

Kentaro Horiuchi, Tokyo Metropolitan University

**The essential role of optical flow in the peripheral
visual field for stable quiet standing: evidence
from the use of a head-mounted display**

Study Documentation

September 11, 2017

Metadata Production

Table of Contents

Overview	4
Producers & Sponsors	4
Data Collection	4
Files Description	5
CoP variables v1.0	5
Variables List	6
CoP variables v1.0	6
Variables Description	8
CoP variables v1.0	9

The essential role of optical flow in the peripheral visual field for stable quiet standing: evidence from the use of a head-mounted display

The essential role of optical flow in the peripheral visual field for stable quiet standing: evidence from the use of a head-mounted display

Overview

Identification	2017-057
-----------------------	----------

Abstract

It has long been thought that vision is the most essential factor in maintaining stable quiet standing compared to other sources (i.e., vestibular and somatosensory inputs) of information. Specifically, several vision studies on postural control have shown evidence for the importance of the visual system, particularly peripheral vision rather than central vision, and optical flow. Nevertheless, to date, no study has manipulated both visual field and optical flow concurrently. In the present study, we experimentally manipulated both the visual field (the central and peripheral visual fields) and the occurrence of optical flow during quiet standing, examining the effects of the visual field and optical flow on postural sway measured in terms of the center of pressure (CoP). Stationary random dot stimuli were presented exclusively in either the central or peripheral visual field, while the occurrence of optical flow was manipulated using a desktop (DTD) or a head-mounted (HMD) display. The optical flow that occurred while using the DTD was a function of the postural sway during quiet standing, while for the HMD, no optical flow occurred even when the body/head swayed during quiet standing. Our results show that the extent of postural sway (e.g., CoP area) was smaller when visual stimuli were presented in the peripheral visual field than that in the central visual field; this was the case while using the DTD alone, with no effects of the peripheral vision on the extent of postural sway while using the HMD. It is therefore suggested that the optical flow occurring in the peripheral visual field is essential for stable quiet standing.

Kind of Data	Experimentell data
---------------------	--------------------

Topics	Medicin och hälsovetenskap, PSYKOLOGI
---------------	---------------------------------------

Countries	
------------------	--

Producers & Sponsors

Primary Investigator(s)	Kentaro Horiuchi, Tokyo Metropolitan University
--------------------------------	---

Data Collection

Data Collection Mode	Fysiska mätningar och tester
-----------------------------	------------------------------

	Experiment
--	------------

Data Collector(s)	Kentaro Horiuchi
--------------------------	------------------

Depositor(s)	Horiuchi, Kentaro [horiuchi-kentaro2@ed.tmu.ac.jp]
---------------------	--

Files Description

Dataset contains 1 file(s)

CoP_variables_v1.0	
# Cases	28
# Variable(s)	45

Variables List

Dataset contains 45 variable(s)

File CoP_variables_v1.0							
#	Name	Label	Type	Format	Valid	Invalid	Question
1	SND_study	SND-study 1029	discrete	numeric-7.0	28	0	-
2	SND_data..	SND-dataset1029-001	discrete	numeric-4.0	28	0	-
3	SND_vers..	SND version 1.0	discrete	numeric-4.0	28	0	-
4	Particip..	-	continuous	numeric-2.0	28	0	-
5	Gender	-	discrete	character-1	28	0	-
6	Envelopm..	Envelopment area, DTD, CV	continuous	numeric-17.15	28	0	-
7	Envelopm..	Envelopment area, DTD, PV	continuous	numeric-17.15	28	0	-
8	Envelopm..	Envelopment area, DTD, FV	continuous	numeric-17.15	28	0	-
9	Envelopm..	Envelopment area, DTD, ND	continuous	numeric-17.15	28	0	-
10	Envelopm..	Envelopment area, HMD, CV	continuous	numeric-17.15	28	0	-
11	Envelopm..	Envelopment area, HMD, PV	continuous	numeric-17.15	28	0	-
12	Envelopm..	Envelopment area, HMD, FV	continuous	numeric-17.15	28	0	-
13	Envelopm..	Envelopment area, HMD, ND	continuous	numeric-17.15	28	0	-
14	Rectangu..	Rectangular area, DTD, CV	continuous	numeric-18.15	28	0	-
15	Rectangu..	Rectangular area, DTD, PV	continuous	numeric-17.15	28	0	-
16	Rectangu..	Rectangular area, DTD, FV	continuous	numeric-17.15	28	0	-
17	Rectangu..	Rectangular area, DTD, ND	continuous	numeric-18.15	28	0	-
18	Rectangu..	Rectangular area, HMD, CV	continuous	numeric-18.15	28	0	-
19	Rectangu..	Rectangular area, HMD, PV	continuous	numeric-18.15	28	0	-
20	Rectangu..	Rectangular area, HMD, FV	continuous	numeric-18.15	28	0	-
21	Rectangu..	Rectangular area, HMD, ND	continuous	numeric-18.15	28	0	-
22	RMSareaD..	RMS area, DTD, CV	continuous	numeric-17.15	28	0	-
23	RMSareaD..	RMS area, DTD, PV	continuous	numeric-17.15	28	0	-
24	RMSareaD..	RMS area, DTD, FV	continuous	numeric-17.15	28	0	-
25	RMSareaD..	RMS area, DTD, ND	continuous	numeric-17.15	28	0	-
26	RMSareaH..	RMS area, HMD, CV	continuous	numeric-17.15	28	0	-
27	RMSareaH..	RMS area, HMD, PV	continuous	numeric-17.15	28	0	-
28	RMSareaH..	RMS area, HMD, FV	continuous	numeric-17.15	28	0	-
29	RMSareaH..	RMS area, HMD, ND	continuous	numeric-17.15	28	0	-
30	Totallen..	Total length, DTD, CV	continuous	numeric-19.15	28	0	-
31	Totallen..	Total length, DTD, PV	continuous	numeric-19.15	28	0	-
32	Totallen..	Total length, DTD, FV	continuous	numeric-19.15	28	0	-
33	Totallen..	Total length, DTD, ND	continuous	numeric-19.15	28	0	-
34	Totallen..	Total length, HMD, CV	continuous	numeric-19.15	28	0	-
35	Totallen..	Total length, HMD, PV	continuous	numeric-19.15	28	0	-

File CoP_variables_v1.0							
#	Name	Label	Type	Format	Valid	Invalid	Question
36	Totalen ..	Total length, HMD, FV	continuous	numeric-19.15	28	0	-
37	Totalen ..	Total length, HMD, ND	continuous	numeric-19.15	28	0	-
38	CoPperar ..	CoP per area, DTD, CV	continuous	numeric-18.15	28	0	-
39	CoPperar ..	CoP per area, DTD, PV	continuous	numeric-18.15	28	0	-
40	CoPperar ..	CoP per area, DTD, FV	continuous	numeric-18.15	28	0	-
41	CoPperar ..	CoP per area, DTD, ND	continuous	numeric-18.15	28	0	-
42	CoPperar ..	CoP per area, HMD, CV	continuous	numeric-18.15	28	0	-
43	CoPperar ..	CoP per area, HMD, PV	continuous	numeric-18.15	28	0	-
44	CoPperar ..	CoP per area, HMD, FV	continuous	numeric-18.15	28	0	-
45	CoPperar ..	CoP per area, HMD, ND	continuous	numeric-18.15	28	0	-

Variables Description

Dataset contains 45 variable(s)

File : CoP_variables_v1.0

SND_study: SND-study 1029

Information [Type= discrete] [Format=numeric] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-]

Value	Label	Cases	Percentage
1029		28	100.0%

Warning: these figures indicate the number of cases found in the data file. They cannot be interpreted as summary statistics of the population of interest.

SND_dataset: SND-dataset1029-001

Information [Type= discrete] [Format=numeric] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-]

Value	Label	Cases	Percentage
1		28	100.0%

Warning: these figures indicate the number of cases found in the data file. They cannot be interpreted as summary statistics of the population of interest.

SND_version: SND version 1.0

Information [Type= discrete] [Format=numeric] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-]

Value	Label	Cases	Percentage
1		28	100.0%

Warning: these figures indicate the number of cases found in the data file. They cannot be interpreted as summary statistics of the population of interest.

Participant

Information [Type= continuous] [Format=numeric] [Range= 1-28] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=14.5 /-] [StdDev=8.226 /-]

Gender

Information [Type= discrete] [Format=character] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-]

Value	Label	Cases	Percentage
F		19	67.9%
M		9	32.1%

Warning: these figures indicate the number of cases found in the data file. They cannot be interpreted as summary statistics of the population of interest.

EnvelopmentareaDTDCV: Envelopment area, DTD, CV

Information [Type= continuous] [Format=numeric] [Range= 0.528066666666667-3.88253333333333] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=2.063 /-] [StdDev=0.997 /-]

EnvelopmentareaDTDPV: Envelopment area, DTD, PV

Information [Type= continuous] [Format=numeric] [Range= 0.544433333333333-4.08603333333333] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=1.547 /-] [StdDev=0.853 /-]

EnvelopmentareaDTDFV: Envelopment area, DTD, FV

Information [Type= continuous] [Format=numeric] [Range= 0.5916-4.0695] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=1.575 /-] [StdDev=0.884 /-]

EnvelopmentareaDTDND: Envelopment area, DTD, ND

Information [Type= continuous] [Format=numeric] [Range= 0.7089-5.3749] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=2.278 /-] [StdDev=1.383 /-]

File : CoP_variables_v1.0

EnvelopmentareaHMDCV: Envelopment area, HMD, CV

Information [Type= continuous] [Format=numeric] [Range= 0.696633333333333-7.2436] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=2.411 /-] [StdDev=1.458 /-]

EnvelopmentareaHMDPV: Envelopment area, HMD, PV

Information [Type= continuous] [Format=numeric] [Range= 0.673666666666667-5.9254] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=2.366 /-] [StdDev=1.455 /-]

EnvelopmentareaHMDFV: Envelopment area, HMD, FV

Information [Type= continuous] [Format=numeric] [Range= 0.578366666666667-9.79353333333333] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=2.494 /-] [StdDev=1.928 /-]

EnvelopmentareaHMDND: Envelopment area, HMD, ND

Information [Type= continuous] [Format=numeric] [Range= 0.639266666666667-7.6251] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=2.401 /-] [StdDev=1.509 /-]

RectangularareaDTDCV: Rectangular area, DTD, CV

Information [Type= continuous] [Format=numeric] [Range= 1.22583333333333-10.6495666666667] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=4.792 /-] [StdDev=2.569 /-]

RectangularareaDTDPV: Rectangular area, DTD, PV

Information [Type= continuous] [Format=numeric] [Range= 1.3584-9.01293333333334] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=3.684 /-] [StdDev=2.01 /-]

RectangularareaDTDFV: Rectangular area, DTD, FV

Information [Type= continuous] [Format=numeric] [Range= 1.4568-9.4829] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=3.707 /-] [StdDev=2.061 /-]

RectangularareaDTDND: Rectangular area, DTD, ND

Information [Type= continuous] [Format=numeric] [Range= 1.45623333333333-13.4378] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=5.398 /-] [StdDev=3.248 /-]

RectangularareaHMDCV: Rectangular area, HMD, CV

Information [Type= continuous] [Format=numeric] [Range= 1.56703333333333-15.5083333333333] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=5.475 /-] [StdDev=3.149 /-]

RectangularareaHMDPV: Rectangular area, HMD, PV

Information [Type= continuous] [Format=numeric] [Range= 1.4208-13.156] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=5.313 /-] [StdDev=3.229 /-]

RectangularareaHMDFV: Rectangular area, HMD, FV

Information [Type= continuous] [Format=numeric] [Range= 1.44306666666667-24.5499333333333] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=5.867 /-] [StdDev=4.668 /-]

RectangularareaHMDND: Rectangular area, HMD, ND

Information [Type= continuous] [Format=numeric] [Range= 1.4161-16.9263333333333] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=5.3 /-] [StdDev=3.331 /-]

RMSareaDTDCV: RMS area, DTD, CV

Information [Type= continuous] [Format=numeric] [Range= 0.362566666666667-3.59853333333333] [Missing=*]

File : CoP_variables_v1.0**# RMSareaDTDCV: RMS area, DTD, CV**

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=1.534 /-] [StdDev=0.891 /-]
--------------------	--

RMSareaDTDPV: RMS area, DTD, PV

Information	[Type= continuous] [Format=numeric] [Range= 0.3679333333333333-2.616866666666667] [Missing=*]
-------------	---

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=1.083 /-] [StdDev=0.587 /-]
--------------------	--

RMSareaDTDFV: RMS area, DTD, FV

Information	[Type= continuous] [Format=numeric] [Range= 0.3471-2.371033333333333] [Missing=*]
-------------	---

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=1.082 /-] [StdDev=0.565 /-]
--------------------	--

RMSareaDTDND: RMS area, DTD, ND

Information	[Type= continuous] [Format=numeric] [Range= 0.4060333333333333-5.792866666666667] [Missing=*]
-------------	---

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=1.689 /-] [StdDev=1.195 /-]
--------------------	--

RMSareaHMDCV: RMS area, HMD, CV

Information	[Type= continuous] [Format=numeric] [Range= 0.4331666666666667-5.046466666666667] [Missing=*]
-------------	---

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=1.533 /-] [StdDev=0.998 /-]
--------------------	--

RMSareaHMDPV: RMS area, HMD, PV

Information	[Type= continuous] [Format=numeric] [Range= 0.4006666666666667-4.10105] [Missing=*]
-------------	---

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=1.531 /-] [StdDev=1.027 /-]
--------------------	--

RMSareaHMDFV: RMS area, HMD, FV

Information	[Type= continuous] [Format=numeric] [Range= 0.3243333333333333-7.2491] [Missing=*]
-------------	--

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=1.577 /-] [StdDev=1.372 /-]
--------------------	--

RMSareaHMDND: RMS area, HMD, ND

Information	[Type= continuous] [Format=numeric] [Range= 0.3998666666666667-5.2044] [Missing=*]
-------------	--

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=1.483 /-] [StdDev=0.972 /-]
--------------------	--

TotallengthDTDCV: Total length, DTD, CV

Information	[Type= continuous] [Format=numeric] [Range= 50.746-110.144] [Missing=*]
-------------	---

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=72.007 /-] [StdDev=15.866 /-]
--------------------	--

TotallengthDTDPV: Total length, DTD, PV

Information	[Type= continuous] [Format=numeric] [Range= 49.898-117.87] [Missing=*]
-------------	--

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=68.353 /-] [StdDev=14.393 /-]
--------------------	--

TotallengthDTDFV: Total length, DTD, FV

Information	[Type= continuous] [Format=numeric] [Range= 33.594-106.32] [Missing=*]
-------------	--

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=65.928 /-] [StdDev=15.745 /-]
--------------------	--

TotallengthDTDND: Total length, DTD, ND

Information	[Type= continuous] [Format=numeric] [Range= 48.744-134.852] [Missing=*]
-------------	---

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=74.941 /-] [StdDev=19.686 /-]
--------------------	--

TotallengthHMDCV: Total length, HMD, CV

Information	[Type= continuous] [Format=numeric] [Range= 49.828-109.442] [Missing=*]
-------------	---

Statistics [NW/ W]	[Valid=28 /-] [Invalid=0 /-] [Mean=79.239 /-] [StdDev=16.532 /-]
--------------------	--

File : CoP_variables_v1.0

TotallengthHMDPV: Total length, HMD, PV

Information [Type= continuous] [Format=numeric] [Range= 48.092-135.552] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=80.513 /-] [StdDev=18.217 /-]

TotallengthHMDFV: Total length, HMD, FV

Information [Type= continuous] [Format=numeric] [Range= 48.092-132.303] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=82.001 /-] [StdDev=20.483 /-]

TotallengthHMDND: Total length, HMD, ND

Information [Type= continuous] [Format=numeric] [Range= 48.33-111.592] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=79.429 /-] [StdDev=17.236 /-]

CoPperareaDTDCV: CoP per area, DTD, CV

Information [Type= continuous] [Format=numeric] [Range= 9.86383333333333-49.1598666666667] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=22.62 /-] [StdDev=11.271 /-]

CoPperareaDTDPV: CoP per area, DTD, PV

Information [Type= continuous] [Format=numeric] [Range= 14.2343-51.12185] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=28.044 /-] [StdDev=11.136 /-]

CoPperareaDTDFV: CoP per area, DTD, FV

Information [Type= continuous] [Format=numeric] [Range= 12.2652-47.9275333333333] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=25.916 /-] [StdDev=10.904 /-]

CoPperareaDTDND: CoP per area, DTD, ND

Information [Type= continuous] [Format=numeric] [Range= 11.4432333333333-40.1233666666667] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=21.66 /-] [StdDev=8.472 /-]

CoPperareaHMDCV: CoP per area, HMD, CV

Information [Type= continuous] [Format=numeric] [Range= 7.8183-45.2105666666667] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=21.39 /-] [StdDev=9.181 /-]

CoPperareaHMDPV: CoP per area, HMD, PV

Information [Type= continuous] [Format=numeric] [Range= 9.24016666666667-53.7127] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=23.38 /-] [StdDev=11.96 /-]

CoPperareaHMDFV: CoP per area, HMD, FV

Information [Type= continuous] [Format=numeric] [Range= 6.4472-53.5871] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=22.759 /-] [StdDev=10.504 /-]

CoPperareaHMDND: CoP per area, HMD, ND

Information [Type= continuous] [Format=numeric] [Range= 7.3658-47.7735666666667] [Missing=*]

Statistics [NW/ W] [Valid=28 /-] [Invalid=0 /-] [Mean=22.991 /-] [StdDev=10.577 /-]