



Is rest simply the best? An investigation of the effectiveness and acceptance of a rest break and a motor task regarding the reduction of mental fatigue


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Aim of this research

 Air Traffic Controllers (ATCOs) perform a safety-critical job, where executive control has to be maintained¹. However, due to prolonged task execution, the risk of mental fatigue (MF) could arise. MF is a functional state that results in increased reaction times (RTs), error rates and a subjective feeling of weariness due to resource depletion². While rest breaks have shown to be effective in reducing MF³, simple motor tasks have not yet been studied in relation to resource recharging. Since these could enrich the break design of ATCOs, this study examines the effectiveness and acceptance of the interventions rest break and motor task with regard to the reduction of MF.

The experiment

 $N = 54$ student participants, aged 20 – 52 years ($M = 27.22$, $SD = 7.30$), randomly assigned to two intervention groups ($n_1 = n_2 = 27$). A maximum of five participants could be tested at the same time, see Figure 1.

 MF was induced through a 60min modified Stroop task, divided into 12 blocks. After 30min, the Stroop task was interrupted by a 10-minute intervention, either a complete rest break or a motor task (play dough session), see Figure 2.



 Subjective MF (F-ISA⁴), RTs and error rates were assessed for each block. For the present research, only data directly before and after the intervention were analyzed. The acceptance was assessed directly after the intervention.



Figure 2. Exemplary result from the motor task.

The results

 F-ISA and RTs decreased significantly directly after compared to before the intervention in both groups: subjective MF (rest break: $t(26) = 5.93$, $p < .001$, $d = 1.14$; motor task: $t(26) = 7.93$, $p < .001$, $d = 1.53$), see Figure 3 a); RTs (rest break: $t(26) = 5.19$, $p < .001$, $d = 1.00$; motor task: $t(26) = 4.34$, $p < .001$, $d = 0.84$), see Figure 3 b).

There was a significantly lower error rate after the intervention in the rest group ($t(26) = 3.28$, $p = .003$, $d = 0.63$), but not in the motor task group ($p = .692$), see Figure 3 c).

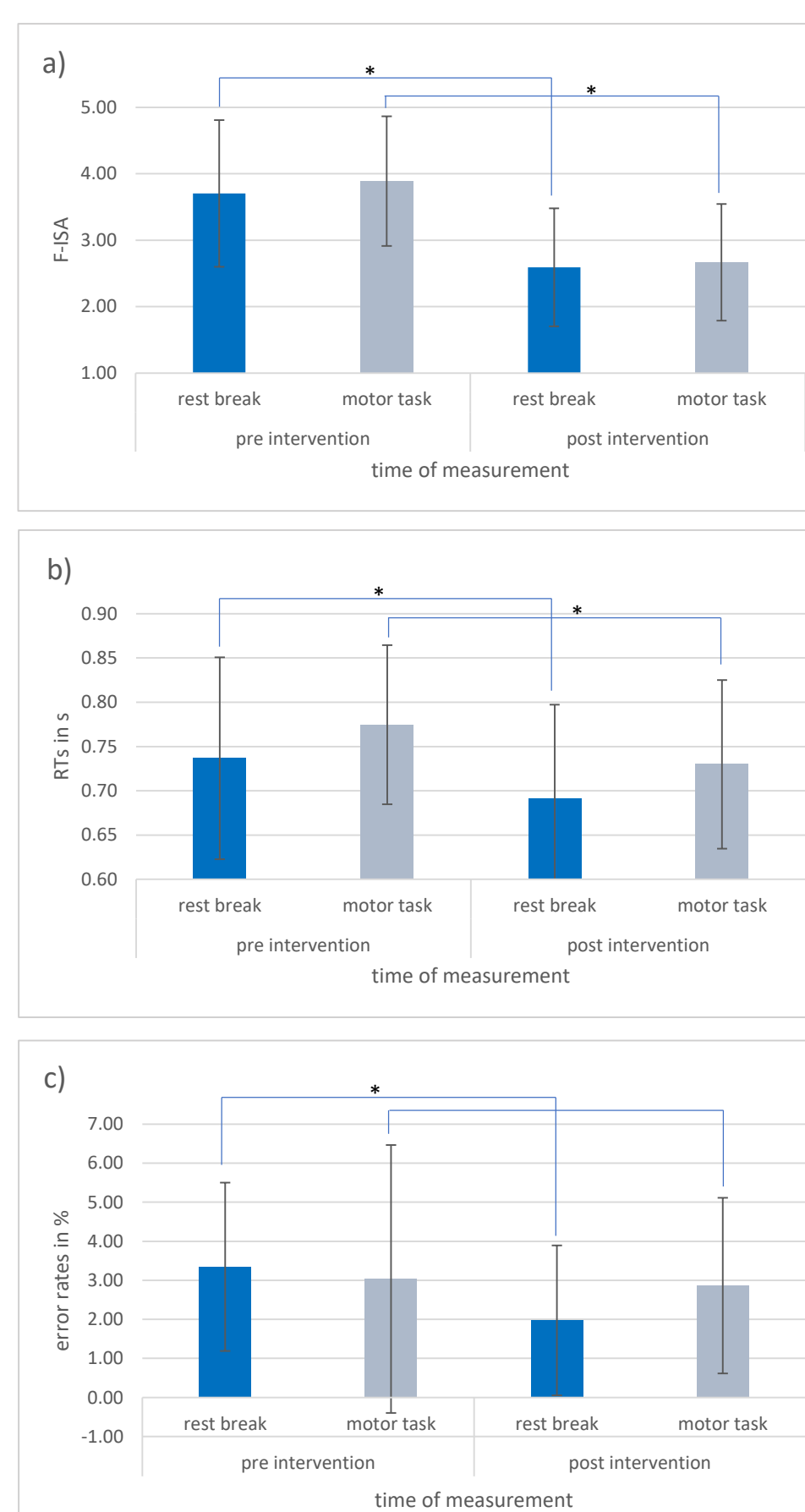


Figure 3. a) mean F-ISA ratings, b) mean RTs, c) mean error rates, per time of measurement and intervention. Error bars indicate SD. Significance levels marked $p < .05^*$.


F-ISA, RTs and error rates directly after the intervention did not differ significantly between the intervention groups (all $ps > .05$). The motor task was more accepted in terms of appreciation ($t(52) = -2.05$, $p = .046$, $d = 0.56$) and feasibility ($t(52) = -2.41$, $p = .020$, $d = 0.65$) than the rest break. The interventions did not differ significantly in subjective



Figure 1. Test setup in the control center simulator at DLR Braunschweig.

effectiveness and behavioral intention ($ps > .05$).

Discussion and implications

 In this study, MF was effectively reduced by both interventions. The results indicate that motor tasks can recharge cognitive resources in a similar way to rest breaks. While rest breaks seemed slightly more effective in restoring performance, the motor task was rated higher in terms of acceptance with respect to its appreciation and feasibility. Thus, simple motor tasks could enrich break design of ATCOs, as they seem to be a pleasant alternative to existing break activities. The integration of such activity options into ATCOs' break rooms should be investigated further.

References

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