Dear Editor,

Blink reflex hyperexcitability is a characteristic manifestation in Parkinson’s disease (PD). The blink reflex is a brainstem reflex evoked by mechanical stimulation of the cornea, electrical stimulation of the supraorbital nerve, auditory stimulation, visual stimulation, and mechanical or electrical stimulation of the limbs. Here, we present the first case of eyeblink bursts that were induced while the patient performed hand movement.

A 70-year-old male patient presented with a 3-year history of freezing of gait, walking with short steps, festination, frequent falls, and a 2-year history of toe tremor. An initial neurological examination in the off-medication condition revealed mild rigidity in both legs, freezing of gait when starting to walk, short stride length, shuffling gait, bilateral reduced arm swing during walking, postural instability, and hyperreflexia in both legs (Supplementary Video 1 in the online-only Data Supplement). Freezing of gait was not obvious when the patient had a large space to walk in. Rest tremors at rest were observed in the left big and second toes. The patient was then instructed to perform movements including hand opening and closing, finger tapping with the thumb and index finger, and hand pronation and supination. When the patient gazed at his finger tapping movement, eyeblink bursts immediately occurred. This unusual eyeblink burst was induced by the movement of both the right and the left hand. Before evaluating the finger tapping movement, the examiner demonstrated finger tapping while the patient looked on. During this short time (1–2 seconds), no eyeblink burst occurred. When the patient gazed at his hand opening and closing, eyeblink bursts occurred twice per 4 trials. When the patient gazed at his hand performing pronation and supination, eyeblink bursts occurred. The amplitude of finger tapping movement and hand pronation and supination appeared to decrease on the left side. Postural or action tremor, oculomotor dysfunction, cognitive dysfunction, olfactory dysfunction, alien limb syndrome, apraxia, and gait and limb ataxias were absent. Myerson’s sign was negative. Neurological examinations were performed again under the on-medication condition (400 mg/day of levodopa). Gait speed and stride length appeared to be slightly increased (Supplementary Video 2 in the online-only Data Supplement). While the amplitude of finger tapping and hand pronation and supination was consistently large on the left side compared with that in the off-medication condition, gazing at the finger tapping movement induced eye blink bursts as in the off-medication condition. When the patient avoided eye contact with the hand movements by gazing straight forward, during left hand pronation and supination, or left hand opening and closing, eyeblink bursts occurred. In 123I-metaiodobenzylguanidine myocardial scintigraphy, the heart/mediastinum uptake ratios were 3.67 and 3.62 (> 2.2) at the two sample times of 15 min and 3 h, respectively (Figure 1A and B). Brain magnetic resonance imaging revealed no abnormalities, including no predominant midbrain atrophy (Figure 1C). 123I-FP-CIT single-photon emission computed tomography demonstrated a decrease in 123I-FP-CIT uptake in the bilateral striatum (Figure 1D). The patient had bradykinesia in both legs and the left hand, resting tremor in the left toes, mild rigidity in both legs, experienced mild benefits from

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levodopa treatment, and showed no red flag signs. According to the clinical diagnostic criteria for PD from the Movement Disorder Society, the patient was diagnosed with clinically probable PD.2

Here, eyeblink burst was frequently induced by visual perception of various hand movements. To the best of our knowledge, this unusual phenomenon has not been described in the previous literature. We thus named the phenomenon “hand-movement-induced eye blink bursts.” In our case, the visual perception of hand movement could have played a crucial role in developing eye blink bursts. Eye blinks are observed in voluntary blinks, spontaneous blinks, blink reflexes, or glabellar reflexes. The blink reflex can be induced by visual stimulations (such as bright light), auditory stimulation, and mechanical or electrical stimulation of the limbs.3-5 Considering that hand movement was presumed to always be included in the patient’s visual field (central or pe-

Figure 1. 123I-metaiodobenzylguanidine myocardial scintigraphy shows normal heart (H)/mediastinum (M) ratios in the early (15 min) (A) and delayed images (3 h) (B). Sagittal T1 magnetization prepared rapid acquisition with gradient echo imaging does not show atrophy of the midbrain and pons (C). 123I-FP-CIT single-photon emission computed tomography shows a decrease in 123I-FP-CIT uptake in the bilateral striatum (D).
Thus, visual perception of the patient's own hand movement un-
basal ganglia have an inhibitory effect on the excitability of brain-
cluded in the study.

The underlying mechanism of hand-movement-induced eye
blink bursts is unclear. However, enhanced excitability of the blink
reflex is a characteristic manifestation in patients with PD. The
basal ganglia have an inhibitory effect on the excitability of brain-
interneurons that are associated with the blink reflex through the
colliculus superior, nucleus raphe magnus, and spinal trigem-
complex. In patients with PD, neuronal loss of dopaminergic
in the substantia nigra is a core neuropathological
change that may decrease the inhibitory output of the basal gan-
and the disinhibition of excitatory brainstem interneurons. Thus,
visual perception of the patient's own hand movement un-
der the enhanced excitability of the blink reflex may represent a
potential mechanism of hand-movement-induced eye blink
bursts. Since hand movement-induced eye blink bursts occurred
in both on- and off-medication conditions, they may be attrib-
table to nondopaminergic dysfunction.

In conclusion, this is the first study to reveal that eyeblink
bursts can be induced by visual perception of repetitive hand
movement. Although further studies are needed, hand move-
ment-induced eyeblink bursts may be a potential hallmark of PD.

Ethics Statement
All procedures performed in studies involving human participants were in
accordance with the ethical standards of the institutional research committee
and with the 1975 Helsinki declaration and its later amendments or compa-
ble ethical standards. Informed consent was obtained from the patient in-
cluded in the study.

Supplementary Video Legends
Video 1. The video was initially recorded in the off-medication condition. Freezing of gait, short stride length, bilateral reduced arm swing during walk-
ing, slow gait speed in a narrow space, resting tremors in the left big and sec-
ond toes, hand-movement-induced eyeblink bursts, and bradykinesia in the
left hand are shown. During finger tapping, the patient was instructed to per-
form the task as largely and quickly as possible.

Video 2. Within 1 week, the video was recorded again in the off-medica-
tion condition. Hand-movement-induced eyeblink bursts, bradykinesia in the
left hand, and bilateral reduced arm swing (a stick in the right hand might be
involved) are shown. During finger tapping, the patient was instructed to per-
form the task as largely as possible. The patient underwent hand opening-
closing and hand pronation-supination without special instructions. Four
days later, videos were recorded in the on-medication condition. The gait
speed and stride length appeared to be mildly increased, and the arm swing
was visibly increased. A hand-movement-induced eyeblink burst is shown.
During finger tapping, the patient was instructed to perform the task as
largely as possible. The patient underwent hand opening-closing and hand
pronation-supination without special instructions.

Supplementary Materials
The online-only Data Supplement is available with this article at https://
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Conflicts of Interest
The authors have no financial conflicts of interest.

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Conceptualization: Gohei Yamada. Data curation: Gohei Yamada, Mitsuya
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