

# Unilateral motor cortex lesion in adult monkeys: impact on manual dexterity of each hand, extent and time course of recovery, preliminary data on anti-Nogo-A antibody treatment.

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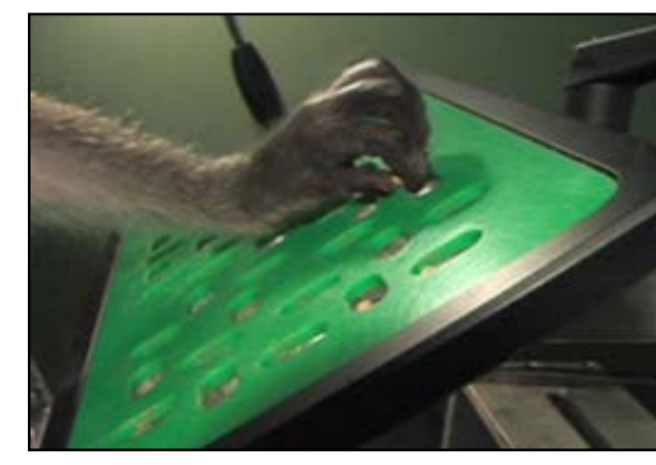
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## OBJECTIVE

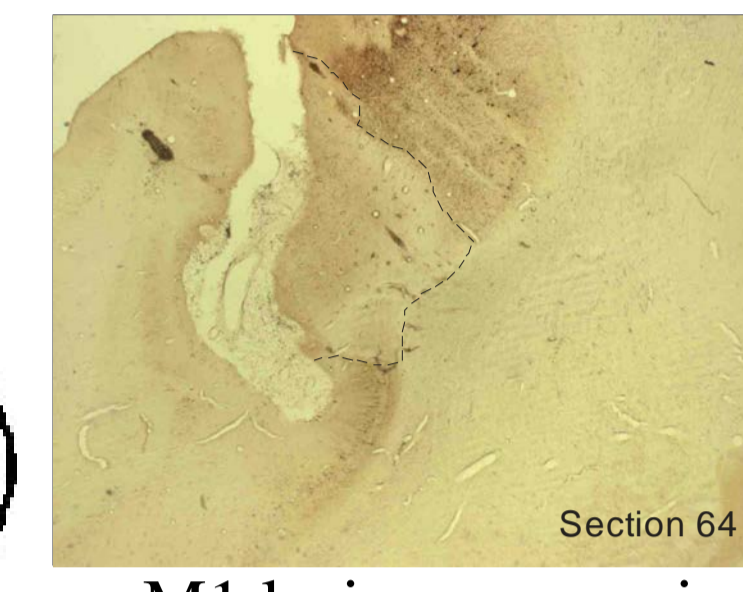
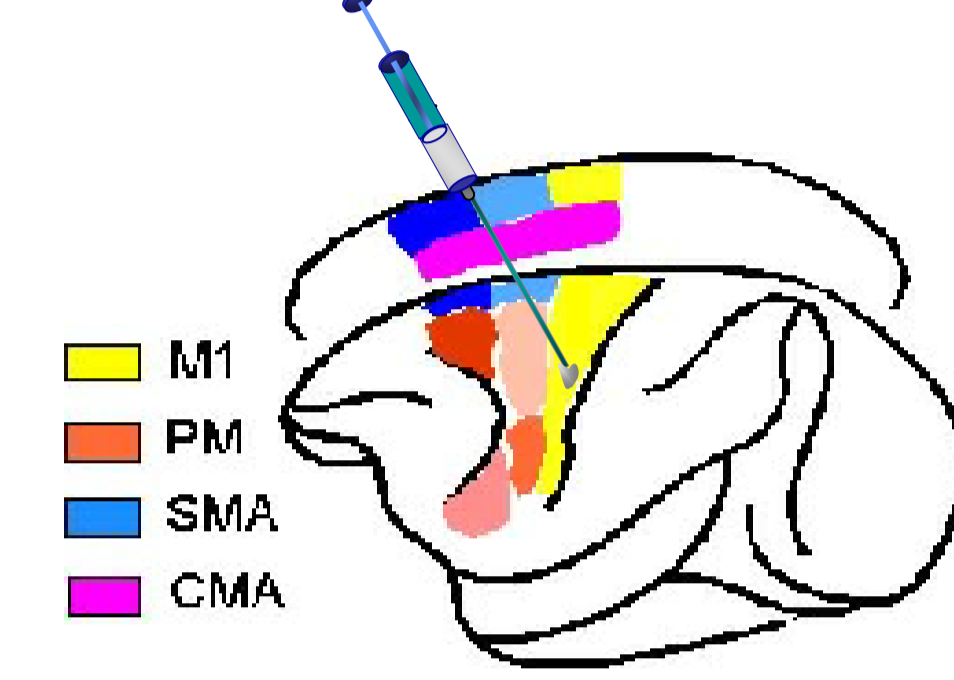
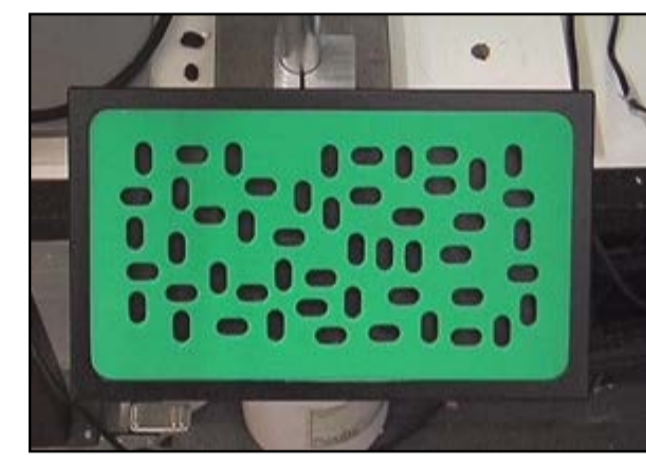
The goal of this study was to investigate the effect of primary motor cortex (M1) lesion on the **contralesional** hand and on the **ipsilesional** hand in non-human primates (*Macaca fascicularis*), using sophisticated behavioral tests of manual dexterity. Spontaneous recovery in control monkeys was compared with anti-Nogo-A antibody treated monkeys.

## METHODS

Experiments were conducted on **10** adult macaque monkeys trained to perform various manual dexterity tasks, including the “modified Brinkman board”, requiring precision grip. The monkeys were then subjected to an unilateral permanent lesion of the hand representation in M1. Monkeys' behavioral performance was measured for each hand, before and after the lesion, until the recovery (complete or incomplete) of the contralesional hand reached a plateau and was pursued later on during several weeks.

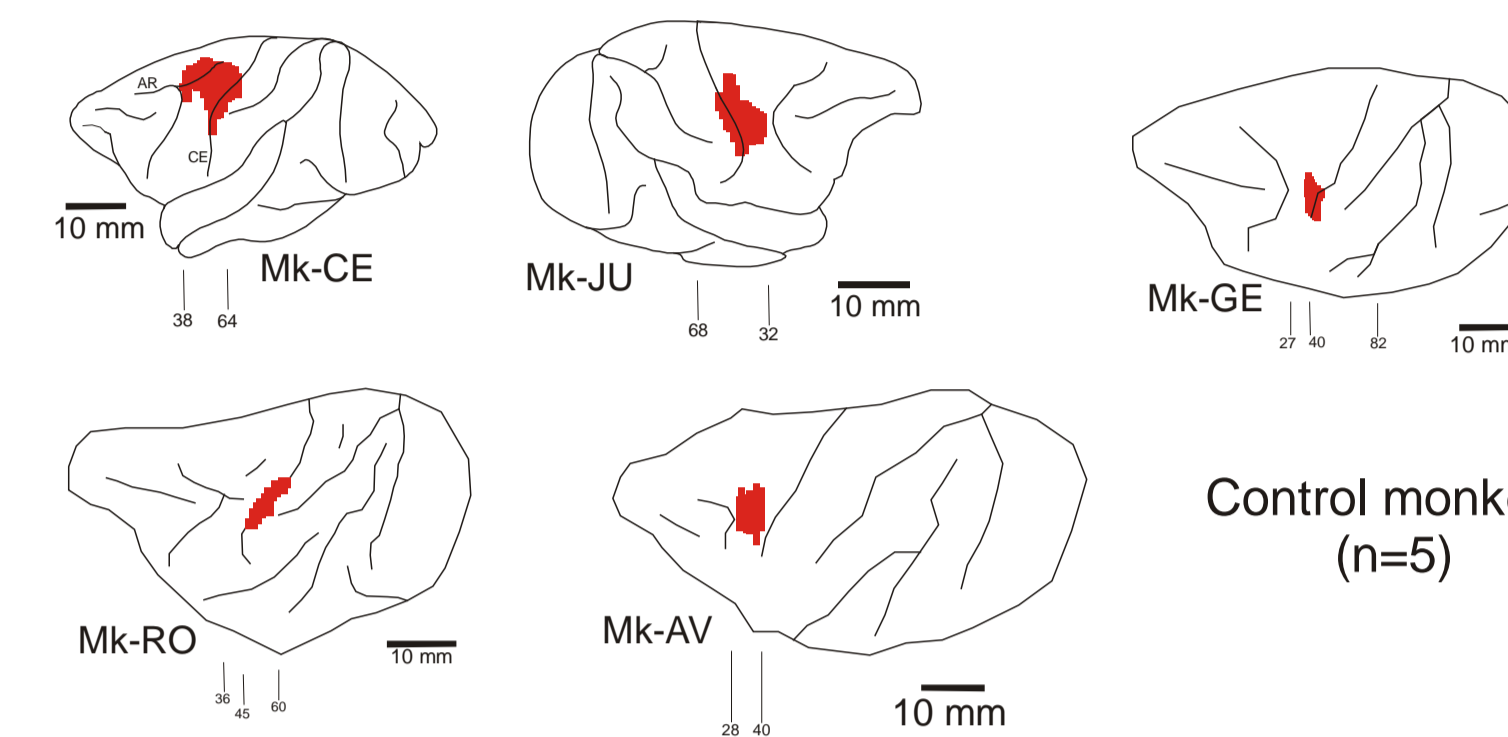


“modified Brinkman board” task

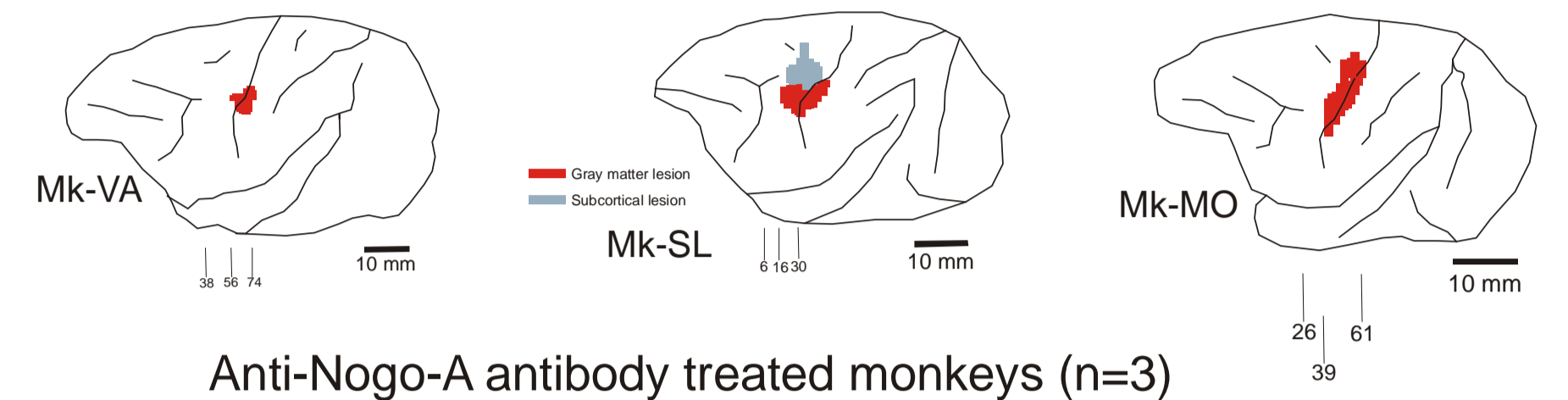


M1 lesion as seen in SMI-32 material for Mk-VA

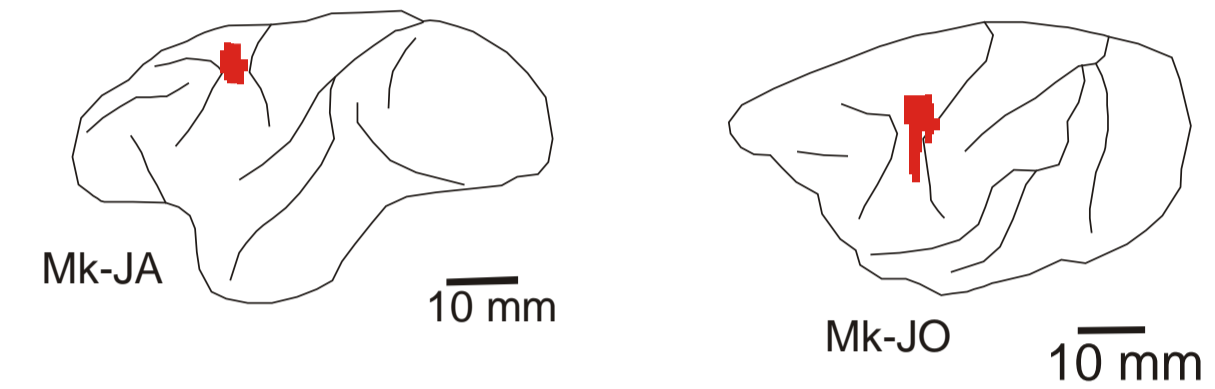
Initially, after the monkeys had reached a behavioral plateau, a lesion of the hand representation's area (fingers) was performed unilaterally in M1 by infusion of ibotenic acid.



Control monkeys (n=5)

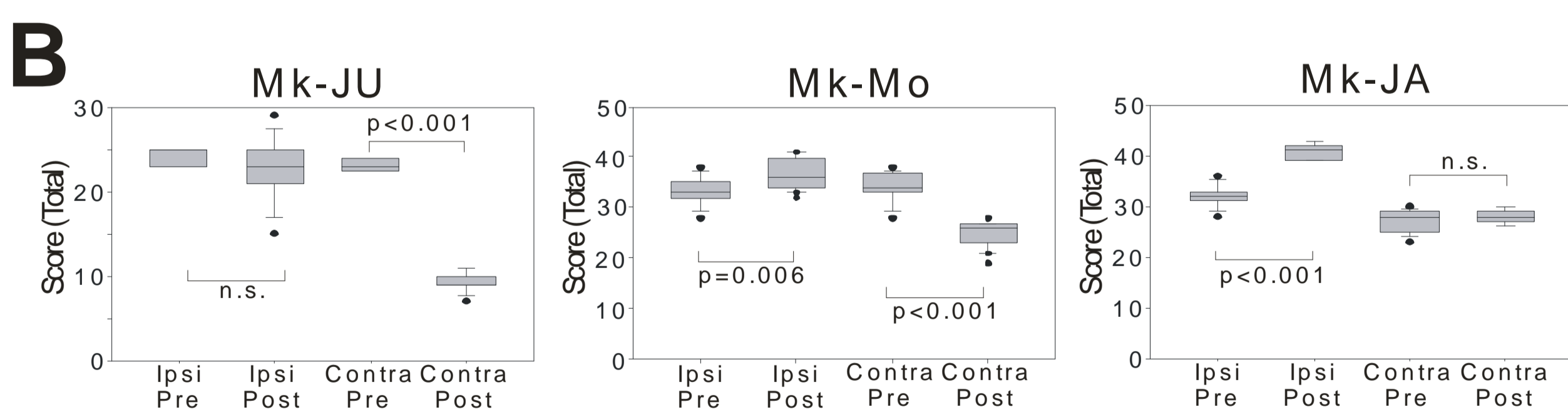
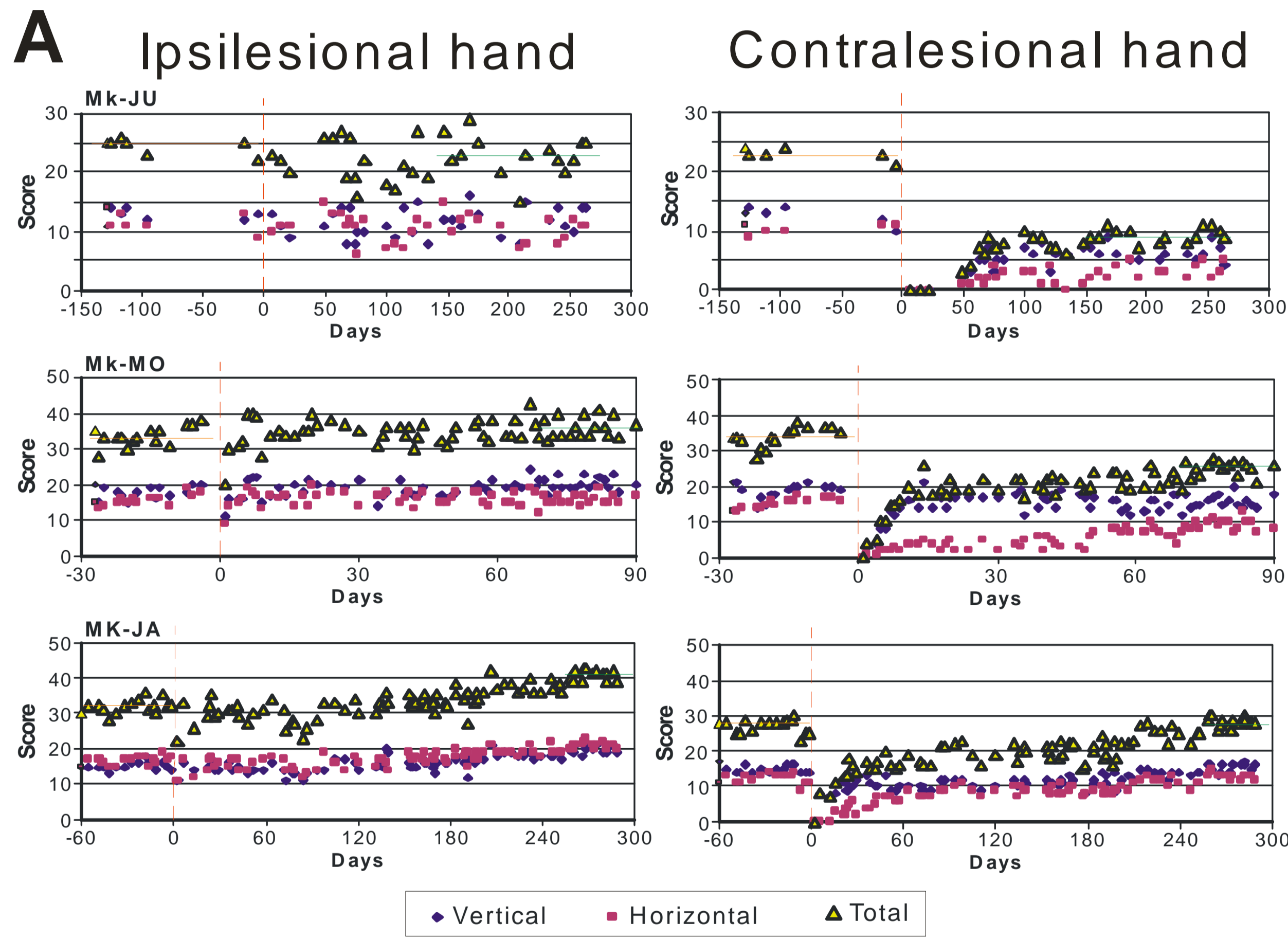


Anti-Nogo-A antibody treated monkeys (n=3)

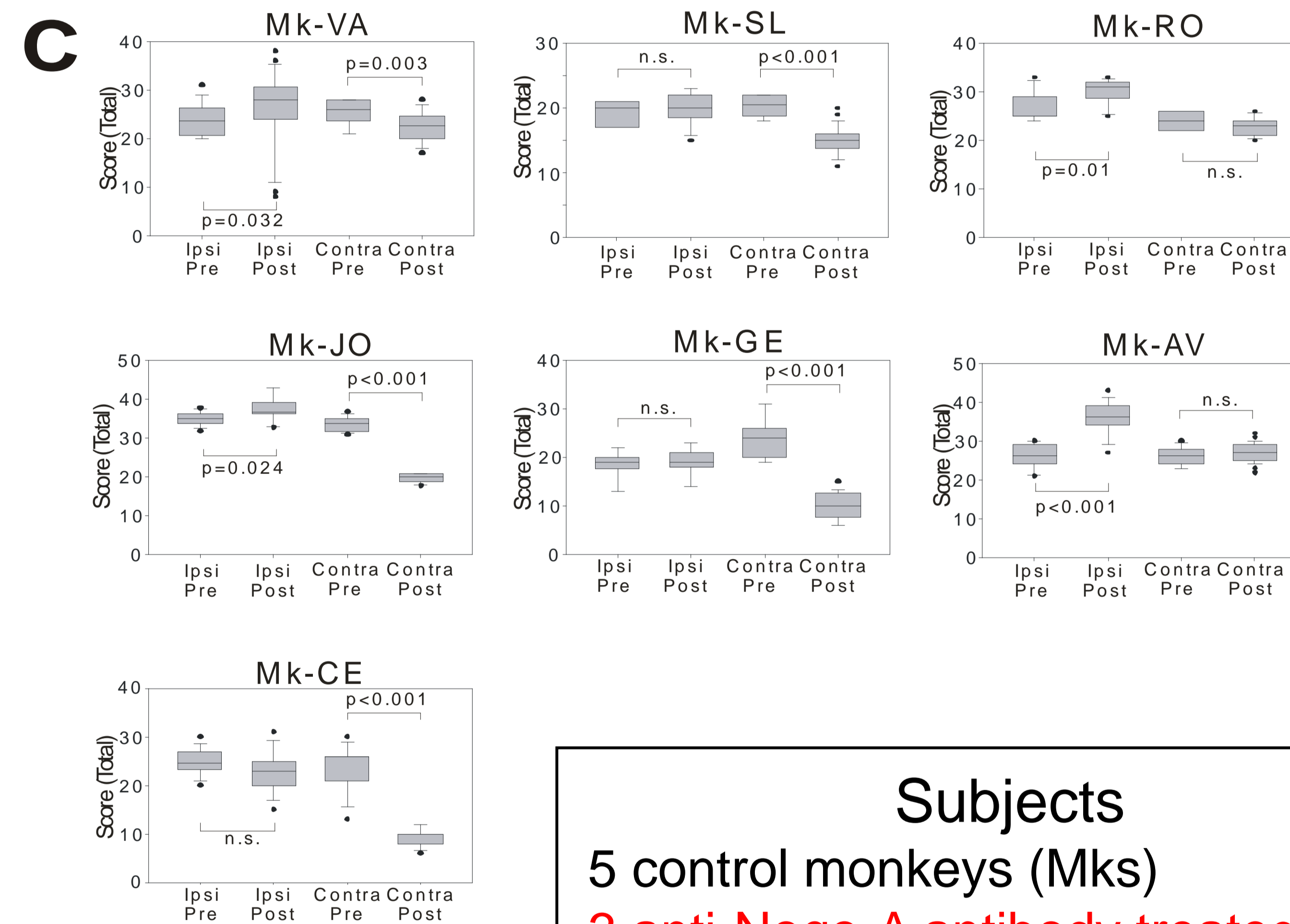


Adult autologous progenitor cell therapy (n=2)

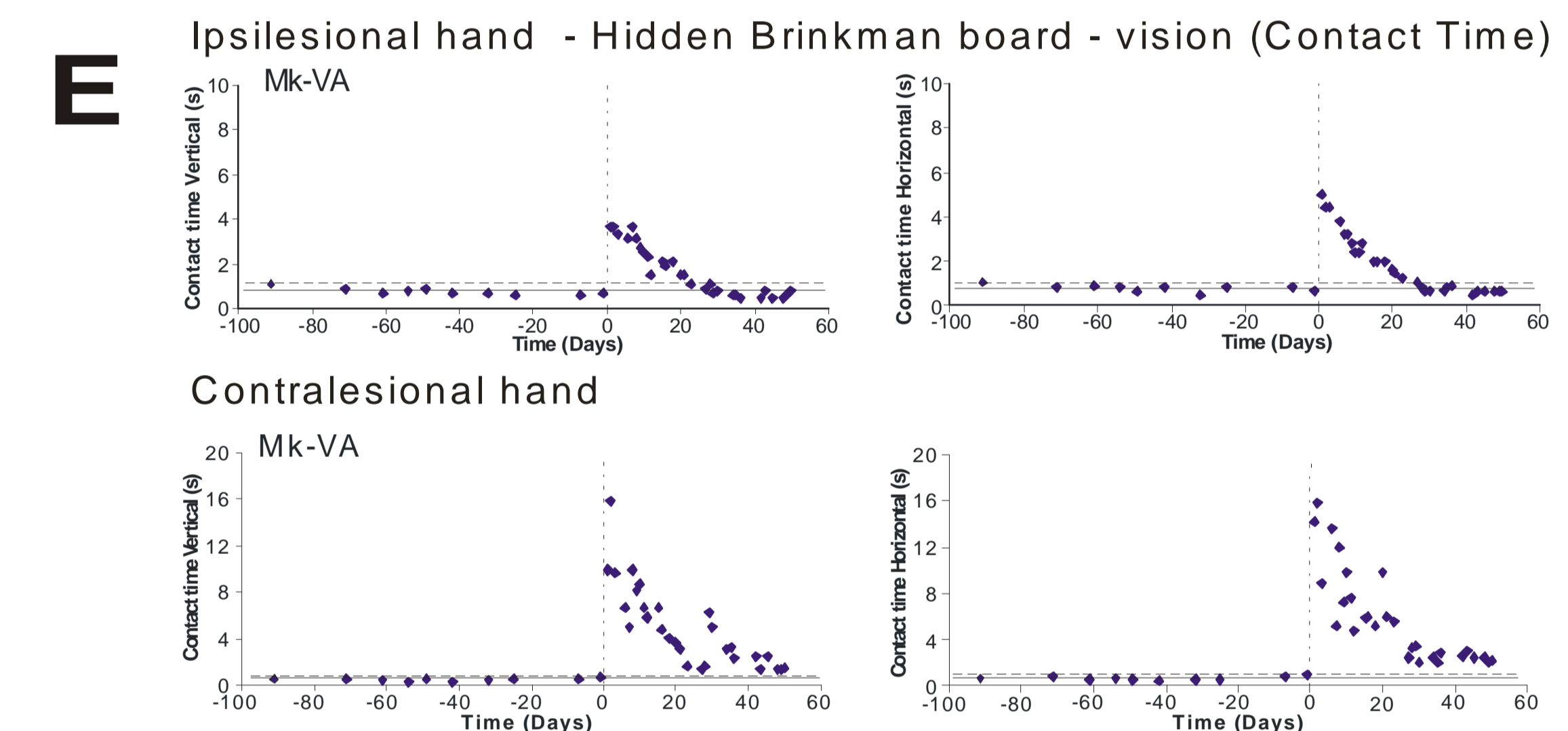
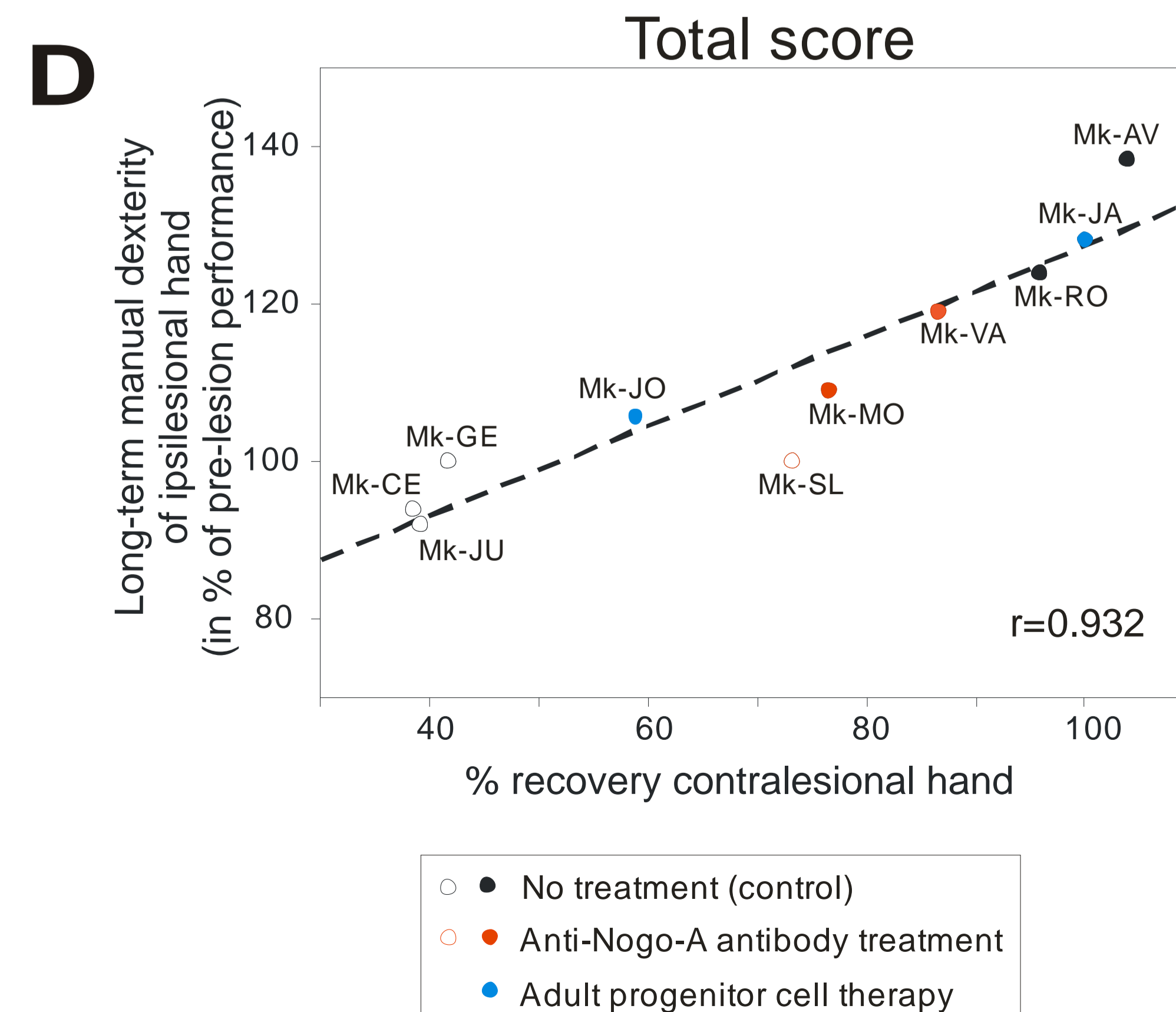
## RESULTS



The manual dexterity was assessed by the score (nb. of pellets retrieved in 30 seconds from the slots in the modified Brinkman board task (A-C)). Note, as expected, the deficit immediately after the lesion for the contralesional hand but not for the ipsilesional hand (A). The long-term recovery for the contralesional hand was quite variable across monkeys, whereas, surprisingly, for the ipsilesional hand the manual dexterity was enhanced on the long-term in some monkeys, as compared to pre-lesion values (A, B and C). Such long-term enhancement of manual dexterity for the ipsilesional hand appeared to be correlated with good functional recovery of the contralesional hand (D).

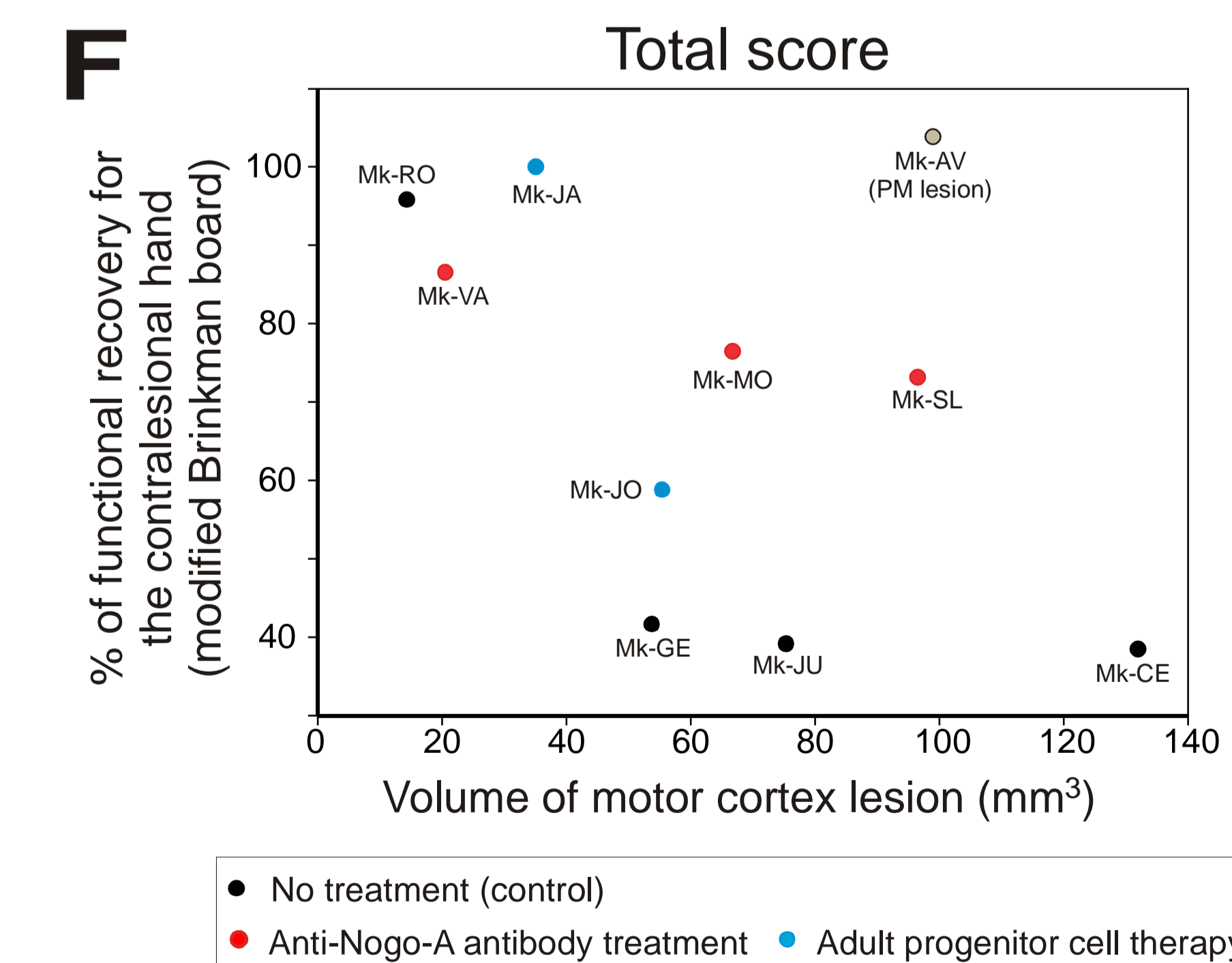


**Subjects**  
 5 control monkeys (Mks)  
 3 anti-Nogo-A antibody treated Mks  
 (2 Mks subjected to cell therapy)



“hidden Brinkman board” task, performed here under visual control

In a more difficult prehension task (right inset), there was a transient deficit for the ipsilesional hand immediately after the lesion, but clearly less than for the contralesional hand exhibiting permanent deficit, as assessed by the “contact time” with the pellet required for grasping.



Plot of recovery for the contralesional hand as a function of lesion extent for the three groups of monkeys.

Note that Mk-AV has a lesion mainly in premotor cortex (PM), as shown in methods.

## CONCLUSION

- The degree of functional recovery of the contralesional hand covariates with the long-term performance of the ipsilesional hand.  
 - Taking into consideration lesion extent and position, preliminary data indicate a trend towards an enhanced functional recovery in anti-Nogo-A antibody treated monkeys.