

Validation of a pedometer algorithm as a tool for evaluation of locomotor behaviour in dairy Mediterranean buffalo.

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Short title: **validation of RumiWatch® pedometer in Mediterranean buffalo**

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SUMMARY

This Research Paper of technical interest addresses the hypothesis to validate an algorithm to monitor natural occurrence of locomotor behaviours in dairy Mediterranean buffalo (MB) based on the output of a 3-dimensional accelerometer (RumiWatch®, pedometer). The accuracy was verified comparing Rumiwatch® outputs with observational data originating from analysis of video recordings (gold standard). The study was based on 2 experiments performed with 15 MB. The first was performed to validate the lying behaviours: *stand up*, *lie down*, number of *lying bouts* (discrete variables), *lying time* and *up-right time* (continuous variables), using an overall data acquisition period of 24h. The second was performed to validate walking behaviour: number of *standing bout*, number of *walking bout* (discrete variables), as well as *standing time*, *walking time* and *number of strides* (continuous variables), using an overall data acquisition period of 1h. Sensitivity, specificity and proportions (discrete variables), as well as mean relative measurement error (RME), *Spearman's* correlation coefficient and Bland and Altman plots (continuous variables) were performed as statistical analysis. RumiWatch® showed a very high [*lying time* ($r_s=1.00$), *up-right time* ($r_s=1.00$), *standing time* ($r_s=0.81$)] or high degree of correlation [*walking time* ($r_s=0.81$) and *number of strides* ($r_s=0.96$)] with video recording analysis as well as a low mean difference. Correctly detected events exceeded 99% for the following variables: *stand up* and *lie down* events, as well as number of *lying*, *standing*, and *walking bouts*. RME was less than 10% for the variables: *lying time* (0.19 ± 0.33 , % \pm SD), *standing time* (2.29 ± 1.06), *up-right time* (0.08 ± 0.07), *number of strides* (9.62 ± 5.72); it was higher only for *walking time* (21.03 ± 11.13).

RumiWatch® algorithm seems accurately detect of locomotor events and could represent a base for future early and real time disease warning system aiming to gain higher health standard in these ruminants.