WSC; however, the number of companies (12) seemed too small to apply multilevel analysis to the current large sample (N=9,350). We also found that the interclass correlation (ICC) was relatively low (1.63%), even for an “empty model,” which predicted psychological distress without any explanatory variable. Hence, we conducted an individual-level analysis, rather than a multilevel one. Furthermore, we found no significant change in results when including company dummies to capture company-level fixed effects.

We estimated four models for each adverse work characteristic, including individual-level covariates, in all regression models. Model 1 predicted the probability of psychological distress related to each work characteristic. Model 2 predicted low individual WSC related to each work characteristic, while Model 3 predicted psychological distress by both work characteristic and low individual WSC. By combining the results from Models 1, 2, and 3, we were able to examine the mediating effects of individual WSC on the associations between each work characteristic and psychological distress in the framework of mediation analysis. Specifically, after checking the statistical significance of the association between individual WSC and each work characteristic in Model 2, we examined how much the odds ratios (ORs) associated with each work characteristic in Model 1 were reduced in Model 3. We also computed the proportion of the mediated association between each work characteristic and psychological distress, along with the 95% confidence interval obtained from our bootstrap estimation (with 2,000 replications). Finally, Model 4 added the interaction term between high job demands and low individual WSC to Model 3 to assess the moderating effect of individual WSC. To assess the moderating effect, we focused on the OR of the interaction term. We estimated these four models according to both low and high WSC cutoff points.

Results

Table 2 summarizes the pairwise correlations between individual WSC, work characteristics, and psychological distress, all of which were expressed in terms of their originally categorized (not dichotomized) values. Psychological distress was positively associated with higher values for job demands, job strain (job demands/control), effort, and ERI (effort/reward), but it was negatively associated with higher values for job control, rewards, and organizational justice. We observed a negative association
between individual WSC and psychological distress. Further, we found significant correlations between the work characteristics.

Table 3 summarizes the results of Models 1–3, using a low WSC cutoff point. To conserve space, the results regarding the covariates are not reported. As seen in this table, Model 1 confirmed a positive association between each adverse work characteristic and psychological distress. Model 2 showed a positive association between each adverse work characteristic and low individual WSC. Model 3 indicated that both adverse work characteristics and low individual WSC were positively related to psychological distress. The estimated associations in Models 1–3 were all highly significant. More importantly, the ORs of adverse work characteristics in Model 3 were somewhat lower than those observed in Model 1, suggesting that individual WSC served as a mediator in the associations between adverse work characteristics and psychological distress.

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work characteristic</td>
<td>ORc 95% CI(^d)</td>
<td>ORc 95% CI(^d)</td>
<td>ORc 95% CI(^d)</td>
</tr>
<tr>
<td>Job demands (high)</td>
<td>2.09 (1.92–2.28)</td>
<td>1.38 (1.25–1.52)</td>
<td>2.04 (1.87–2.22)</td>
</tr>
<tr>
<td>Job control (low)</td>
<td>1.41 (1.29–1.54)</td>
<td>1.98 (1.78–2.19)</td>
<td>1.29 (1.18–1.41)</td>
</tr>
<tr>
<td>Job strain (high)</td>
<td>2.27 (2.09–2.47)</td>
<td>1.89 (1.71–2.08)</td>
<td>2.13 (1.95–2.32)</td>
</tr>
<tr>
<td>Effort (high)</td>
<td>2.49 (2.28–2.72)</td>
<td>1.39 (1.26–1.54)</td>
<td>2.43 (2.23–2.66)</td>
</tr>
<tr>
<td>Reward (low)(^b)</td>
<td>2.90 (2.66–3.17)</td>
<td>3.50 (3.14–3.90)</td>
<td>2.60 (2.38–2.85)</td>
</tr>
<tr>
<td>Effort reward imbalance (high)(^b)</td>
<td>3.36 (3.07–3.67)</td>
<td>2.26 (2.04–2.50)</td>
<td>3.12 (2.86–3.42)</td>
</tr>
<tr>
<td>Procedural justice (low)</td>
<td>1.90 (1.75–2.07)</td>
<td>2.35 (2.16–2.57)</td>
<td>1.61 (1.48–1.76)</td>
</tr>
<tr>
<td>Interactional justice (low)</td>
<td>2.02 (1.85–2.20)</td>
<td>2.51 (2.30–2.74)</td>
<td>1.73 (1.58–1.89)</td>
</tr>
</tbody>
</table>

\(^a\)Adjusted for gender, age, educational attainment, household income, and job classification in all models. The cutoff point was 8 (in the range 3–12), and the proportion of respondents with WSC below the cutoff point was 24.6%. \(^b\)N=9,157 for reward and effort/reward. \(^c\)OR: Odds ratio. \(^d\)CI: Confidence interval. \(^e\)Bias-corrected and accelerated confidence interval based on bootstrap estimation with 2,000 replications.

Table 4. Estimated associations across adverse work characteristics, low individual WSC, and psychological distress using a high WSC cutoff point\(^*\) (Models 1–3)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work characteristic</td>
<td>ORc 95% CI(^d)</td>
<td>ORc 95% CI(^d)</td>
<td>ORc 95% CI(^d)</td>
</tr>
<tr>
<td>Job demands (high)</td>
<td>2.09 (1.92–2.28)</td>
<td>1.11 (1.00–1.23)</td>
<td>2.10 (1.93–2.30)</td>
</tr>
<tr>
<td>Job control (low)</td>
<td>1.41 (1.29–1.54)</td>
<td>2.28 (2.03–2.56)</td>
<td>1.28 (1.17–1.41)</td>
</tr>
<tr>
<td>Job strain (high)</td>
<td>2.27 (2.09–2.47)</td>
<td>1.82 (1.64–2.02)</td>
<td>2.15 (1.98–2.35)</td>
</tr>
<tr>
<td>Effort (high)</td>
<td>2.49 (2.28–2.72)</td>
<td>1.41 (1.27–1.57)</td>
<td>2.43 (2.23–2.66)</td>
</tr>
<tr>
<td>Reward (low)(^b)</td>
<td>2.90 (2.66–3.17)</td>
<td>3.06 (2.74–3.43)</td>
<td>2.65 (2.42–2.90)</td>
</tr>
<tr>
<td>Effort reward imbalance (high)(^b)</td>
<td>3.36 (3.07–3.67)</td>
<td>2.03 (1.83–2.26)</td>
<td>3.18 (2.91–3.47)</td>
</tr>
<tr>
<td>Procedural justice (low)</td>
<td>1.90 (1.75–2.07)</td>
<td>2.35 (2.16–2.57)</td>
<td>1.65 (1.51–1.80)</td>
</tr>
<tr>
<td>Interactional justice (low)</td>
<td>2.02 (1.85–2.20)</td>
<td>2.51 (2.30–2.74)</td>
<td>1.75 (1.60–1.91)</td>
</tr>
</tbody>
</table>

\(^*\)Adjusted for gender, age, educational attainment, household income, and job classification in all models. The cutoff point was 10 (in the range 3–12), and the percentage of respondents with WSC below the cutoff point was 79.4%. \(^b\)N=9,157 for reward and effort/reward. \(^c\)OR: Odds ratio. \(^d\)CI: Confidence interval. \(^e\)Bias-corrected and accelerated confidence interval based on bootstrap estimation with 2,000 replications.
cal distress. The rightmost column reports the estimated proportions of the mediated association, underscoring the significant mediating effects of individual WSC for all work characteristics. Notably, the proportion of the mediated association was about 30% or more for job control, procedural justice, and interactional justice.

Table 4 provides the results obtained when replacing a low WSC cutoff point with a high one. The results were similar to those in Table 3, with one exception: job demand, for which individual WSC did not significantly mediate its associations with psychological distress. The proportion of the mediating effect was higher for job control, procedural justice, and interactional justice, in line with the results found in Table 3.

Then, we turned to the moderation analysis. Table 5 summarizes the estimated ORs for psychological distress in response to each work characteristic, low individual WSC, and their interactions; these estimated ORs were obtained from Model, 4 with a low WSC cutoff point. For all work characteristics, we observed that psychological distress was positively associated with adverse work characteristics and low individual WSC, as already observed in Table 3. The more noteworthy finding was that the ORs of none of the interaction terms were different from one at the 5% significance level, indicating that individual WSC did not have a moderating effect.

Finally, Table 6 provides the results of the moderation analysis with a high WSC cutoff. Unlike the results presented in Table 5, we observed significantly higher-than-one ORs for job demands, job strain, and effort, ERI,
interactional justice, but not for job control, reward, or procedural justice. Considering the lack of moderating effects on job control and reward, we can argue that the moderating effects of individual WSC on job strain and ERI were attributable to WSC’s moderating effects on job demands and effort, respectively.

**Discussion**

We focused on individuals’ WSC and used cross-sectional data collected from a Japanese occupational survey to investigate its importance in maximizing workers’ mental health. We tested the following three hypotheses—H1: low levels of individual WSC are positively associated with psychological distress, H2: individual WSC mediates the associations between adverse work characteristics and psychological distress, and H3: individual WSC works as a moderator in these associations. The estimation results supported H1 and H2 but did not fully support H3, as is summarized in the following discussion.

First, individual WSC was negatively associated with psychological distress. This result supported H1 and agreed with the observations of preceding studies on the association between individual WSC and depression. Second, individual WSC mediated the associations between adverse job characteristics and psychological distress in almost all model specifications. This result supported H2 and suggested that an individual assessment of WSC was affected by various job characteristics. These two results, which held true regardless of whether WSC cutoff levels were high or low, confirmed the validity of H1 and H2.

In contrast, the results regarding the moderating effects were mixed and were not fully supportive of H3. We first found that the moderating effect of individual WSC was observed with only a high WSC cutoff point, implying that intensive efforts to enhance WSC are necessary to increase its effectiveness as a moderator of adverse work characteristics.

We also observed that individual WSC selectively moderated the associations between adverse work characteristics and psychological distress, even with a high WSC cutoff point. Individual WSC moderated the associations of psychological distress with high job demands, high effort, and low interactional justice, but no moderation effects were observed in the case of associations between psychological distress and low job control, reward, and procedural justice. These results seem to reflect differences in work characteristics. Job demands and effort basically refer to the external pressures exerted upon workers by supervisors, co-workers, or institutions. In contrast, job control and reward are supportive resources with which workers can cope with job stresses, such as individual WSC. Individual WSC tends to react to changes in workplace conditions in a similar direction as job control and reward, as suggested by the results of Model 2, which demonstrated that the ORs of job control and reward were higher than those of job demand and effort, respectively (Tables 3 and 4). Hence, the moderating effects of individual WSC on the associations of psychological distress with job control and reward tended to be weaker than the moderating effects between distress and job demand and effort.

The relationships between individual WSC and organizational justice were mixed, as well. Individual WSC moderated the association of psychological distress with interactional justice, but not with procedural justice. These differences in the moderating effects of individual WSC on the two types of organizational justice can be attributed to the different types of job stress to which they refer. Interactional justice mainly refers to the extent to which workers are treated with respect by their supervisors, while procedural justice refers to the fairness and transparency of corporate decision-making processes. Hence, interactional justice is external in nature, as it relates to interactions between co-workers, while procedural justice is internally determined and is affected by these interactions. Consequently, bonding WSC, which concerns the social network in the workplace, buffers against the external pressure that is derived from a lack of interactional justice but moves in the same direction as procedural justice.

We recognize that this study has several limitations. First, our analyses were based on a cross-sectional data set; thus, it was difficult to identify causal relationships between key variables. For example, employees with psychological distress likely tend to underestimate their job characteristics and WSC more than those who do not have psychological distress. Second, we should examine the mediating/moderating effects of other aspects of WSC (that is, bridging and linking), because we assumed that Japanese WSC is mainly a bonding type. Bridging and linking WSC likely affect the impact of adverse work characteristics on workers’ mental health differently than bonding WSC.

Finally, our study sample was not a random sample of Japanese workers; thus, the results may not apply to the general Japanese working population. Although the workers in question were selected from a diverse employee
population and the sample size was the largest among surveys of its kind in Japan, replication should be attempted with a representative sample of employed workers.

Although further studies are necessary to explore the functions of WSC in general, we conclude that individual WSC mediates the associations between adverse work characteristics and psychological distress among Japanese workers and moderates them selectively only at high levels. The findings of the current study, which highlight the role of WSC, have clear implications to occupational health strategy; personnel management aimed at enhancing communication, mutual help, and knowledge sharing in workplace is expected to improve workers’ mental health via strengthened WSC.

Acknowledgement

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