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# Assessing Work Stressors in the Health Care Sector by Combining External Observation and Health Professionals' Self-report in a Cross-sectional Study Design

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## Abstract

**Objective:** Health professionals are particularly affected by work stressors and various methods have already been used to assess them. Linking health professionals' self-report and external observations can provide a more detailed assessment of stressors, since conclusions for interventions can be derived from their agreement. Since there is a lack of studies in the health sector linking both data sources, the aim of this study is to identify the convergence between health professionals' self-reports and external observations.

**Methods:** Data were collected in general hospitals, nursing homes, psychiatric institutions and home-care organizations in a cross-sectional study design. 110 health professionals were observed during one entire shift, by one of eight trained external observers. Health professionals and observer separately filled out a questionnaire on work stressors after the observation. For data analysis multiple regression models using bootstrap were calculated considering possible observer effects.

**Results:** Convergent scores for 3 of 9 tested scales on 'predictability' of work, 'social community' and 'social relations' ($p>0.05$) at work, were identified. However, health professionals rated their 'quantitative' ($p=0.001$), 'sensorial' ($p=0.001$) and 'physical demands' ($p=0.001$) significantly higher than the external observers did. On the contrary, external observers perceived the 'possibilities for development' ($p=0.007$), 'influence at work' ($p=0.032$) and 'social support at work' ($p=0.002$) as lower than did the health professionals. Results also indicate a significant influence of different work settings ($p<0.05$) on the convergence of self-assessed and observed work stressors.

**Conclusion:** This study results reveal that results on work stressors can be influenced by the chosen method for data collection, which should be considered when using one method only. Moreover, differences between the settings indicate that results on work stressors from one health-care setting cannot be easily transferred to another.

**Keywords:** Work stressors; External observation; Self-report; Observation-based assessment; Convergence; Health professionals; Health care sector

## Introduction

Work-related stress is one of the main reasons why health professionals change or leave their jobs [1, 2]. In particular, work stressors such as long working hours, shift work, work-family conflicts, emotionally stressful situations, physical demands, understaffing or time pressure can lead to a high level of stress at work [3, 4]. Work stressors have been measured in several ways. Self-reports and observational assessments (e.g. analysis of work processes, external observations) are among the most widely used assessment techniques [5, 6]. However, each of these sources brings its strong and weak methodological points [7]. While self-reports provide insight into the internal psychological states of employees and may therefore be the only reliable source of such information, observational measures can provide more objective information in the sense of being independent of the employee [8]. Moreover, external observations of work stressors are able to identify certain circumstances that are already taken for granted by employees and can provide a level of objectivity that is not possible when using self-reports alone [8, 9]. Therefore, linking both data sources is important to know whether the objective (externally observed) assessment corresponds to the subjective (self-assessment of employee), since conclusions for interventions can be derived from the extent of that agreement [6].

Linking both data sources has been done in various studies [10-12]. However, the agreement between self-assessed and observation-based measures is often modest, with a convergence ranging mostly between 10 and 30% [13]. Moreover, results indicate that the observed exposures of work stressors are underestimated, while employee self-assessments can be overestimated [12, 13]. Nachreiner et al. [14] conclude that an agreement between these two data sources cannot be expected.

Also in the health care sector, studies including both health professionals' self-reports and observational approaches have been carried out on work-organisation and teamwork, among others [15-19]. However, there is a lack of studies linking employee self-report and observation-based assessment among health professionals. Studies linking both data sources are important to gain deeper knowledge of the issues concerning work stressors in the health care sector. Therefore, the aim of this study is to identify the convergence between health professionals' self-reports and external observations concerning stressors at work.

## Method

This study has a cross-sectional design and the data is based on

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external observations and health professionals' self-reports on work stressors. This study is also of the national STRAIN study - 'work-related stress among health professionals in Switzerland' (clinical trials registration: NCT03508596).

## Study population

A convenience sample of health professionals from two acute care hospitals, one home care organization, a nursing home and two psychiatric institutions in the German-speaking part of Switzerland was used. The study sample consisted of health professionals from various disciplines (e.g. nurses, medical-technical-therapeutic-professionals, physicians) with direct patient contact. Health professionals in the participating health organizations received online study information and were asked whether they would like to participate on a voluntary basis. Health professionals willing to participate could contact the STRAIN research team directly (by email or phone) and an observation date was set for an entire shift. Since the external observation was conducted during one entire shift (9-12 hours), health professionals who worked less than 9 hours a shift (e.g. half days) were excluded.

## Instruments

For this study, a self-report questionnaire for health professionals and an observational questionnaire for external observers were developed (Figure 1). The self-assessment scales are based on the STRAIN questionnaire [20] and the questionnaire for external observers on the STRAIN-EOS (STRAIN - External Observation of work Stressors). Both questionnaires contain the same scales but differ in the wording (e.g. "Do you have to work very fast?" for self-reports and, "Does the observed person have to work very fast?", for external observers). Both questionnaires (self-report and observation) assess information about demands at work, work organization and content, and social relations and leadership and consist of items from the Copenhagen Psychosocial Questionnaire -COPSOQ [21, 22] and the Sixth European Working Condition Survey - EWCS [23].

The scales on demands at work contain questions about quantitative, sensory and physical demands. A high score indicates a high risk for stress at work. Response options are on a five-point Likert scale for COPSOQ scales (always-never) and on a seven-point Likert scale (always-never) for the EWCS scale. Scales on work organisation and content include questions about possibilities for development and influence at work on a five-point Likert response scale (always-never). A low score indicates a high risk for stress at work. Scales on social relations and leadership contain questions about predictability, social support, community and social relations at work on a five-point Likert response scale (always-never). Also, a low scoring indicates a high risk for stress at work.

Psychometric properties for all included self-report scales are good and revealed satisfactory reliability (Cronbach's alpha >0.7), as well as criterion and construct validity in previous studies [22, 24]. Previous testing of the STRAIN-EOS demonstrated internal consistency (Cronbach's alpha of 0.67-0.92), content and construct validity as well as sufficient reactivity and usability for the included scales. Since many aspects can influence the validity of observational data, special attention should be paid to personal and procedural reactivity (Foster, 2006; Monahan & Fisher, 2010).

Personal reactivity means that subjects behave differently because of personal characteristics or the behaviour of the observer (Foster, 2006). Therefore, an additional question was added to the health professionals' self-report, giving a possible indication of personal reactivity during observations: "How did you perceive the observer?" On a five-point Likert scale "very pleasant" to "very unpleasant".

Procedural reactivity means that subjects behave differently because they are being observed. Therefore, additional questions addressing procedural reactivity were integrated in the self-report questionnaire: "How often did you feel observed?", "Did the observation have an influence on your work organization or workflow?", "Do you think that in certain situations you would have behaved differently without being observed?" on a five-point Likert scale "always" to "never"

## Selection and training of external observers

External observers were recruited by advertisements. Care was taken to ensure that the observers were familiar with the health care setting (education in a health profession), and that they were heterogenous regarding age, experience and occupation. A total of eight external observers aged 22-40 years, all female, with a professional training in nursing, physiotherapy or psychology and professional experience of 2


**Figure 1:** Assessment of stressors by to external observers and employee self-reports.

-19 years were recruited. The external observers carried out between 3 and 27 external observations.

To minimize a possible observer bias, all external observers were trained before starting data collection. Therefore, the training was conducted in two groups and lasted from 8 to 10 hours per training. In the first part, external observers received information about how the thinking process works and how it is influenced. In the second part of the training, all observers watched a total of 10 video sequences including footage of doctors and nurses at work (30 min on average) and assessed stressors using the STRAIN-EOS. After each video sequence, assessed rankings using the STRAIN-EOS were discussed for each item. Also, every item in the questionnaire was then checked for comprehensibility and interpretation. During the observation, external observers were advised that they could speak with the observed person (if necessary), but not to support them at work.

### Data collection

Data collection took part between December 2017 and May 2018. All participating health professionals were observed during one entire shift/working day of 9 to 12 hours. At the end of the observation, health professionals and the external observers separately filled out the questionnaire (10-15 min) assessing stressors at work.

### Data analysis

Data analyses were done using IBM SPSS Statistics® 24. All questions about personal and procedural reactivity were analyzed descriptively. All items in the self-assessment and observational scales were transformed on a value range from 0 (minimum value) to 100 (maximum value). To analyze the differences between health professional self-reported and externally observed data, multiple regression models for each scale were calculated taking into account possible observer effects. For the regression models the difference between self-assessment (SE) scores and externally observed (OB) scores (SE-OB) was used as the dependent variable and dummy variables for observers and different healthcare settings as independent variables. The dummy variables were coded in such a way that the sum of observer effects is equal to zero (sum to zero contrasts), whit observer 8 as reference. Using this dummy variable specification, the intercept (constant) of the model can be interpreted as the mean difference between self-reported and externally observed data when adjusting for observer effects. Since the assumption of heteroskedasticity (modeling errors are uncorrelated / uniform) was not met, standard errors, p-values and confidence intervals were computed based on bootstrap (r=1000 bootstrap, bias corrected and accelerated, 95% CI). To check for differences between the health care settings (general hospital, nursing home, home care organization, psychiatric institution), a linear regression model including dummy variables for observers and dummy variables for the health care settings was used. To test whether there is any difference between health care settings, 2-tailed F-tests were used. In case of a significant F-test (p-value < 0.05), post hoc analyses based on Wald tests were performed to find out which settings differ from each other.

## Results

### Description of the study sample

In total, 110 health professionals were observed (n=110 health professional self-reports, n=110 external observations). The observations were conducted in the acute care hospital (18%), in nursing home (27%), home care setting (22%) and psychiatric institutions (33%). Most observed shifts were day (63%) and evening-shifts (24%). Registered nurses (n=60) and nurse assistants (n=41) were most frequently represented in the study sample. The mean age of the observed health professionals was 40 years (SD = 13) with a mean professional experience of 15 years (SD = 11) in general and 5.5 years (SD = 6) in their current position. Observed health professionals were registered nurses (55%), nurse assistants (37%), medical-technical-therapeutic professionals or physicians (8%).

### Self-reported and observational data

A first tendency indicated that observed health professionals perceived the demands at work scales (quantitative, sensorial and physical demands) as higher than the external observers (Figure 2). The means of the scale for possibilities for development, influence at work, social support and social relations also showed a tendency for observational data scores to be lower than the self-reported data. On the other hand, a tendency was found for the observation-based assessments of the scale predictability and social community to be ranked higher than for health professionals' self-assessments.

### Influence of external observers

Results of questions on personal reactivity indicate that most observed health professionals (90%) perceived the external observer as 'very pleasant-pleasant', 8% as 'neutral' and a few (2%) as 'unpleasant-very unpleasant' during the external observation sequence.

Further results on procedural reactivity reveal that most of the observed health professionals 'seldom-never' felt observed (64%). In addition, most observed health professionals did not think that the external observation had an influence on their work organization or workflow (84%) and would not have behaved differently if there were not being observed (87%).

Additional results on the observers' influence indicate significant observer-effects for quantitative and sensorial demands, all scales on work organization and content and social relation and leadership. Results on observer's influence are presented in (Table 1) and reveal significant influence (using F-statistics) of the external observers as well as information, which of the observers have differed significantly. Considering all scale, no observers' influence pattern can be recognized; any observer's effects are random.

### Differences between SE and OB

Results of robust multiple regression using bootstrap are presented in (Table 1). The table includes descriptive statistics for the difference between the self-assessment (SE) and external observations (OB), influence of observer's as well as the estimated difference (SE-OB) at the level of 0.05 and 0.005 (2-tailed).

### Demands at work

Results of multiple regression on the demands at work scales indicate that the observed health professionals rated several demands at work as higher than the external observers did (Table 1). Health professionals' ratings for 'quantitative demands' are significantly higher than those from external observers (estimated difference = 18.5, p=0.001). Also, for the scales on 'sensorial demands' (estimated difference = 12.6, p=0.001) and 'physical demands' (estimated difference = 13.0, p=0.001) the results of the regression analysis revealed a significant difference between the self-assessment and observation-based scales.

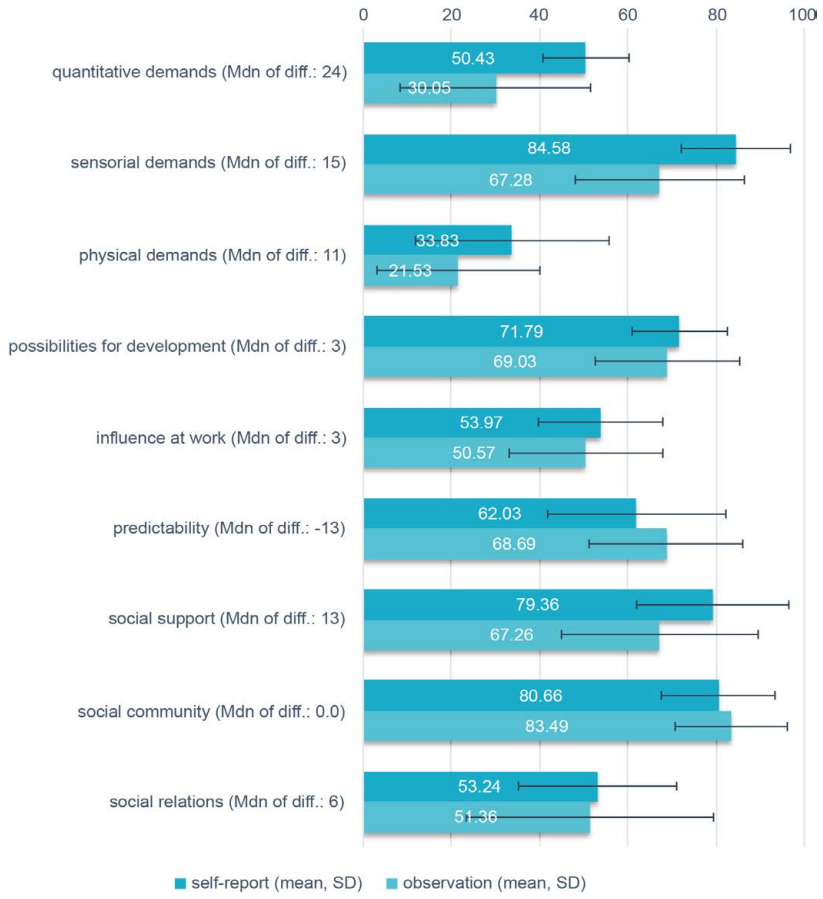


**Figure 2:** Self-assessment scores (SE) vs. external observation (OB) scores (mean, standard deviation, median of the difference SE-OB).

| | Descriptive Statistics | | | Observer influence | Sig. influence observer | Difference between SE and OB | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean (SD) SE | Mean (SD) OB | N | F-test observer | | Estimated difference (SE-OB) | p-value | BCa 95% CI | |
| | | | | | | | | Lower | Upper |
| Demands at work | | | | | | | | | |
| Quantitative demands (SE-OB) | 50.43 (9.73) | 30.05 (21.61) | 108 | 2.51 | 0.020[2] | 18.478 | 0.001** | 12.646 | 24.211 |
| Sensorial demands (SE-OB) | 84.58 (12.44) | 67.28 (19.14) | 107 | 14.12 | 0.0003,5 | 12.555 | 0.001** | 8.229 | 16.822 |
| Physical demands (SE-OB) | 33.83 (22.00) | 21.53 (18.47) | 107 | 1.277 | 0.27 | 13.015 | 0.001** | 8.966 | 16.736 |
| Work organisation and content | | | | | | | | | |
| Possibilities for development (SE-OB) | 71.79 (10.94) | 69.03 (16.27) | 108 | 4.286 | 0.0002,3,7 | 4.886 | 0.007* | 0.856 | 8.627 |
| Influence at work (SE-OB) | 53.97 (14.10) | 50.57 (17.44) | 108 | 6.09 | 0.0001,4,5 | 3.869 | 0.032* | 0.067 | 8.163 |
| Social relation and leadership | | | | | | | | | |
| Predictability (SE-OB) | 62.03 (20.24) | 68.69 (17.53) | 97 | 3.182 | 0.0053 | -2.363 | 0.398 | -8.009 | 3.175 |
| Social support (SE-OB) | 79.36 (17.15) | 67.26 (22.24) | 68 | 3.343 | 0.0042,7 | 24.761 | 0.002** | 16.913 | 31.952 |
| Social community (SE-OB) | 80.66 (12.92) | 83.49 (12.84) | 107 | 2.284 | 0.0343,4,5,7 | -1.653 | 0.37 | -5.467 | 2.77 |
| Social relations (SE-OB) | 53.24 (17.87) | 51.36 (28.10) | 108 | 4.701 | 0.0001,2,3,4 | -0.453 | 0.912 | -8.32 | 7.762 |

**Table 1:** Differences between health professionals self-report and external observations. 1 sig. influence of observer one, 2 sig. influence of observer two, 3 sig. influence of observer three, 4 sig. influence of observer four, 5 sig. influence of observer five, 6 sig. influence of observer six, 7 sig. influence of observer seven, significance: * p-value<0.05, **p-value<0.005 (=0.05/10).

## Work organization and content

Here, significant results indicated that the external observers perceived the 'possibilities for development' and 'influence at work' as being lower than did the health professionals. Results for the scale on 'possibilities for development' revealed an estimated difference (SE-OB) of 4.9 (p=0.007). Also, the scale on 'influence at work' indicated significant results (estimated difference = 3.9, p=0.032) at the significance level of 0.05, but not at 0.005 (including Bonferroni correction).

| | Descriptive Statistics | | | | | | | | | Significant influence of setting | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | (1) General hospital | | (2) Nursing homes | | (3) Home care organisations | | (4) Psychiatry | | f-test | Differences between settings |
| | | Mean (SD) SE | Mean (SD) OB | mean (SD) SE | Mean (SD) OB | Mean (SD) SE | Mean (SD) OB | Mean (SD) SE | Mean (SD) OB | | |
| Quantitative demands | 108 | 46.07 (11.87) | 26.00 (23.65) | 54.03 (7.36) | 39.00 (21.31) | 51.71 (11.24) | 37.08 (21.16) | 48.98 (8.11) | 20.14 (16.32) | 1.84 | - |
| Sensorial demands | 107 | 86.75 (11.73) | 81.25 (11.75) | 84.00 (10.54) | 73.06 (11.30) | 85.65 (12.09) | 79.71 (11.74) | 83.14 (14.66) | 46.76 (13.70) | 2.77* | 1 *vs.* 4 (p=0.048), 2 *vs.* 4 (p=0.01),3 *vs.* 4 (p=0.012) |
| Physical demands | 107 | 40.88 (18.46) | 46.88 (26.86) | 44.56 (24.11) | 52.92 (18.18) | 41.08 (18.43) | 46.87 (17.77) | 15.84 (10.80) | 39.93 (14.58) | 2.35 | - |
| Possibilities for development | 108 | 72.50 (12.54) | 71.87 (14.12) | 70.00 (10.34) | 61.04 (16.30) | 70.19 (10.19) | 64.84 (19.23) | 73.98 (10.98) | 76.91 (10.86) | 4.22* | 1 *vs.* 4 (p=0.042), 2 *vs* 3 (p=0.014), 2 *vs.* 4 (p=0.001) |
| Influence at work | 108 | 49.75 (14.00) | 37.50 (12.82) | 53.28 (14.30) | 39.79 (9.35) | 52.19 (14.97) | 50.82 (17.40) | 58.06 (12.79) | 66.67 (11.08) | 2.81* | 1 *vs.* 4 (p=0.034), 2 *vs.* 4 (p=0.005) |
| Predictability | 97 | 61.25 (21.42) | 66.18 (19.14) | 67.13 (18.72) | 61.50 (16.11) | 61.98 (17.86) | 60.71 (16.43) | 58.68 (22.12) | 79.51 (12.73) | 3.00* | 2 *vs.* 4 (p=0.024), 3 *vs.* 4 (p=0.011) |
| Social support | 68 | 79.06 (14.80) | 63.19 (9.08) | 83.62 (16.65) | 58.22 (18.29) | 74.74 (12.83) | 55.29 (27.10) | 79.17 (20.70) | 85.05 ()15.39 | 3.43* | 1 *vs.* 2 (p=0.012), |
| Social community | 107 | 83.75 (13.10) | 90.83 ()14.28 | 80.17 (12.87) | 81.11 (10.71) | 82.64 (9.80) | 76.81 (10.35) | 78.01 (14.52) | 85.71 (12.87) | 1.47 | - |
| Social relations | 108 | 46.07 (11.87) | 62.50 (19.02) | 54.03 (7.36) | 45.42 (23.55) | 51.71 (11.24) | 25.52 (26.70) | 48.98 (8.11) | 67.36 (22.61) | 11.9** | 1 *vs.* 2 (p=0.003), 2 *vs.* 3 (p=0.011), 2 *vs.* 4 (p=0.002), 3 *vs.* 4 (p=0.000) |

**Table 2:** Differences between health care settings. Significance: * p-value<0.05, **p-value<0.005 (=0.05/10)

### Social relations and leadership

On the scales for 'social relations' and 'leadership', health professional self-reports and external observations appeared to be more similar. No significant differences on 'predictability' at work (estimated difference = -2.4, p=0.398), 'social community' (estimated difference = -1.7, p=0.370) and 'social relations' (estimated difference = -0.5, p=0.912) between health professional self-reports and external observations was found. However, the scale for 'social support' from colleagues and supervisors indicated significant differences between the two assessments: external observers perceived the 'support' received from colleagues and supervisors as significantly lower than did the observed health professionals themselves (estimated difference = 24.8, p=0.002)(Table 2).

### Influence of different health care settings

However, differences between the health professionals' and observers' ratings can be identified for the scales on:

'Sensorial demands' (p<0.05) between the psychiatric institution and all other settings

'Possibilities for development' (p<0.05) between general hospital and psychiatric institution, nursing home and home care organization and nursing home and psychiatric institution

'Influence at work' (p<0.05) between psychiatric institution and general hospital/nursing home

'Predictability' (p<0.05) between psychiatric institution and nursing home/home care organization

'Social support' (p<0.05) between general hospital and nursing home

'Social relations' (p<0.005) between nursing home and all the other settings as well as between home care and psychiatric institution.

## Discussion

This study reveals convergent as well as dissenting assessments of work stressors by health professionals and external observers. Convergent scores (p>0.05) between health professionals self-reported and externally observed 'predictability' of work, 'social community' and 'social relations' at work were identified.

However, further results indicate that health professionals rated their 'quantitative', 'sensorial' and 'physical demands' significantly higher than the external observers did. Similar results on physical risk factors at work using self-report, video observation and direct measurement methods were also found by Spielholz, Silverstein, Morgan, Checkoway and Kaufman [12]. Moreover, some authors suggest results on demands at work as overestimated by employees' self-assessments and as underestimated by observations [13, 25]. A possible reason for this difference could be a higher 'initial level' of perceived stress factors by the health professionals over time. Therefore, it is possible, that the health professionals' and external observers rating are not based on the exactly same situations [10]. Certain demands at work may have already been experienced by the employees over a longer period of time and have led to an overall more intensive judgment, while external observers only observed a limited period of time and therefore rate the situation as less demanding [13].

Furthermore, significant differences were found for 'possibilities for development' and 'influence at work'. The external observers scored the 'possibilities for development' as well as the 'influence at work' as lower than observed health professionals. Moreover, significant differences for health professionals self-assessed and externally observed 'social support' from colleagues and supervisors at work also indicate that external observers perceived the 'social support' during the observation sequences as being lower than did the observed health professionals. Regarding study results about self-reported and observed 'social support' of young couples, Lorenz, Melby, Conger and Surjadi [10] suspected that hostile and supportive behaviors are more likely to be remembered and therefore may be more superficial in employee self-report. On the other hand, supportive behavior is more difficult to identify for external observers than hostility [10].

Further results reveal that although the external observers have been trained beforehand, there is still a significant influence of the different external observers on the results. However, further findings

from personal and procedural reactivity indicate, that most observed health professionals perceived the external observer as 'pleasant' and 'seldom to never' felt observed. As Guest, Namey, and Mitchell (2013) stated, a good external observer fits into the observation-based situation 'well enough to be ignored'. Therefore, it is important that external observers adapt to their observation-based setting (e.g. wearing the same clothes), are familiar with the health care setting and well-trained in advance. Furthermore, it is important to consider a possible observer-influence in the data analysis to avoid a distortion of the results.

Further results indicate a significant influence of different work settings on the convergent of self-assessed and observed work stressors. Most frequently, the difference between self- and externally assessed work stressors in psychiatric institutions (in 11 cases) and nursing homes (in 8 cases) were significantly different from other settings. However, as the results of Parker et al. [26] indicate, there is a significant relationship between the psychological climate (operationalized as employees' perception) and employees work attitudes, performance and motivation, which could provide a possible explanation for these differences. It seems possible that the psychological climate differs strongly between these health care settings, which could result in a stronger difference between self-reports and external observations.

Overall, this study results reveal that for 6 of 9 tested scales (60%) no convergence between health professionals self-assessed and externally observed work stressors was met, which is in line with previous literature [13]. However, one could conclude that one of the data sources (self-reports or external observation) is maybe more valid than the other (captures the true value). Therefore, it is important to note that both methods include 'true variance' as well as 'biasing effects' [13]. Moreover, it is to be assumed that both data sources capture the same approach in a different way (e.g. self-reports as 'intrinsic' and externally observed as 'extrinsic' perception of stressors) [14]. However, considering that it is the perception of each employee that ultimately determines his or her reaction to the work environment [27].

Nevertheless, the complementary perspective of external observers can provide further insights into the current work situation with an 'objective' external view. As these study results reveal, this should be considered especially when assessing 'demands at work', 'possibilities for development', 'influence at work' as well as 'support' from colleagues and supervisors, where a double check (self-assessments and external observers) can be useful, before intervention is derived. Moreover, the results on possibilities for development and influence at work (observers rated these as lower than the employees) indicate, that especially here the involvement of external observers can be useful to design more suitable interventions.

## Conclusion

These study results contribute important information for future research on work stressors in the health care sector. As the findings of this study reveal, results can strongly differ depending on which method is used to assess work stressors. This should also be considered when interpreting results about work stressors if one method is chosen only (e.g. self-reports). Especially for scales on 'demands at work', 'possibilities for development', 'influence at work' and 'social support', which strongly differ between self-report and external observation, a combination of both methods can provide a more detailed assessment, than using one data source only. Especially when interventions to improve health professionals 'possibilities for development' and 'influence at work' will be designed, an inclusion of both data sources such as external observers and health professionals' self-reports could provide additional evidence. However, as this study results reveal, setting specific differences should also be kept in mind when developing interventions for different health organizations to reduce work stressors.

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