PHYSICAL REVIEW D **74,** 057901 (2006)

Pion decoupling and $SU(2)_L \times SU(2)_R$ restoration in the hadron spectrum

R. L. Jaffe, Dan Pirjol, and Antonello Scardicchio

Center for Theoretical Physics, Laboratory for Nuclear Science, and Department of Physics Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA

(Received 17 July 2006; published 1 September 2006)

We clarify the relationship between $SU(2)_L \times SU(2)_R$ restoration in the hadron spectrum, parity doubling, and pion-hadron couplings.

DOI: 10.1103/PhysRevD.74.057901 PACS numbers: 11.30.Rd, 11.40.Ex, 12.39.Fe

It has been brought to our attention [1] that some statements in our recent paper [2], might be interpreted as denying the possibility that chiral symmetry can be realized linearly on sets of states *that do not couple to pions*. This is incorrect: Indeed, it is obvious that hadrons that do not couple to pions can form linear representations of $SU(2)_L \times SU(2)_R$. Formally, in models of such a world, there would be *two* independent $SU(2)_L \times SU(2)_R$ symmetries, one under which the pions transform nonlinearly and the other under which the hadrons in question transform linearly. We had not envisioned such a radical explanation of parity doubling among hadrons in the 1.5–2.5 GeV region. If this is the case, then to the extent they are parity doubled, the states in question must not interact by pion emission or absorption, a striking prediction that can be tested experimentally. This remark applies to the work of L. Glozman and collaborators in Refs. [3]. We regret any misunderstanding caused by our omission.

[1] L. Ya. Glozman (private communication).
[2] R. L. Jaffe, D. Pirjol, and A. Scardicchio, Phys. Rev. Lett. **96**, 121601 (2006).
[3] L. Ya. Glozman, Phys. Lett. B **475**, 329 (2000); **587**, 69 (2004); Int. J. Mod. Phys. A **21**, 475 (2006); T. D. Cohen and L. Ya. Glozman, Int. J. Mod. Phys. A **17**, 1327 (2002); L. Ya. Glozman and A. V. Nefedief, Phys. Rev. D **73**, 074018 (2006).

