Supplemental Information

Training task performance: Evidence for associative learning and improvement over time

Go RT and stop/no-go error data were computed separately for each relevant stimulus category, i.e. low-calorie foods vs. water filler images (or their control task equivalents) for go RT, and high-calorie foods vs. water filler images (or their control task equivalents) for no-go/stop errors. This enabled comparison of responses to stimuli that were 100% associated with go or no-go signals (food images) relative to stimuli that were 50% associated with go or no-go signals (filler pictures). The performance difference between these image categories is thought to reflect associative (stimulus-response) learning in the tasks and is shown in Table 2 in the manuscript under "Category effect". As expected, in both the active and control groups, the 100% predictive stimuli were associated with faster go RTs and lower no-go or stop errors than the 50% predictive stimuli indicating associative learning and replicating prior research (Lawrence et al., 2015a). A similar measure of associative learning in the dot-probe and respond-signal tasks is indicated by the relative speeding to respond to targets following a consistent versus inconsistent predictive stimulus; data suggested improved associative learning in these tasks, replicating previous findings (Kakoschke et al., 2014).

In the go/no-go task, no-go error rates were very low (on average 1.45% in session 1 and 1.19% in session 4) and did not change over time (F [1, 40] = 0.44, p = .51, η2p = .01) or differ as a function of group (F [1, 40] = 0.42, p = .52, η2p = .01) or group x time (F [1, 40] = 0.08, p = .78, η2p = .002). As expected, there was a main effect of stimulus category (F [1, 40] = 7.73, p = .008, η2p = .16), with fewer no-go errors to the 100% no-go stimuli (high-calorie food or their control equivalents) than to the 50% no-go stimuli (Table 2). This category effect did not interact with group (F [1, 40] = 0.6, p = .44, η2p = .015), time (F [1, 40] = 0.008, p = .93, η2p < .001) or

group x time (F [1, 40] =1.24, p = .27, η2p = .03). Go RT became significantly faster over time (F[1, 40] = 60.88, p < .001, η2p = .6) but did not differ as a function of group (F[1, 40] = 1.21, p = .28, η2p = .03) or group x time (F [1, 40] = 2.44, p = .13, η2p = .058). There was also a main effect of stimulus category on Go RT (F[1,40] = 4.77, p = .035, η2p = .11), with faster RTs to the 100% go stimuli (low-calorie food or their control equivalents) than to the 50% go filler stimuli (Table 2). However, category did not interact with group (F [1, 40] = 0.99, p = .33, η2p = .024), time (F [1, 40] = 0.43, p = .51, ηp2 < .011) or group x time (F [1, 40] =0.71, p = .79, η2p = .002).

In the stop-signal task stopping error rates were also very low (on average 0.51% in session 1 and 1.72% in session 4). These error rates increased over time (F [1, 37] = 5.91, p = .02, η2p = .14), perhaps because the first session was conducted in the scanner, with longer inter-trial intervals and slower responses leading to fewer commission errors. There were no differences in stop errors between groups (F [1, 37] = 1.67, p = .2, η2p = .043) or as a function of group x time (F [1, 37] = 0.15, p = .7, η2p = .004). The effect of stimulus category approached significance (F [1, 37] = 3.85, p = .057, η2p = .094), with fewer stop errors to the 100% stop stimuli than to the 50% stop stimuli (Table 2). Category did not interact significantly with group (F [1, 37] = 3.2, p = .08, η2p = .081), time (F [1, 37] = 2.08, p = .16, ηp2 < .053) or group x time (F [1, 37] = 0.26, p = .62, η2p = .007). Go RT in the stop-signal task became significantly faster over time (F[1, 37] = 113.3, p < .001, η2p = .75), but did not differ as a function of group (F[1, 37] = 0.85, p = .36, η2p = .02) or group x time (F [1, 37] = 1.44, p = .24, η2p = .037). As expected, there was a main effect of stimulus category on Go RT (F[1,37] = 9.3, p = .004, η2p = .2), with faster RTs to the 100% go stimuli than to the 50% go filler stimuli (Table 2). Category did not interact with

group (F [1, 37] = 0.68, p = .42, η2p = .018), time (F [1, 37] = 0.44, p = .51, ηp2 < .012) or group x time (F [1, 37] = 0.83, p = .37, η2p = .022).

In the dot-probe task, responses became faster over time and, as expected, were faster when probes appeared behind images that were consistently (90% of the time) associated with the probe location relative to images that were infrequently (10% of the time) associated with the probe location. This is reflected in the positive attentional bias score (RT difference) in Table 2. The intervention group showed larger attentional bias scores than the control group overall (F[1, 37] = 10.07, p < .01, partial η2 = .21), and attentional bias scores increased over time (F[1, 37] = 10.84, p < .001, partial η2 = .23). There was no group × time interaction (F[1, 37] = 1.29, p > .05), suggesting similar learning of the attentional bias over sessions in both groups.

In the visual-search task, the mean RT to correctly identify the one low-calorie food (or its control task equivalent) in the array of high-calorie foods showed significant improvement over time (F[1, 38] = 47.54, p < .001, partial η2 = .56). There was also a main effect of group (F[1, 38] = 271.13, p < .001, partial η2 = .88), with control participants responding faster than intervention participants (Table 2), and a group × time interaction (F[1, 38] = 33.51, p < .001, partial η2 = .47), due to greater improvements in response speed in the intervention relative to the control group. There was only one category of target image (low-calorie food or control task equivalent) in the visual-search task so it is not possible to assess category-specific learning.

In the respond-signal task, go RT was significantly faster to images consistently paired with a respond-signal (low-calorie foods or their control equivalents) relative to filler images that were paired with a respond-signal 50% of the time (F[1,25] = 35.28, p < .001, η2p = .59). There was no effect of group (F[1,25] = .02, p = .89, η2p = .001) but there was a group x category interaction (F[1,25] = 4.71, p = .04, η2p = .16), due to the intervention group showing stronger

category effects, i.e. a greater difference in go RT to 100% versus 50% stimuli (Table 2). These results validate the training by showing that participants responded as expected and confirm that training conditions were matched for task demands, stimulus-specific learning, and engagement.

References

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