Erratum: Light vector and axial mesons effective couplings to constituent quarks [Phys. Rev. D **97**, 054025 (2018)]

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Several coupling constants of axial mesons to constituent quarks were defined incorrectly in this paper. Besides the corrected axial mesons—constituent quarks coupling constants, few vector mesons—constituent quarks coupling constants are rewritten differently below. The numerical results presented in that paper are not modified since they correspond to the vector mesons couplings.

The leading effective constituent quark couplings to the canonically defined vector and axial mesons, in the longwavelength local limit, are as follows:

$$\mathcal{L}_{v-q} = g_{r1} V_i^\mu(x) j_{\mu}^{V,i}(x) + g_{A1} \bar{A}_i^\mu(x) j_{\mu}^{A,i}(x) + g_{v1} V^\mu(x) j_\mu(x) + g_{f1} \bar{A}_\mu(x) j_A^\mu(x), \quad (13)$$

where the following effective coupling constants were defined in Euclidean momentum space,

$$g_{r1} = g_{v1} = 4N_c d_1 (\alpha g^2) Tr'((\tilde{S}_2(k) \bar{R}(k))), \quad (14a)$$

$$g_{A1} = g_{f1} = g_{r1} + g_{ax} = 4N_c d_1 (\alpha g^2) Tr'((\tilde{S}_{2A}(k) \bar{R}(k))), \quad (14b)$$

$$g_{ax} = 8N_c d_1 M^{*2} (\alpha g^2) Tr'((\tilde{S}_0^2(k) \bar{R}(k))), \quad (14c)$$

where

$$\tilde{S}_2 = \frac{k^2 - M^{*2}}{(k^2 + M^{*2})^2}, \quad \tilde{S}_{2A} = \frac{k^2 + M^{*2}}{(k^2 + M^{*2})^2}, \quad \tilde{S}_0 = \frac{1}{k^2 + M^{*2}}.$$

Therefore, the leading, gauge-type, axial mesons couplings to constituent quarks axial currents are not exactly the same as the corresponding chiral partners vector mesons couplings to constituent quarks vector currents.

The two-vector/axial mesons constituent quark current couplings of Eq. (15) should be written as

$$\begin{aligned} I_{2v-j} = & g_{va-j} ([V_\mu \bar{A}_i^\mu + V_\mu^i \bar{A}^\mu] j_{ps}^i + [V_\mu^i \bar{A}_i^\mu + V_\mu \bar{A}^\mu] j_{ps}) \\ & + g_{vv-j} ([V_\mu^2 + V_\mu^{i2}] j_s + V^\mu V_\mu^i j_s^i) + g_{va-j} ([\bar{A}_\mu^2] + (\bar{A}_i^\mu)^2) j_s + \bar{A}_\mu \bar{A}_i^\mu j_s^i \\ & + g_{Fjs} [(\mathcal{F}_{\mu\nu} \mathcal{F}^{\mu\nu} - \mathcal{F}_{\mu\nu}^A \mathcal{F}_A^{\mu\nu}) + (\mathcal{F}_{\mu\nu}^i \mathcal{F}_i^{\mu\nu} - \mathcal{F}_{\mu\nu}^{A,i} \mathcal{F}_{A,i}^{\mu\nu})] j_s \\ & + (\mathcal{F}_{\mu\nu}^i \mathcal{F}_A^{\mu\nu} + \mathcal{F}_{\mu\nu} \mathcal{F}_{A,i}^{\mu\nu}) j_p^i + (\mathcal{F}_{\mu\nu}^i \mathcal{F}^{\mu\nu} - \mathcal{F}_{\mu\nu}^{A,i} \mathcal{F}_A^{\mu\nu}) j_s^i \\ & + (\mathcal{F}_{\mu\nu} \mathcal{F}_A^{\mu\nu} + \mathcal{F}_{\mu\nu} \mathcal{F}_A^{\mu\nu}) j_p] + i\epsilon_{ijk} (g_{ev} \mathcal{F}_{\mu\nu}^i V_j^\nu + g_{evA} \mathcal{F}_{\mu\nu}^{i,A} \bar{A}_j^\nu) j_{k,V}^\mu \\ & + i\epsilon_{ijk} (g_{ev} \mathcal{F}_{\mu\nu}^i \bar{A}_j^\nu + g_{evA} \mathcal{F}_{\mu\nu}^{i,A} \bar{V}_j^\nu) j_{k,A}^\mu \\ & + g_{FV} (\mathcal{F}_{\mu\nu}^i V^\nu + \mathcal{F}_{\mu\nu} V_i^\nu) j_{i,V}^\mu + g_{evA} (\mathcal{F}_{\mu\nu}^{i,A} \bar{A}^\nu + \mathcal{F}_{\mu\nu}^A \bar{A}_i^\nu) j_{i,V}^\mu \\ & + g_{evA} (\mathcal{F}_{\mu\nu}^i \bar{A}^\nu + \mathcal{F}_{\mu\nu}^{i,A} \bar{V}^\nu + \mathcal{F}_{\mu\nu} \bar{A}_i^\nu + \mathcal{F}_{\mu\nu}^A \bar{V}_i^\nu) j_{i,A}^\mu. \end{aligned} \quad (15)$$

In this expression, the following effective coupling constants have been defined:

$$g_{vv-j} = 12N_c d_1 M^* (\alpha g^2) Tr'((\tilde{S}_2(k) \tilde{S}_0(k) R(k))), \quad (17)$$

$$\begin{aligned}
g_{va-j} &= g_{vv-j} + 2\Delta g_{a-j} = 12N_c d_1 M^* (\alpha g^2) Tr'((\tilde{S}_{2A}(k)\tilde{S}_0(k)R(k))), \\
2\Delta g_{a-j} &= 24N_c d_1 M^{*3} (\alpha g^2) Tr'((\tilde{S}_0^3(k)R(k))), \\
g_{\epsilon v} &= g_{FV} = \frac{g_{vv-j}}{M^*} = 12N_c d_1 (\alpha g^2) Tr'((\tilde{S}_2(k)\tilde{S}_0(k)R(k))),
\end{aligned} \tag{18}$$

$$\begin{aligned}
g_{\epsilon vA} &= \frac{g_{va-j}}{M^*} = 12N_c d_1 (\alpha g^2) Tr'((\tilde{S}_{2A}(k)\tilde{S}_0(k)R(k))), \\
g_{Fjs} &= -12N_c d_1 M^{*3} (\alpha g^2) Tr'((\tilde{S}_0^3(k)R(k))).
\end{aligned} \tag{19}$$

Therefore, the next-leading axial mesons couplings to constituent quarks axial currents are not exactly the same as the corresponding chiral partners vector mesons couplings to constituent quarks vector currents.

The axial mesons terms should be written correctly as

$$I_{\text{free}} = -\frac{(M_v^{(0)})^2}{2} (V_\mu^2 + V_\mu^2) - \frac{(M_a^{(0)})^2}{2} (\bar{A}_{i,\mu}^2 + \bar{A}_\mu^2), \tag{20}$$

where the following effective parameters have been defined:

$$(M_v^{(0)})^2 = d_1 8N_c Tr'((\tilde{S}_2(k))), \quad (M_a^{(0)})^2 = d_1 8N_c Tr'((\tilde{S}_{2A}(k))). \tag{22}$$

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