# Symptom-triggered Attention to Self as a Possible Trigger of Functional Comorbidity

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Attention is crucial in functional movement disorders (FMD), demonstrated by worsening of functional movement disorders when attention is directed towards the affected limb and improvement by distraction.

When professional sportspeople perform their highly skilled movements their attentional focus is on the goal of the movement. A strongly replicable finding in sports-related research is that adopting an "internal, body- focused attention" impairs performance compared to adopting an "external, goal-focused attention" [1–3]. How does misallocation of attention to the mechanics of motor execution lead to impaired movements? Most authors agree that automatic motor processes provide more optimal fine motor control than the slower, effortful, more conscious processes characterised by voluntary attention [1,4].

The Movement Specific Reinvestment Scale (MSRS) is a ten-item questionnaire testing a person's tendency to consciously monitor their movements [5]. It contains two subscales, the conscious motor processing subscale, which evaluates awareness of the processes of one's own movements, and the more interpersonal movement self-consciousness scale, which evaluates the concern about one´s "style" of movement (Table 1).

We administered the MSRS, and the hospital anxiety and depression scale to 52 people with FMD (action tremor, dystonia, myoclonus, gait disorder, weakness), to 41 age and gender matched patients with equivalent non-functional, other movement disorders (OMD) (action tremor, dystonia, myoclonus, weakness) and to 57 age and gender matched healthy controls

(HC). The patients were primarily recruited from the clinical practice of experts in functional

and movement disorders (MJE and KPB).

As detailed in Table 1, we found that functional and other movement disorders patients scored equally highly on the MSRS, with both groups scoring significantly higher than healthy controls in the total and the two sub-scores. The FMD group had significantly higher anxiety and depression scores than their organic counterparts, which in turn had significantly higher scores than the healthy controls. There were only weak correlations between the MSRS total score and either anxiety (Pearson´s correlation coefficient FMD $r=.25$, Spearman´s rho OMD $\rho=.36$, HC $\rho=.38$) or depression (FMD $r=.36$, OMD $\rho=.43$, HC $\rho=.15$).

These findings suggest that having a movement disorder, regardless of whether it is of functional origin or not, and largely independently of anxiety or depression, induces increased attention to one's movement. This increase in conscious motor processing may be adaptive, and may be necessary for the patient to move safely and efficiently, if automatic motor control mechanisms are impaired. Importantly, more conscious motor processing (perhaps corresponding to MSRS subscale 1) seems to be accompanied by increased movement self-consciousness (corresponding to MSRS subscale 2) (Pearson´s correlation coefficient FMD $r=.54$; OMD $r=.75$, Spearman´s rho HC $\rho=.73$).

These observations might help explain why an estimated 10-15% of movement disorders patients have an additional functional movement disorder and why 12% of patients with a neurological disease also display "symptoms unexplained by the disease" [6,7]. The increased attention to the body in patients with movement disorders triggered by the presence

of physical symptoms might make them more susceptible to developing a functional

neurological disorder in addition.

**Ethical Compliance Statement**

**Acknowledgment**

**Authors' roles**

1) Research project: A. Conception, B. Organization, C. Execution;

2) Statistical Analysis: A. Design, B. Execution, C. Review and Critique;

3) Manuscript: A. Writing of the first draft, B. Review and Critique, C. Final version

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Patrick Haggard: 2A, 2C, 3B

Mark Edwards: 2C, 3B

**Data availability**

Our ethics agreement prevents data being openly available, but individual researchers may request deidentified participant data from the corresponding author.

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**Table 1: Movement Specific Reinvestment Scale and Hospital Anxiety and Depression scale group averages and statistical analyses with effect sizes**

| | HC (n=57) mean (sd) | OMD (n=41) mean (sd) | FMD (n=52) mean (sd) | One-way ANOVA / Kruskal-Wallis | Two sample t-test / Wilcoxon rank-sum test | | |
|---|---|---|---|---|---|---|---|
| | | | | | FMD versus OMD | OMD versus HC | FMD versus HC |
| **Movement Specific Reinvestment Scale (MSRS)** | | | | | | | |
| **MSRS total** | 21.9 (11.6) | 36.6 (13.6) | 36.0 (12.0) | $F(2,147)=23.97$ $p_{corr}<.0001$ $\eta^2=.25$ | $t(91)=0.23$ $p=.81$ $d=0.05$ | $Z=-4.94$ $p<.0001$ $r=.50$ | $Z=-5.39$ $p<.0001$ $r=-.52$ |
| **Conscious motor processing subscale** | 11.8 (6.8) | 18.8 (7.1) | 19.0 (6.9) | $F(2,147)=18.96$ $p_{corr}<.0001$ $\eta^2=.21$ | $t(91)=-0.18$ $p=.86$ $d=-0.04$ | $Z=-4.63$ $p<.0001$ $r=-.47$ | $Z=-4.99$ $p<.0001$ $r=-.48$ |
| I rarely forget the times when my movements have failed me, however slight the failure. | 2.5 (2.0) | 3.5 (1.8) | 3.6 (1.9) | $F(2,147)=5.11$ $p_{corr}=.014$ $\eta^2=.065$ | $t(91)=-0.26$ $p=.79$ $d=-0.05$ | | |
| I am always trying to figure out why my actions failed. | 2.4 (1.9) | 3.1 (2.0) | 3.7 (1.8) | $F(2,147)=7.06$ $p_{corr}=.003$ $\eta^2=.088$ | $t(91)=-1.60$ $p=.11$ $d=-0.33$ | | |
| I reflect about my movement a lot. | 2.1 (1.6) | 4.1 (1.7) | 3.9 (1.8) | $F(2,147)=23.73$ $p_{corr}<.0001$ $\eta^2=.24$ | $t(91)=0.65$ $p=.52$ $d=0.14$ | | |
| I am always trying to think about my movements when I carry them out. | 2.2 (1.7) | 3.8 (1.8) | 3.9 (2.0) | $F(2,147)=14.61$ $p_{corr}<.0001$ $\eta^2=.17$ | $t(91)=-0.21$ $p=.83$ $d=-0.04$ | | |
| I am aware of the way my mind and body works when I am carrying out a movement. | 2.7 (1.8) | 4.3 (1.8) | 3.9 (1.8) | $F(2,147)=11.31$ $p_{corr}<.0001$ $\eta^2=.13$ | $Z=1.20$ $p=.23$ $r=.12$ | | |
| **Movement self-consciousness subscale** | 10.1 (6.0) | 18.0 (7.2) | 16.9 (6.8) | $F(2,147)=21.52$ $p_{corr}<.0001$ $\eta^2=.23$ | $t(91)=0.70$ $p=.48$ $d=0.15$ | $Z=-4.85$ $p<.0001$ $r=-.49$ | $Z=-5.01$ $p<.0001$ $r=-.48$ |
| I am self-conscious about the way I look when I am moving. | 2.5 (1.7) | 4.0 (1.9) | 4.2 (1.8) | $F(2,147)=14.95$ $p_{corr}=.0001$ $\eta^2=.17$ | $Z=-0.49$ $p=.62$ $r=-.05$ | | |
| I sometimes have the feeling that I am watching myself move. | 1.6 (1.2) | 3.4 (1.9) | 2.9 (1.9) | $F(2,147)=16.08$ $p_{corr}<.0001$ $\eta^2=.18$ | $Z=1.43$ $p=.15$ $r=.15$ | | |
| I am concerned about my style of moving. | 1.8 (1.4) | 3.7 (1.8) | 3.7 (1.7) | $F(2,147)=24.34$ $p_{corr}<.0001$ $\eta^2=.25$ | $t(91)=0.11$ $p=.91$ $d=0.02$ | | |
| If I see my reflection in a shop window, I will examine my movements. | 2.3 (1.6) | 2.6 (1.7) | 2.4 (1.8) | $F(2,147)=0.57$ $p_{corr}=.57$ $\eta^2=.008$ | $Z=0.58$ $p=.56$ $r=.06$ | | |
| I am concerned about what people think about me when I am moving. | 1.9 (1.4) | 4.1 (1.8) | 3.7 (1.9) | $F(2,147)=24.33$ $p_{corr}<.0001$ $\eta^2=.25$ | $t(91)=1.01$ $p=.32$ $d=0.21$ | | |
| **Hospital Anxiety and Depression score (HADS)** | | | | | | | |
| **HADS-Anxiety** | 4.9 (3.3) | 7.6 (3.8) | 10.2 (4.9) | $\chi^2(2)=34.35$ $p=.0001$ $\eta^2=.22$ | $t(91)=-2.80$ $p=.006$ $d=-0.59$ | $Z=-3.57$ $p=.0004$ $r=-.36$ | |
| **HADS-Depression** | 2.5 (2.6) | 4.4 (2.7) | 8.9 (4.6) | $\chi^2(2)=57.34$ $p=.0001$ $\eta^2=.38$ | $Z=-4.90$ $p<.0001$ $r=-.51$ | $Z=-3.73$ $p=.0002$ $r=-.38$ | |

MSRS: Each question is rated on a six-point Likert scale (strongly, moderately weakly disagree/agree). The ANOVA $p$-values are Šidák-Holm corrected for multiple comparisons ($p_{corr}$). Significant results are highlighted in bold. HADS <8: normal, 8–10: mild, 11-14: moderate, 15-21: severe affection.