

several limitations, such as the non-validated chronotyping approach with arbitrary cut-off values and a priori exclusion of night shift-workers who sleep during the day on days off (and who likely represent extreme late chronotypes).

Future studies are needed to further elucidate the interplay between working times and the circadian system. Working times should be evaluated on an external (social) time-scale as well as an internal (biological) one.

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## Early, but not late chronotypes, are up during their biological night when working the night shift

Bhatti *et al*<sup>1</sup> recently examined the impact of chronotype on melatonin levels in shift-workers and concluded that '(...) morning type shift-workers were better able to maintain normal patterns of melatonin secretion (...), suggesting that morning types may be protected against the negative effects of shift-work related melatonin disruption'. However, their data show that, compared to daytime workers sleeping at night, early chronotypes have lower melatonin levels than late chronotypes during daytime sleep after a nightshift. They also show a larger difference in melatonin secretion during their first regular night-time sleep after night shifts (table 3, dichotomous categorisation:  $\Delta=-34.6\%$  and late types:  $\Delta=-4.2\%$ ), suggesting that early chronotypes are more affected by working night shifts than late chronotypes.

This makes sense when considering the biological definition of chronotype,<sup>2</sup> where early chronotypes, with an earlier subjective, internal night, exhibit an earlier peak in melatonin secretion than late chronotypes.<sup>3</sup> Night shift-work consequently coincides with the subjective night of early types, but only partially (or not) for later chronotypes, so that earlier ones should be affected most from working at night. Indeed, we have shown that early chronotypes experience poorer and shorter sleep after night shifts, as compared to later ones.<sup>4</sup> Recent evidence further supports this assertion: Papantoniou *et al*<sup>5</sup> reported lower 24 h melatonin levels in early versus late night-shift workers.

Overall, the paper by Bhatti and colleagues remains difficult to interpret due to