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Table 1. Demographic Data of MCS Subjects and Controls Who Underwent the One-week

		MCS subjects (n=14 [13]*)	Controls (n=12)
Measurement of Symptoms and Chemical Exposure			
Gender	Male	7 [6]	2
	Female	7	10
Education	≤ 16 years	6 [5]	6
	12-16 years	4	4
	≥ 12 years	4	3
Occupation	(+)	9 [8]	8
	(-)	5	4
Marriage	(+)	10 [9]	9
	(-)	4	3
Age	mean ± SD	38.2±7.6 [37.8±7.6]	36.2±6.5
	range	23 - 53 [23-47]	26 - 48

\* Figures in parentheses represent the results of 13 MCS subjects included in the analyses of symptom profile.

Table 2. Profiles of the MCS Subjects, Including Identifiable Onset, Psychiatric Comorbidity, and Participation in One-week Measurement

Patient	Identifiable Onset	Psychiatric Comorbidity	Participation
A1	(-)	Panic disorder with agoraphobia	(-)
A2	Moving into a new house	Agoraphobia	(+)
A3	Use of chemicals in the office	(-)	(+)
A4	Use of chemicals in the office	(-)	(+)
A5	Moving into a new house	Agoraphobia	(+)
A6	Use of chemicals in the office	Agoraphobia	(+)
A7	(-)	Agoraphobia	(+)
A8	(-)	Social anxiety disorder, Agoraphobia	(+)
A9	Use of chemicals in the office	Major depression, Agoraphobia	(+)
A10	(-)	(-)	(+)
A11	Moving into a new office	Agoraphobia	(+)
A12	Moving into a new office	Major depression, Obsessive compulsive disorder	(-)
A13	Moving into a new office	Panic disorder (lifetime) with agoraphobia(+)	
A14	Moving into a new house	Agoraphobia	(+)
A15	Moving into a new office	Agoraphobia	(+)
A16	Moving into a new house	Agoraphobia	(+)
A17	Use of chemicals in the office	Agoraphobia	(-)
A18	Moving into a new house	Agoraphobia	(-)

Table 3. Possible Causative Chemicals for Hypersensitivity Symptoms

Patient	Chemicals	Exposure concentration	
		Symptomatic Condition	Control (Non-symptomatic) Condition
A2	formaldehyde	15.5 ppb	6.7 ppb
	acetaldehyde	13.5 ppb	4.0 ppb
	acetone	35.1 ppb	22.0 ppb
	propionaldehyde	2.1 ppb	1.0 ppb
	tridecane	48.3 µg/m <sup>3</sup>	11.9 µg/m <sup>3</sup>
A3	none	-	-
A4	none	-	-
A5	formaldehyde	31.1 ppb	17.5 ppb
	Toluene	11.3 µg/m <sup>3</sup>	9.1 µg/m <sup>3</sup>
	m/p-xylene	13.8 µg/m <sup>3</sup>	8.9 µg/m <sup>3</sup>
	alfa-pinene	248.4 µg/m <sup>3</sup>	129.1 µg/m <sup>3</sup>
	limonene	16.5 µg/m <sup>3</sup>	7.4 µg/m <sup>3</sup>
A6	formaldehyde	13.8 ppb	5.4 ppb
	acetaldehyde	6.4 ppb	t.r. (<5.4 ppb)
	toluene	26.0 µg/m <sup>3</sup>	6.9 µg/m <sup>3</sup>
	m/p-xylene	22.3 µg/m <sup>3</sup>	15.4 µg/m <sup>3</sup>
	undecane	24.2 µg/m <sup>3</sup>	9.8 µg/m <sup>3</sup>
	tridecane	41.6 µg/m <sup>3</sup>	12.6 µg/m <sup>3</sup>
A7	formaldehyde	24.0 ppb	16.5 ppb
	acetaldehyde	12.1 ppb	9.0 ppb
	acetone	13.6 ppb	8.9 ppb
A8	formaldehyde	25.8 ppb	20.1 ppb
	acetaldehyde	9.1 ppb	6.7 ppb
	propionaldehyde	4.0 ppb	2.5 ppb
	toluene	27.5 µg/m <sup>3</sup>	22.9 µg/m <sup>3</sup>
A9	formaldehyde	14.5 ppb	8.0 ppb
	acetaldehyde	8.3 ppb	5.5 ppb
	acetone	12.9 ppb	10.9 ppb
	propionaldehyde	1.6 ppb	1.1 ppb
	toluene	769.5 µg/m <sup>3</sup>	108.9 µg/m <sup>3</sup>
	butyl acetate	459.6 µg/m <sup>3</sup>	26.6 µg/m <sup>3</sup>
	ethylbenzene	130.1 µg/m <sup>3</sup>	8.2 µg/m <sup>3</sup>
	m/p-xylene	207.6 µg/m <sup>3</sup>	17.5 µg/m <sup>3</sup>
1,2,4-trimethylbenzene	14.3 µg/m <sup>3</sup>	8.9 µg/m <sup>3</sup>	
A10	formaldehyde	20.2 ppb	9.7 ppb
	acetaldehyde	10.4 ppb	5.0 ppb

	toluene	28.6 µg/m <sup>3</sup>	20.7 µg/m <sup>3</sup>
A11	formaldehyde	71.8 ppb	18.9 ppb
A13	none	-	-
A14	formaldehyde	33.9 ppb	30.3 ppb
	acetaldehyde	5.8 ppb	3.5 ppb
	propionaldehyde	1.6 ppb	0.8 ppb
	toluene	48.6 µg/m <sup>3</sup>	27.5 µg/m <sup>3</sup>
A15	butanol	55.5 µg/m <sup>3</sup>	33.4 µg/m <sup>3</sup>
	methyl isobutyl ketone	4.2 µg/m <sup>3</sup>	N.D.(<1.4 µg/m <sup>3</sup> )
	Limonene	5.7 µg/m <sup>3</sup>	N.D. (<2.2 µg/m <sup>3</sup> )
A16	formaldehyde	71.3 ppb	50.6 ppb
	butanol	15.7 µg/m <sup>3</sup>	11.0 µg/m <sup>3</sup>

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t.r. = trace, N.D. = not detected

Table 4. Differences in 17 Physical Symptoms between Control and Symptomatic Conditions within the MCS

Group	Control Condition		Symptomatic Condition		Pr >  t
	Estimate	SEM	Estimate	SEM	
Fatigue*	25.96	7.11	31.11	1.68	0.0106
Concentration problems***	20.56	7.22	30.07	1.88	0.0004
Forgetfulness***	17.98	9.02	24.02	1.33	0.0009
Sore throat****	21.01	9.12	32.58	1.81	<.0001
Headache****	11.77	6.40	25.94	1.92	<.0001
Muscle weakness**	5.44	8.04	9.71	1.32	0.0079
Joint pain*	6.07	6.99	9.22	1.26	0.0291
Muscular pain**	6.34	6.91	12.03	1.38	0.0017
Nausea***	1.37	5.67	9.20	1.35	0.0001
Breathlessness***	1.91	5.14	8.94	1.42	0.0004
Abdominal pain	0.91	5.19	2.03	0.98	0.2743
Feverishness*	3.40	5.84	6.69	1.46	0.0451
Eye irritation***	24.86	7.72	36.39	1.97	0.0001
Skin itching/problems	19.50	8.15	20.73	1.66	0.4747
Dizziness/Vertigo****	4.19	6.24	13.47	1.42	<.0001
Stuff and runny noses***	18.96	7.25	26.03	1.48	0.0006
Palpitation***	2.79	4.99	11.06	1.44	0.0001

\*p<0.05, \*\*p<0.01, \*\*\*p<0.001, \*\*\*\*p<0.0001

Table 5. Differences in 4 Mood Measures between Control and Symptomatic Conditions within the MCS

Group	Control Condition		Symptomatic Condition		Pr >  t
	Estimate	SEM	Estimate	SEM	
Anxious mood **	47.72	28.50	64.84	4.30	0.0022
Positive mood***	59.69	20.41	41.90	3.82	0.0007
Negative mood****	20.86	21.14	44.53	3.64	<.0001
Depressive mood****	261.14	27.01	302.56	5.87	<.0001

\*\*p<0.01, \*\*\*p<0.001, \*\*\*\*p<0.0001



Table 6. Differences in 17 Physical Symptoms between MCS Subjects under the Control Condition and

	Control Subjects				
	MCS Subjects		Controls		Pr >  t
	Estimate	SEM	Estimate	SEM	
Fatigue	29.38	9.11	33.29	6.42	0.6723
Concentration problems	22.27	7.06	22.22	4.96	0.9951
Forgetfulness	22.26	8.78	22.81	6.19	0.951
Sore throat	19.62	8.19	14.67	5.77	0.5519
Headache	12.42	5.78	9.63	4.06	0.6347
Muscle weakness	6.46	6.70	9.38	4.73	0.6671
Joint pain	7.83	6.98	10.43	4.92	0.7128
Muscular pain	9.23	8.50	15.30	6.00	0.4826
Nausea	2.03	4.43	2.23	3.12	0.9638
Breathlessness	3.93	4.54	5.99	3.18	0.6553
Abdominal pain	1.49	4.24	4.23	2.98	0.5249
Feverishness	5.53	5.30	7.13	3.70	0.7663
Eye irritation	25.21	9.56	24.17	6.74	0.914
Skin itching/problems	21.96	8.82	25.09	6.18	0.7261
Dizziness/Vertigo	3.80	4.98	6.12	3.51	0.6467
Stuff and runny noses	20.81	10.02	36.78	7.05	0.1252
Palpitation	4.01	3.98	5.03	2.79	0.8019

Table 7. Differences in 4 Mood Measures between MCS Subjects under the Control Condition and Control

Subjects	Patients		Controls		Pr >  t
	Estimate	SEM	Estimate	SEM	
Anxious mood	54.88	26.38	75.77	18.58	0.4369
Positive mood	58.95	24.68	97.35	17.42	0.134
Negative mood	25.44	20.63	45.53	14.53	0.3408
Depressive mood	266.42	32.42	248.28	22.86	0.5815

Table 8. Coarse Graining Spectral Analysis (CGSA, 粗視化スペクトル解析) 法による解析

	MCS		Control	
	awake Mean (SD)	sleep Mean (SD)	awake Mean (SD)	sleep Mean (SD)
RRI (msec)	750.7 (94.7)	989.1 (159.9)	752.0 (152.1)	971.9 (186.4)
LF power (msec <sup>2</sup> )	100.4 (84.0)	77.8 (84.9)	113.1 (84.31)	156.5 (175.0)
HF power (msec <sup>2</sup> ) *	38.6 (43.2)	236.4 (316.5)	64.0 (101.4)	371.4 (653.5)
Total power (msec <sup>2</sup> )	4601.8 (1484.2)	7912.5 (8631.0)	8867.6 (9811.5)	8793.8 (8230.5)
%Fractal	79.2 (85.9)	79.2 (74.8)	85.2 (99.8)	80.6 (85.1)
$\beta^{\#}$	1.38 (0.13)	1.35 (0.20)	1.27 (0.15)	1.24 (0.13)

# p < 0.05 for the main effect of group.

\* p < 0.01 for the main effect of awakening or sleep.

Table 9. 患者群の基礎データ

年齢	精神疾患の合併	発症日時	発症のきっかけ	原因化学物質
50F	全般性不安障害、広場恐怖	2004年5月	リフォーム	トルエン
57F	(-)	2002年10月	新築	ホルムアルデヒド
37F	(-)	2000年	職場(看護婦、内視鏡)	ホルムアルデヒド
25F	(-)	2001年	引越し	不明
56M	(-)	2004年3月	職場(写真現像)	ホルムアルデヒド、酢酸、アンモニア
25F	(-)	2004年3月	職場(写真現像)	ホルムアルデヒド、酢酸、アンモニア
43F	(-)	2004年8月	エアコンの洗浄	不明
38M	(-)	2003年12月	職場(ヨーグルト工場)	塩素疑い
45M	(-)	2003年11月	新築	ホルムアルデヒド疑い
35M	社会不安障害	2003年3月	新築	$\alpha$ ピネン、リモネン
35M	(-)	2003年3月	農薬暴露	クロルピリン
46F	(-)	2002年12月	新築	不明
43F	広場恐怖	2005年10月	歯科治療	ホルマリン疑い
21M	(-)	2000年12月	ストーブの匂い	ヘキサン系疑い
46M	パニック障害	1999年6月	引越し	農薬疑い
29F	(-)	2004年3月	職場の引越し(プレハブ)	不明
33F	(-)	2004年6月	職場の工事	不明
39F	(-)	1998年	新築	不明
37M	(-)	2005年7月	整髪料	不明

Table 10. 研究開始時に行った質問紙の結果。QEESI の 5 つの評価項目の素点と、POMS の T 得点

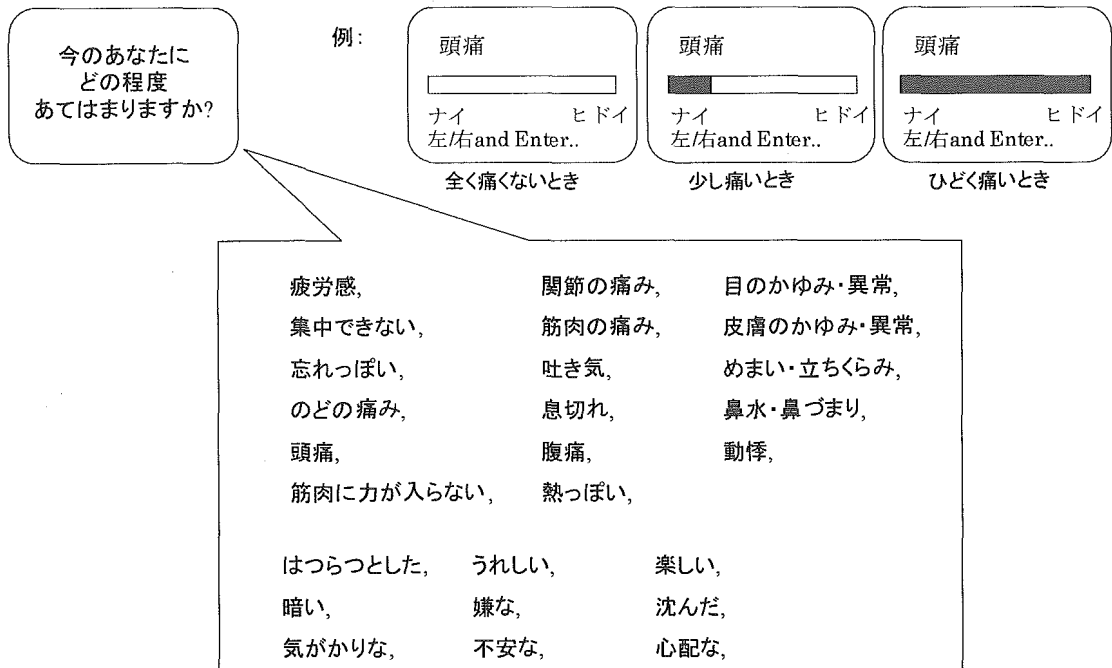
	MCS (n=19)	CON (n=4)
QEESI1 (化学物質暴露による反応)	49.0±22.9	2.0±1.2
QEESI2 (その他の化学物質暴露による反応)	18.0±10.7	3.6±3.8
QEESI3 (症状)	42.8±25.4	5.6±9.3
QEESI4 (マスクング)	2.6±1.6	2.8±1.6
QEESI5 (日常生活の障害の程度)	41.8±18.9	0.4±0.9
POMS-T (不安緊張)	54.8±12.2	45.8±5.6
POMS-D (抑うつ)	59.3±13.4	47.6±4.9
POMS-A (怒り)	54.1±11.5	42.8±2.3
POMS-V (活力)	42.7±10.0	53.6±15.7
POMS-F (疲労感)	57.7±12.2	46.2±6.4
POMS-C (混乱)	61.7±14.0	50.2±9.7

Table 11. 体動データの AW2 による解析結果。活動時間(おきている時間)、Activity Mean(日中の体動量の平均)、Activity Index(日中に体動を認めた時間の割合)などの指標は、患者群とコントロール群(参考)で明らかな差を認めなかった。

	MCS (n=10)	CON (n=4)
活動時間 (分)	994±74	1015±45.6
Activity Mean	170±26	161±14
Activity Index (%)	91.3±3.8	93.5±3.0

Table 12. 心拍変動の解析結果(破線より上は CGSA 解析、下は DFA 解析)。個人間のばらつきが大きい、睡眠中に患者群で高周波成分低値、LF/HF 比高値の傾向を認めた。

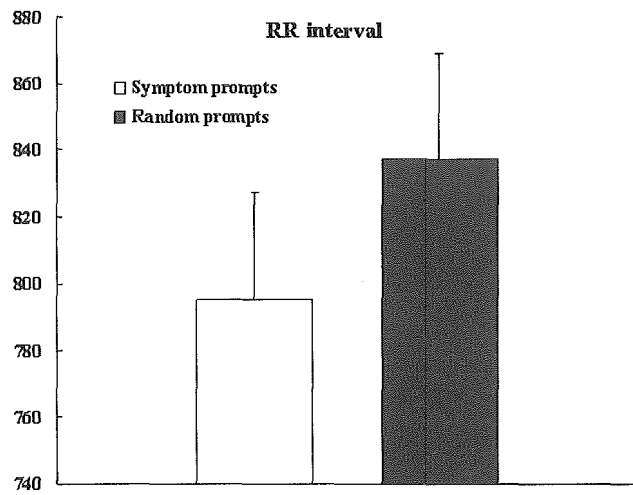
	MCS(n=12)		CON(n=4)	
	awake	sleep	awake	sleep
RRI (msec)	748.6(76.9)	998.5(77.9)	747.2(55.7)	1025.5(69.6)
LF power (msec <sup>2</sup> )	105.0(96.1)	147.9(95.9)	170.6(156.9)	306.6(298.6)
HF power (msec <sup>2</sup> )	72.4(133.7)	269.0(228.9)	42.2(37.4)	657.6(580.3)
LF/HF	7.36(11.4)	0.99(0.79)	4.50(2.29)	0.69(0.46)
Total power (msec <sup>2</sup> )	4264.1(2143.7)	3793.6(1406.5)	5252.5(3904.9)	4592.0(1779.0)
Percent Fractal Power (%)	81.3(9.2)	55.6(12.4)	85.1(2.5)	50.8(12.9)
$\beta$	1.32(0.23)	1.24(0.25)	1.31(0.14)	1.17(0.25)
$\alpha 1$	1.06(0.36)	0.82(0.34)	1.17(0.13)	0.72(0.15)
$\alpha 2$	1.12(0.10)	1.00(0.08)	1.04(0.07)	0.98(0.10)



**Fig.1 症状の項目と入力方法**

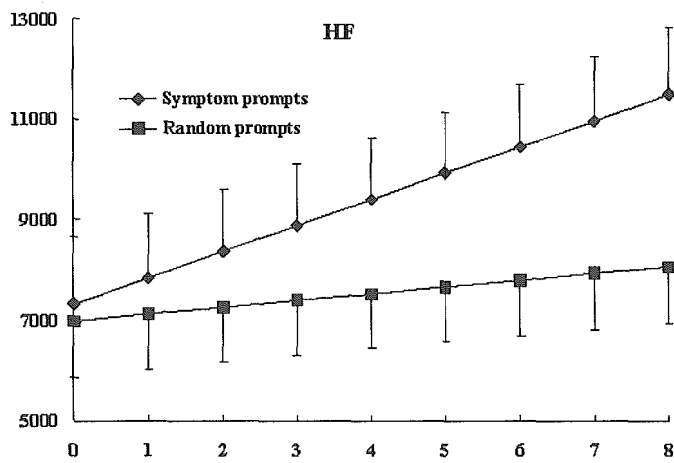


### Fig. 2 SPWVD法(1)



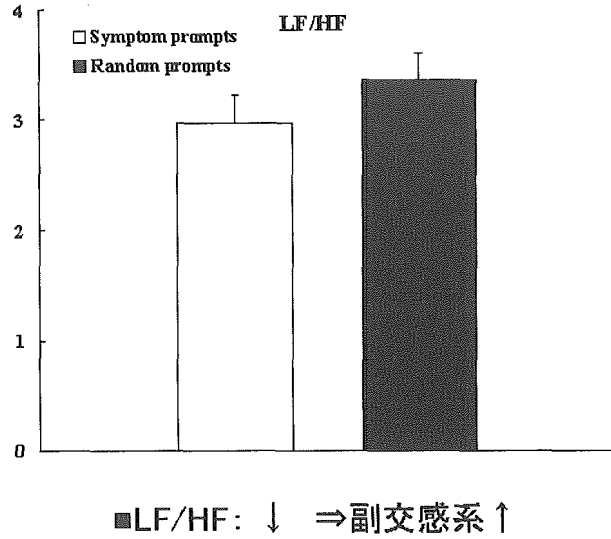
■心拍数: ↑ ⇒交感系↑、副交感系↓

### Fig. 3 SPWVD法(2)

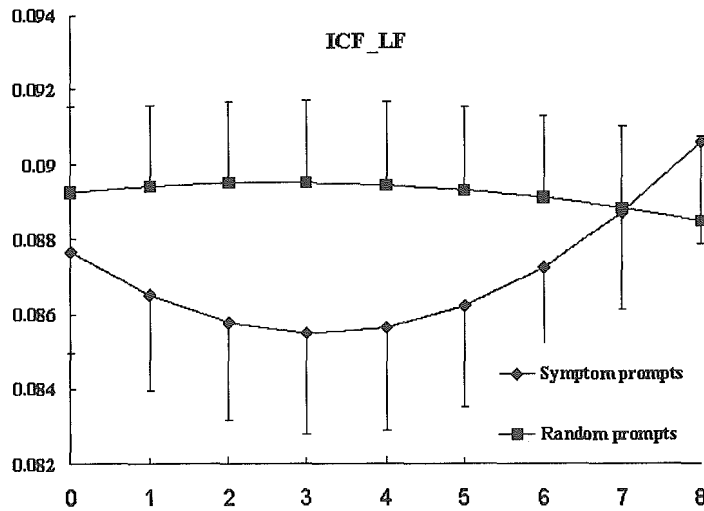


■HF: 時間とともに↑ ⇒副交感系↑

**Fig.4 SPWVD法(3)**

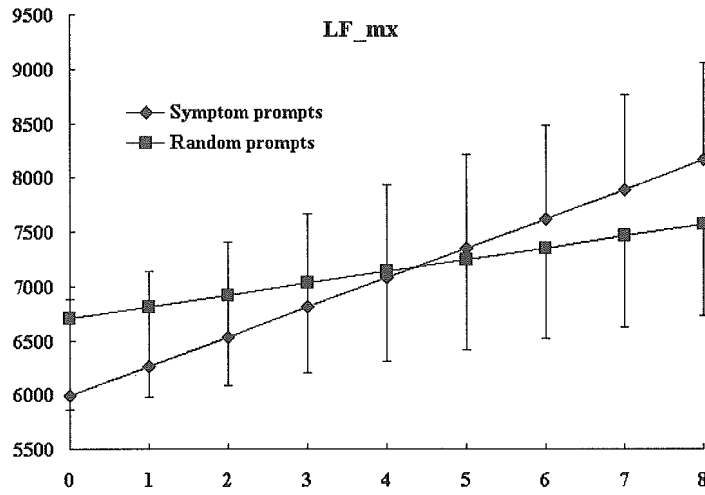


**Fig.5 SPWVD法(4)**



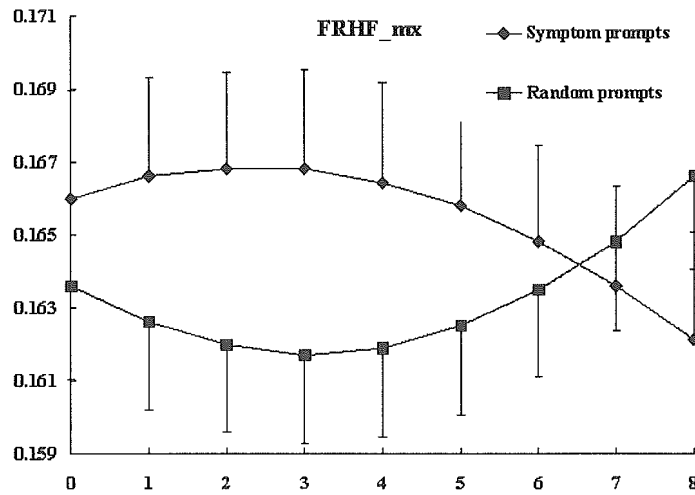
■ LFの瞬間中心周波数: 時間とともに ↑ ⇒ 副交感系 ↑

**Fig. 6 SPWVD法(5)**



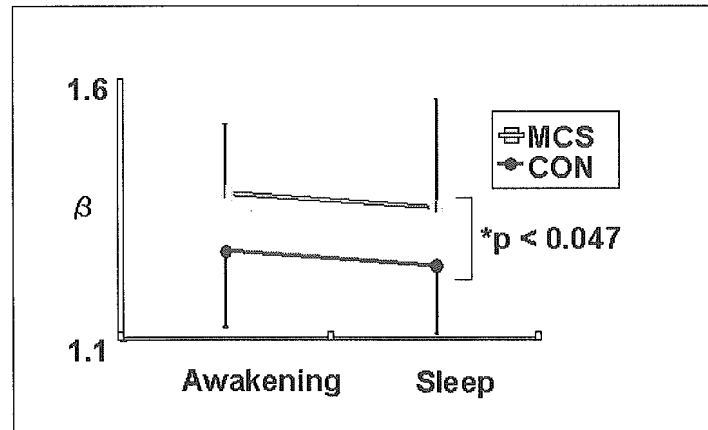
■LFの局所最大パワー: 時間とともに↑ ⇒交感系↑、副交感系↑

**Fig. 7 SPWVD法(6)**



■HFの局所パワーの周波数: 時間とともに↓ ⇒呼吸数↓

Fig.8 CGSA法(2)



患者群とコントロール群の覚醒時と睡眠時のスペクトル指数  $\beta$ 。