Background
There has been a dramatic increase in the practice of shift work throughout the world. Shift work is defined as work primarily outside of the normal daytime working hours [1] and it is known to associate with several adverse health outcomes including increased adiposity [2].

Objectives
To systematically evaluate the literature to find the associations between exposure to shift work and body composition.

Methods
• A five-stage comprehensive search of the literature was conducted in PubMed®, Web of Science® and SciVerse Scopus® for studies published before 31st March 2020.
• The next stages involved duplicates, title screening, abstract screening and finally inclusion of full texts matching the eligibility criteria.
• The studies comparing a group of shift workers (night or rotating shift workers) with a comparative group of day or regular hour workers were involved.

Results
• Database searching indicated 2311 potentially eligible records identified through database searching (n =1506).
• Records screened (n =2311).
• 28 Full-text articles were excluded due to: no outcome of interest, not English , reporting clockwise and counterclockwise shifts, no comparison.
• Records excluded (n =1418).
• 4648 nurses were involved.

Conclusions
• This is the first comprehensive systematic review and meta-analysis on the comparing of shift workers’ and non shift workers’ body composition.
• Several studies showed a clinically higher BF% in shift workers when compared to the non-shift group.
• The meta-analysis displayed no statistical significant difference between shift and non-shift workers.
• Individual studies showed considerable heterogeneity.
• Therefore in order to clarify the underlying mechanisms, more and better quality studies on this field are necessary.
• Researchers should include body composition measures even when it is not their primary objective, and should express body composition both pooled and separate genders.

References

Table 1 Main characteristics of the studies included in the review

<table>
<thead>
<tr>
<th>Author, Published year</th>
<th>Country</th>
<th>Study design</th>
<th>Gender</th>
<th>Age: Mean (SD)</th>
<th>Sample size (M/F)</th>
<th>Population size</th>
<th>Body fat % (mean ±95% CI) or mean (95% CI) Shift workers Non-shift workers Mean difference P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee et al. [3] 2018</td>
<td>Korea</td>
<td>CS</td>
<td>CS</td>
<td>20–65</td>
<td>13/4</td>
<td>Power plant workers</td>
<td>21.32 (12.00–27.50) 20.90 (13.50–31.40)</td>
</tr>
<tr>
<td>Teraoka et al. [2] 2019</td>
<td>Japan</td>
<td>CS</td>
<td>CS</td>
<td>50</td>
<td>40</td>
<td>Nurses</td>
<td>36.5 (7.1) 38.5 (8.3)</td>
</tr>
<tr>
<td>Shi et al. [4] 2015</td>
<td>Germany</td>
<td>CS</td>
<td>CS</td>
<td>25–45</td>
<td>31/96</td>
<td>Hotel industry employees</td>
<td>30.1 (3.8) 25.9 (7.1)</td>
</tr>
<tr>
<td>Seibt et al. [5] 2015</td>
<td>Germany</td>
<td>CS</td>
<td>CS</td>
<td>25–65</td>
<td>12/20</td>
<td>Service employees</td>
<td>32.0 (3.6) 32.6 (3.6)</td>
</tr>
<tr>
<td>Chu et al. [7] 2012</td>
<td>USA</td>
<td>CS</td>
<td>CS</td>
<td>40-65</td>
<td>106/75</td>
<td>Police Officers</td>
<td>27.2 (6.6) 24.9 (5.9)</td>
</tr>
<tr>
<td>Son et al. [8] 2015</td>
<td>Korea</td>
<td>CS</td>
<td>CS</td>
<td>20–65</td>
<td>1526</td>
<td>Metal and non-metal workers</td>
<td>(34.4–37.9) 36.3</td>
</tr>
</tbody>
</table>

Table 2 Effect size of shift workers and non shift workers

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>n</th>
<th>Mean (95% CI)</th>
<th>Weight (g)</th>
<th>Z (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meta-analysis</td>
<td>2.0</td>
<td>2470</td>
<td>4548</td>
<td>-0.19 (±0.02)</td>
<td>0.89</td>
</tr>
</tbody>
</table>

Figure 1 Flow diagram detailing the review filtering process

Figure 2 Forest plots showing body fat % of shift workers and non shift workers

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Forest plots showing body fat % of shift workers and non shift workers

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