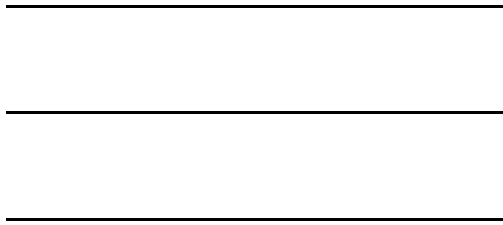


2002 6



가

,

,

,

.

가

,

가

,

.

,

.

2002 7

가

...

1	-----	1
1.1	-----	1
1.2	-----	2
2	-----	3
2.1	-----	3
2.1.1	-----	3
2.1.2	-----	4
2.1.3	-----	4
2.1.4	-----	5
2.2	-----	6
2.2.1	-----	6
2.2.2	-----	6
2.2.3	-----	8
2.2.4	가 -----	11
3	-----	13
3.1	-----	13
3.2	-----	14
3.3	-----	14
3.4	-----	18

4	-----	20
4.1	-----	20
4.1. 1	-----	20
4.1. 2	-----	21
4.1. 3	-----	23
4.1. 4	-----	28
4.1. 5	-----	29
4.1. 6	-----	32
4.1. 7	-----	34
4.1. 8	-----	36
4.1. 9	-----	37
4.1.10	-----	41
4.2	-----	47
4.2.1	가 -----	47
4.2.2	가 -----	48
4.2.3	Cross Validation 가 -----	48
4.2.4	가 -----	49
4.3	CART -----	51
5	-----	55
6	-----	60
	-----	62
	-----	65
	-----	68

< 1>	-----	13
< 2>	(1)-----	53
< 3>	(2)-----	54
< 1>	-----	15
< 2>	-----	18
< 3>	-----	20
< 4>	-----	21
< 5>	-----	22
< 6>	-----	24
< 7>	-----	24
< 8>	-----	25
< 9>	-----	25
< 10>	-----	26
< 11>	-----	26
< 12>	-----	29
< 13>	-----	30
< 14>	() -----	33
< 15>	-----	35
< 16>	-----	36
< 17>	-----	37
< 18>	-----	44
< 19>	가 -----	47
< 20>	, , -----	49
< 21>	가-----	50

가
 가
 2000 9 11
 2
 1,147 (545 , 602)
 , t-

SAS E-Miner
 (5 Fold Cross-Validation) CHAID,
 C4.5, CART 가 , 가
 CART
 , 41.1%(35.2%, 46.4%) ,
 가 (odds
 ratio) 1.58 , 60 20 20.67 ,
 1.86 .
 (18.37%) (36.9%)
 가 , ' , ' ,

5.43

가 2.47

0.47

30

0.46

가 3.77 , 가 2.09 ,

가 3.78 , 가 2.99 , 3.94 ,

4.28 , 가 2.82 ,

3.72 , 2.73 , 3.92 ,

3.74 , 2.65

가 3.09 , 1.92 ,

2.97

가 CART

CART

37.5 19.3% 가

37.5 30 ,

156.5mg% , 20.6%

, 53.5 , BMI가 22.69 84.8%

가

, BMI,

1

1.1

2000 40.4%가 ' '

40.4%가

(, 2001).

'가 ,

1

7 (Rhoten, 1982), 14%-20%가

(Chen, 1986)

43%가

(2001).

가 (Hart,

1978) , 6

(chronic fatigue) (chronic fatigue syndrome, CFS)

가

(mood) 가 ,

(Fieler, 1991)

(1976)

가

2

2.1

2.1.1

가 (, 1996). Webster (1979) , fatigare , ' , ' , ' , ' , ' , ' . (, 1982) ' 가 ' . Grandjean(1970) , 가 ' 가 , (tiredness) (Exhaustion) 가 . Potempa (1986) , O'conner(1989) 3가 , 가 , 가 .

(Gilbert, 1971),
 (Potempa, Lopez, Reid & Lawson, 1986).

2.1.2

1
 7 (Rhoten, 1982), 14%-20%가
 (Chen, 1986), 25%가
 (Cullen 2002), 22%가
 (Bultmann 2002).
 43%가
 가
 가 6 (chronic fatigue)
 (chronic fatigue syndrome, CFS)
 , , , , , , ,
 , , , 가
 (Hart, 1978) .

2.1.3

, (1995)
 , ,
 , , , , , , ,
 가 가 .
 Rhoten(1982)
 , , , , , , ,
 , , , , , , , .

2.1.4

가
(mood) 가 ,
(Fieler, 1991). Hargreaves(2000)

33%

, 가

(1976)

, 가 가

가 가 ,

가 , ,

가 .

2.2

2.2.1

(process)
(, 1999).

가
(, 1999).

2.2.2

가 가
가 가
가 가
가
(2001)
(Credit Scoring)
(2000) 가

가

가

, Chae(2001)

(Health outcome)

가

CHIAD(Chi-squared

Automatic Interaction Detection) C5.0(a variant of 4.5)

CHAID

, 가

C5.0 가

가

(2000)

가

234,224

가

가

(2002)

(1997)

가

CHAID

가

가

2.2.3

(Association rule)

가

(, 1999).

(cluster)

(neurophysiology)

가

(prediction)

(nonlinear models)

(hidden units)

(combination)

가

(, 1999).

가

가

가
가
(, 1999).

(1) CHAID(Chi-squared Automatic Interaction Detection)

1975 J.A Hadrian
1963 J.A Morgan N.A Souquist
AID 가 CHAID
CHAID C4.5, CART 가 가
CHAID
CHAID 가 ,

가
CHAID (, 2000).

(2) C4.5

C4.5 , J Ross Quinlan
ID3(Iterative Dichotomize 3) 1986

C4.5 ID3
가 가 가
(, 2000).

(3) CART(Classification and Regression Trees)

CART 가
. 1984 L. Breiman
(machine-learning)
CART
CART 가
가
가
(leaf-node)

가

가

(, 2000).

2.2.4

가

(Guoqiang, 1999).

가

가

(Resubstitution

Method)

Unbias

(Cross-

Validation Method),

(Jackknife Method),

(Bootstrap

Method)

(, 1999).

2

(analysis sample, train sample)

(split-sample)

(, 2000).

(validation sample)

가

60 40,

75 25

(, 2000).

2000).

(Resubstitution method)

가 가

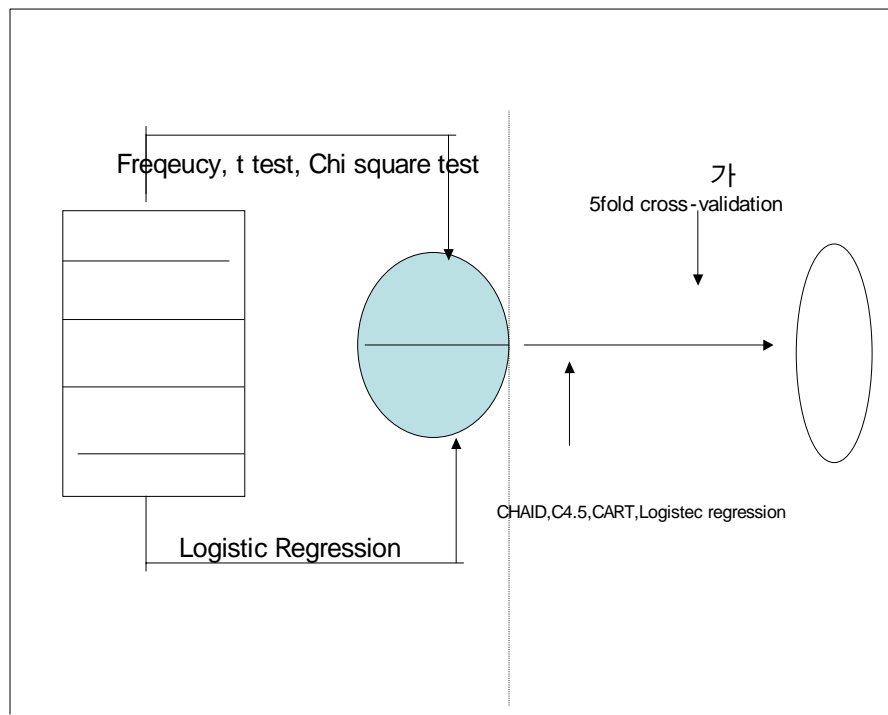
,
(Stone, M. 1974)

가 (Geisser, S. 1975)
(, 2000).

3

3.1

(1).



< 1 >

3.3.2

3가

3.3.3

), , 5가 , , ,
3가 , , 3가
, A, B, 3 ,
(7가)8가 22가 (1).

< 1 >

BMI

(±, 1+, 2+, 3+, 4+)

(±, 1+, 2+, 3+, 4+)

(±, 1+, 2+, 3+, 4+)

A

B

A, B

3.3.4

?’

가

3.3.5

‘ , , . , 1 3 , 가 , ‘ ? 가 . ‘ ?’ 가 , 가 , () ?’ () , , 2~3 , 4 가 .

3.3.6

‘ , ’
() , 2~3 ,
1~2 , 3~4 , 가
, 1 (2)?
, , 2 가
.

3.3.7

, ‘
, () ,
, ~ , ~ ,
가 , ‘ ,
5 , 5~9 , 10~19 , 20~29 , 30 가
.

3.3.8

, ‘
, , 1~2 , 3~4 , 5~6
, 가 . 30
, 30 1 , 1 2 , 2 가
.

3.3.9

‘ , ‘ , ‘ , (2).

< 2>

1	3ka	(가)가
	가 가	가
가		
	() 가	
가	가 가	
	가	

3.4

- SAS package SAS E-miner .
- 1) , X², t-
- test .
- 2)

- 3) validation 가 Logistic 3가 , Cross-
CHAID, C4.5, CART 가 .
- 4) 가 CART
- ‘ , ’
- .

4

4.1

4.1.1

1,147 47.52%, 52.48%
. 20 10.11%, 30 34.35%, 40
34.18%, 50 19.53%, 60 1.83% .
29.47%, 24.5%,
46.03% (3).

< 3>

		(%)
	545	(47.52)
	602	(52.48)
	1,147	(100.0)
20	116	(10.11)
30	394	(34.35)
40	392	(34.18)
50	224	(19.53)
60	21	(1.83)
	1,147	(100.0)
	338	(29.47)
	281	(24.50)
	528	(46.03)
	1,147	(100.0)

4.1.2

1,147 가 41.1% ,
 58.9% . 35.2%, 46.4%
 가 .
 (4).
 , 20 50.86%가
 , 30 53.55%, 40 40.31%, 50 31.25%, 60
 4.76%가 가
 (4).
 가 42.01%가
 , 50.53%, 35.42%가
 가
 (4).
 , 가
 , 가
 (5).

< 4>

		(%)		(%)	²	p-value
	353	(64.77)	192	(35.23)	14.60	0.0001
	323	(53.65)	279	(46.35)		
	676	(58.94)	471	(41.06)		
20	57	(49.14)	59	(50.86)		
30	211	(53.55)	183	(46.45)	29.76	0.0001
40	234	(59.69)	158	(40.31)		
50	154	(68.75)	70	(31.25)		

< 4> -

		(%)	(%)	²	p-value
60	20	(95.24)	1 (4.76)		
	676	(58.94)	471 (41.06)		
	196	(57.99)	142 (42.01)		
	139	(49.47)	142 (50.53)	17.49	0.0002
	341	(64.58)	187 (35.42)		
	676	(58.94)	471 (41.06)		

< 5> .

		(%)	(%)	²	P-value
20	7	(43.75)	9 (56.25)	16.32	0.0026
30	98	(56.98)	74 (43.02)		
40	124	(66.67)	62 (33.33)		
50	108	(70.13)	46 (29.87)		
60	16	(94.12)	1 (5.88)		
	353	(64.77)	192 (35.23)		
20	50	(8.31)	50 (50)	8.76	0.0671
30	113	(50.90)	109 (49.1)		
40	110	(53.40)	96 (46.6)		
50	46	(65.71)	24 (34.29)		
60	4	(100.0)	0 (0.00)		
	323	(53.65)	279 (46.35)		
	56	(68.29)	26 (31.71)	6.51	0.0384
	55	(53.92)	47 (46.08)		
	242	(67.04)	119 (32.96)		
	353	(64.77)	192 (35.23)		
	140	(54.69)	116 (45.31)	5.49	0.0641
	84	(46.93)	95 (53.07)		
	99	(59.28)	68 (40.72)		
	323	(53.65)	279 (46.35)		

4.1.3

168.57cm, 168.54cm 가
, 가
(6). 가 가
(6).
,
(6).
80.87mmHg 78.64mmHg ,
(6).
(7).
,
(8).
,
가 (9).
37.36%, B 37.43%, A
가 가 가 30.98% ,
(10).
44%, B 45.87%, A
가 가 , 51.11%
(10).

가

57.97%

44.84%

(11).

< 6>

	±S.D		±S.D		t - test	p - value
	353	168.57±5.31	192	168.54±5.58	0.06	0.9505
	323	157.86± 4.97	279	158.27±4.99	-1.02	0.3086
	353	68.69±8.32	192	68.31±8.37	0.65	0.5176
	323	55±6.54	279	54.81±7.53	0.32	0.7502
	353	126.27±14.96	192	122.89±14.29	2.56	0.0157
	323	112.92±12.68	279	110.86±13.12	1.96	0.0508
	353	80.875±10.07	192	78.64±8.55	2.73	0.0065
	323	73.12± 8.06	279	72.36±8.44	1.13	0.2591

< 7>

	(%)		(%)		t - test	p - value
	5	(71.43)	2	(28.57)	2.29	0.6822
	111	(65.68)	58	(34.32)		
	106	(61.27)	67	(38.73)		
	123	(66.13)	63	(33.87)		
	8	(80.00)	2	(20.00)		
	353	(64.77)	192	(35.23)		
	15	(40.54)	22	(59.46)	5.44	0.2447
	208	(55.61)	166	(44.39)		
	64	(55.65)	51	(44.35)		
	36	(48.00)	39	(52.00)		
	0	(0.00)	1	(100)		
	323	(53.65)	279	46.35		

< 8>

	±S.D		±S.D		t - test	p - value
353	15.22±	0.91	192	15.19±	0.37	0.7112
322	12.84±	1.15	279	12.71±	1.37	0.1711
353	93.06±	26.34	192	89.77±	1.76	0.0790
322	84.66±	13.64	279	84.19±	0.48	0.6332
353	208.03±	34.61	192	204.63±	1.08	0.2793
322	198.28±	40.72	279	196.80±	0.46	0.6486

< 9>

	(%)	(%)	²	p - value	
345	(64.73)	188	(35.27)	0.01	0.8894
8	(66.67)	4	(33.33)		
353	(64.77)	192	(35.23)		
322	(53.58)	279	(46.41)	0.03	0.8491
0	(0.00)	0	(0.00)		
322	(53.58)	279	(46.41)		
347	(64.74)	189	(35.26)	0.01	0.9044
6	(66.67)	3	(33.33)		
353	(64.77)	192	(35.23)		
318	(53.54)	276	(46.46)	0.03	0.8491
4	(57.14)	3	(32.86)		
322	(53.58)	279	(46.42)		
326	(64.30)	181	(35.70)	0.70	0.4006
27	(71.05)	11	(28.95)		
353	(64.77)	192	(35.23)		
247	(55.26)	200	(44.74)	1.97	0.1595
75	(48.70)	79	(51.30)		
322	(53.58)	279	(46.42)		

< 10> .

		(%)	(%)	²	p-value
A	109	(62.64)	65 (37.36)	2.2	0.33
B	117	(62.57)	70 (37.43)		
	127	(69.02)	57 (30.98)		
	353	(64.77)	192 (35.23)		
A	126	(56.00)	99 (44.00)	1.75	0.41
B	131	(54.13)	111 (45.87)		
	66	(48.89)	69 (51.11)		
	323	(53.65)	279 (46.35)		

< 11> .

		(%)	(%)	²	p-value
	348	(64.56)	191 (35.44)	0.91	0.6700
	5	(83.33)	1 (16.67)		
	353	(64.77)	192 (35.23)		
	323	(53.83)	277 (46.17)	2.32	0.2100
	0	(0.00)	2 (100.00)		
	323	(53.65)	279 (46.35)		
	341	(64.46)	188 (35.54)	0.75	0.3800
	12	(75.00)	4 (25.00)		
	353	(64.77)	192 (35.23)		
	314	(53.22)	276 (46.78)	2.24	0.1300
	9	(75.00)	3 (25.00)		
	323	(53.65)	279 (46.35)		
	313	(63.10)	183 (36.90)	6.70	0.0096
	40	(81.63)	9 (18.37)		
	353	(64.77)	192 (35.23)		
	316	(53.74)	272 (46.26)	0.07	0.7800
	7	(50.00)	7 (50.00)		
	323	(53.65)	279 (46.35)		

< 11> .

	(%)	(%)	²	p-value	
335	(64.30)	186	(35.70)	1.15	0.2800
18	(75.00)	6	(25.00)		
353	(64.77)	192	(35.23)		
311	(53.62)	269	(46.38)	0.00	0.9300
12	(54.55)	10	(45.45)		
323	(53.65)	279	(46.35)		
311	(64.79)	169	(35.21)	8E-04	0.9700
42	(64.62)	23	(35.38)		
353	(64.77)	192	(35.23)		
317	(53.64)	274	(46.36)	0.00	0.9500
6	(54.55)	5	(45.45)		
323	(53.65)	279	(46.35)		
336	(64.37)	186	(35.63)	0.87	0.3400
17	(73.91)	6	(26.09)		
353	(64.77)	192	(35.23)		
321	(53.68)	277	(46.32)	0.02	1.0000
2	(50.00)	2	(50.00)		
323	(53.65)	279	(46.35)		
333	(64.79)	181	(35.21)	0.01	0.9700
20	(64.52)	11	(35.48)		
353	(64.77)	192	(35.23)		
294	(55.16)	239	(44.84)	4.23	0.0396
29	(42.03)	40	(57.97)		
323	(53.65)	279	(46.35)		

< 12>

	(%)	(%)	²	p-value
	225 (78.13)	63 (21.88)	49.60	0.0001
	69 (49.17)	92 (50.83)		
	15 (42.86)	20 (57.14)		
	18 (60.00)	12 (40.00)		
	347 (64.98)	187 (35.02)		
	209 (71.33)	84 (28.67)	77.93	0.0001
	92 (36.80)	158 (63.20)		
	4 (21.05)	15 (78.95)		
	6 (30.00)	14 (70.00)		
	311 (53.44)	271 (46.56)		

4.1.5

30.24% , '1 3 , 가
 48.62%, ' , 가
 60.87% , 40.92%
 , '1 3 , 59.83%, ' ,
 , 56.72%
 , (13).
 , ' , 34.69%, ' , 32.48% 가 , ' ,
 , 46.81% .
 , 52.38%, ' , 44.2% 가
 , 51.9% ,
 (13).

34.31%, 가 35.71%,
34.69% 49.69%,
가 44.07%,
55.32% 가 가
, (13).
() , 1 ()
) 26.09%, 37.11%, 2~3
33.61%, 4 50%
() 38.1%,
46.6%, 2~3 49.58%, 4 29.17%
, (13).

< 13 >

	(%)	(%)	²	n-value
	286 (69.76)	124 (30.24)	19.66	0.0001
1 3	56 (51.38)	53 (48.62)		
,	9 (39.13)	14 (60.87)		
	351 (64.76)	191 (35.24)		
	244 (59.08)	169 (40.92)	16.30	0.0003
1 3	47 (40.17)	70 (59.83)		
,	29 (43.28)	38 (56.72)		
	320 (53.60)	277 (46.40)		

< 13>

-

	(%)	(%)	²	p-value
	64 (65.31)	34 (34.69)	6.68	0.0354
	237 (67.52)	114 (32.48)		
	50 (53.19)	44 (46.81)		
	351 (64.64)	192 (35.36)		
	50 (47.62)	55 (52.38)	3.25	0.1900
	231 (55.80)	183 (44.20)		
	38 (48.10)	41 (51.90)		
	319 (53.34)	279 (46.66)		
	67 (65.69)	35 (34.31)	0.07	0.9600
가	252 (64.29)	140 (35.71)		
	32 (65.31)	17 (34.69)		
	351 (64.64)	192 (35.36)		
	82 (50.31)	81 (49.69)	3.06	0.2100
가	217 (55.93)	171 (44.07)		
	21 (44.68)	26 (55.32)		
	320 (53.51)	278 (46.49)		
1 ()				
()	17 (73.91)	6 (26.09)	3.21	0.3500
	161 (62.89)	95 (37.11)		
2~3	162 (66.39)	82 (33.61)		
4	9 (50.00)	9 (50.00)		
	349 (64.51)	192 (35.49)		
()	26 (61.90)	16 (38.10)	5.00	0.1700
	157 (53.40)	137 (46.60)		
2~3	121 (50.42)	119 (49.58)		
4	17 (70.83)	7 (29.17)		
	321 (53.50)	279 (46.50)		

4.1.6

, ‘ ,
 , 37.36%, ‘ 2~3 , 33.33%, ‘
 1~2 ’ 36.94%, ‘ 3~4 ’ 27.5%,
 ‘ , 33.33% ‘ 3~4 ’
 가 (p-value 0.76).
 ‘ , 45.18%, ‘ 2~3 ’
 53.15%, ‘ 1~2 ’ 41.67%, ‘
 3~4 ’ 50% ‘ 1~2 ’
 (14).
 , 2 ‘
 , 36.99%, ‘ , 30.15%, ‘
 , 34.29%, ‘ , 32.11% ‘ ,
 가 , .
 , ‘ ,
 49.79% 47.83% ,
 (14).

< 14> ()

	(%)	(%)	²	p-value
()				
()	109 (62.64)	65 (37.36)	1.86	0.7600
2~3	106 (66.67)	53 (33.33)		
1~2	99 (63.06)	58 (36.94)		
3~4	29 (72.50)	11 (27.50)		
	8 (66.67)	4 (33.33)		
	351 (64.76)	191 (35.24)		
()	250 (54.82)	206 (45.18)	2.54	0.4600
2~3	52 (46.85)	59 (53.15)		
1~2	14 (58.33)	10 (41.67)		
3~4	2 (50.00)	2 (50.00)		
	0 (0.00)	0 (0.00)		
	318 (53.45)	277 (46.55)		

(2)

	(%)	(%)	²	p-value
	92 (63.01)	54 (36.99)	2.44	0.4800
	139 (69.85)	60 (30.15)		
	46 (65.71)	24 (34.29)		
	11 (57.89)	8 (32.11)		
	288 (66.36)	146 (33.64)		
	121 (50.21)	120 (49.79)	1.01	0.6000
	12 (51.27)	11 (47.83)		
	1 (100.0)	0 (0.00)		
	0 (0.00)	0 (0.00)		
	134 (50.57)	131 (49.43)		

4.1.7.

()

31.28%,
27.55% 가 , 41.23% ,
(15). ()

47.36% , 40% ,
(15).

50%, ~ 36.49%, ~
48.28%, 33.33% ,
(15). 가
, (15).

(15).

< 15>

	(%)	(%)	²	p-value
()	145 (68.72)	66 (31.28)	7.57	0.0227
	71 (72.45)	27 (27.55)		
	134 (58.77)	94 (41.23)		
	350 (65.18)	187 (34.82)		
()	269 (52.64)	242 (47.36)	4.55	0.1000
	5 (100.0)	0 (0.00)		
	3 (60.00)	2 (40.00)		
	277 (53.17)	244 (46.83)		
	24 (50.00)	24 (50.00)	3.56	0.3100
~	94 (63.51)	54 (36.49)		
~	15 (51.72)	14 (48.28)		
	2 (66.67)	1 (33.33)		
	135 (59.21)	93 (40.79)		
	1 (50.00)	1 (50.00)	1.33	0.5100
~	1 (100.0)	0 (0.00)		
~	1 (100.0)	0 (0.00)		
	0 (0.00)	0 (0.00)		
	3 (75.00)	1 (25.00)		
5	20 (54.05)	17 (45.95)	7.87	0.0961
5~9	30 (75.00)	10 (25.09)		
10~19	90 (63.38)	52 (36.62)		
20~29	72 (64.29)	40 (35.71)		
30	21 (84.00)	4 (16.00)		
	233 (65.45)	123 (34.55)		
5	4 (100.0)	0 (0.00)	6.46	0.3500
5~9	3 (100.00)	0 (0.00)		
10~19	1 (50.00)	1 (50.00)		
20~29	2 (100.0)	0 (0.00)		
30	3 (100.0)	0 (0.00)		
	13 (92.86)	1 (7.14)		

4.1.8

45.78% 가 , 1~2
 33.20%, 3~4 27.06%, 5~6 27.78%,
 24.14% 가 , 가 가
 ,
 49.56% 가 , ' 5~6 ' 25%
 , (16).
 1 '30'
 46.62% 가 , '1 2 ' 22.32% 가
 ,
 .(16).

< 16>

	(%)	(%)	²	p-value
	90 (54.22)	76 (45.78)	12.99	0.0113
1~2	163 (66.80)	81 (33.20)		
3~4	62 (72.94)	23 (27.06)		
5~6	13 (72.22)	5 (27.78)		
	22 (75.86)	7 (24.14)		
	350 (64.58))	192 (35.42)		
	171 (50.44)	168 (49.56)	10.95	0.0271
1~2	78 (51.66)	73 (48.34)		
3~4	39 (67.24)	19 (32.76)		
5~6	12 (75.00)	4 (25.00)		
	17 (68.00)	8 (32.00)		
	317 (53.82)	272 (46.18)		

< 16> -

		(%)	(%)	2	n-value
1					
	30	79 (53.38)	69 (46.62)	17.82	0.0005
	30 1	108 (62.43)	65 (37.57)		
	1 2	87 (77.68)	25 (22.32)		
	2	27 (72.97)	10 (27.03)		
		301 (64.04)	169 (35.96)		
	30	88 (52.07)	81 (47.93)	1.43	0.6900
	30 1	76 (58.46)	54 (41.54)		
	1 2	34 (57.63)	25 (42.37)		
	2	3 (50.00)	3 (50.00)		
		201 (55.22)	163 (44.78)		

4.1.9

가 , 17 , ‘
 ,
 , ‘
 ,
 , 2 15 .
 (17).

< 17>

		(%)	(%)	2	n-value
1	3kg	(가)가			
		309 (67.91)	146 (32.09)	11.54	0.0007
		42 (48.84)	44 (51.16)		
		351 (64.88)	190 (35.12)		
		252 (56.88)	191 (43.12)	7.81	0.0052
		68 (43.87)	87 (56.13)		
		320 (53.51)	278 (46.49)		

< 17>

-

	(%)	(%)	²	p-value	
326	(68.78)	148	(31.22)	25.58	0.0001
27	(38.03)	44	(61.97)		
353	(64.77)	192	(35.23)		
296	(58.96)	206	(41.04)	33.40	0.0001
27	(27.27)	72	(72.73)		
323	(53.74)	278	(46.26)		
가 가					
319	(67.73)	152	(32.27)	13.29	0.0003
34	(45.95)	40	(54.05)		
353	(64.77)	192	(35.23)		
307	(55.32)	248	(44.68)	5.26	0.0217
16	(37.21)	27	(62.79)		
323	(54.01)	275	(45.99)		
가					
336	(68.57)	154	(31.43)	32.29	0.0001
16	(29.63)	38	(70.37)		
352	(64.71)	192	(35.29)		
303	(56.74)	231	(43.26)	14.95	0.0001
20	(31.25)	44	(68.75)		
323	(54.01)	275	(45.99)		
가					
316	(69.91)	136	(30.09)	28.20	0.0001
34	(40.09)	51	(60.00)		
350	(65.18)	187	(34.82)		
262	(59.68)	177	(40.32)	23.08	0.0001
56	(37.09)	95	(62.91)		
318	(53.90)	272	(46.10)		

< 17>

-

	(%)		(%)	²	p-value
323	(70.99)	132	(29.01)	41.70	0.0001
27	(33.75)	53	(66.25)		
350	(65.42)	185	(34.58)		
204	(68.46)	94	(31.54)	54.81	0.0001
112	(38.10)	182	(61.90)		
316	(53.38)	276	(46.62)		
302	(72.42)	115	(27.58)	45.23	0.0001
46	(38.98)	72	(61.02)		
348	(65.05)	187	(34.95)		
276	(62.73)	164	(37.27)	55.96	0.0001
42	(27.63)	110	(72.37)		
318	(53.72)	274	(46.28)		
() 가					
324	(68.79)	147	(31.21)	25.63	0.0001
28	(38.36)	45	(61.64)		
352	(64.71)	192	(35.29)		
287	(57.40)	213	(42.60)	13.58	0.0002
35	(36.84)	60	(63.16)		
322	(54.12)	273	(45.88)		
327	(69.87)	141	(30.13)	27.47	0.0001
17	(33.33)	34	(66.67)		
344	(66.28)	175	(33.72)		
288	(56.92)	218	(43.08)	15.14	0.0001
17	(29.82)	40	(70.18)		
305	(54.17)	258	(45.83)		
307	(71.73)	121	(28.27)	43.25	0.0001
43	(38.39)	69	(61.61)		
350	(64.81)	190	(35.19)		

< 17>

-

	(%)	(%)	²	p-value
	262 (58.09)	189 (41.91)	11.90	0.0006
	59 (41.55)	83 (58.45)		
	321 (54.13)	272 (45.87)		
	335 (66.21)	171 (33.79)	7.95	0.0048
	16 (43.24)	21 (56.76)		
	351 (64.64)	192 (35.36)		
	313 (56.81)	238 (43.19)	26.36	0.0001
	7 (16.28)	36 (83.72)		
	320 (53.87)	274 (46.13)		
	347 (66.10)	178 (33.90)	11.20	0.0008
	5 (27.78)	13 (72.22)		
	352 (64.83)	191 (35.17)		
	313 (55.01)	256 (44.99)	6.68	0.0097
	8 (29.63)	19 (70.37)		
	321 (53.86)	275 (46.14)		
	340 (65.89)	176 (34.11)	4.05	0.044
	11 (45.83)	13 (54.17)		
	351 (65.00)	189 (35.00)		
	319 (54.72)	264 (45.28)	6.85	0.0089
	2 (16.67)	10 (83.33)		
	321 (53.95)	274 (46.05)		
가	309 (69.59)	135 (30.41)	24.29	0.0001
가	43 (43.43)	56 (56.57)		
가	352 (64.83)	191 (35.17)		
	271 (60.90)	174 (39.10)	32.69	0.0001
	51 (34.00)	99 (66.00)		
	322 (54.12)	273 (45.88)		

< 17>		-				
	(%)	(%)		²	p-value	
310	(68.28)	144	(31.72)	13.67	0.0002	
42	(47.73)	46	(52.27)			
352	(64.94)	190	(35.06)			
241	(56.71)	184	(43.29)	5.71	0.0168	
80	(45.98)	94	(54.02)			
321	(53.59)	278	(46.41)			
337	(65.06)	181	(34.94)	1.18	0.27	
13	(54.17)	11	(45.83)			
350	(64.58)	192	(35.42)			
309	(56.59)	237	(43.41)	19.06	0.0001	
13	(25.00)	39	(75.00)			
322	(53.85)	276	(46.15)			
가						
345	(64.73)	188	(35.27)	0.11	0.72	
7	(70.00)	3	(30.00)			
352	(64.83)	191	(35.17)			
316	(53.92)	270	(46.08)	0.00	0.96	
6	(54.55)	5	(45.45)			
322	(53.94)	275	(46.06)			

4.1.10

,
(odds ratio) ,
1.58 (p-value 0.0001), 60
20 20.67 (p-value 0.0005), 30 17.31 (p-value 0.0016), 40

13.48 (p-value 0.04)

1.86

(p-value 0.0005).

4.07 (p-value 0.0072), ‘ 가 5.43 (p-value 0.0058)

1 3

2.16 (p-value 0.069)

가 2.47 (p-value 0.0214)

0.81

(p-value 0.014) 가

가 1.23 (p-value 0.065).

‘()’

가 0.47 가 (p-value 0.0027), ‘ 0.94 가 (p-value 0.0819).

‘5’

‘10~19’ 0.82 가 (p-value 0.080)

‘1-2’ 가 0.68 가 (p-value 0.094),

1 ‘30’ ‘1

~2 0.46 가 (p-value 0.042)

. 1 3kg (가)가
 ‘ , ‘ , 가 1.98
 (p-value 0.0001). 3.77
 (p-value 0.0001).
 가 ‘ , ‘ , 가 2.09
 (p-value 0.0002), 가 ‘ , ‘ , 3.78
 (p-value 0.0001), 가 ‘ , ‘ , 2.99 (p-
 value 0.0001), ‘ , ‘ , 3.94 (p-value 0.0001),
 ‘ , ‘ , 4.28 (p-value 0.0001),
 가 ‘ , ‘ , 2.82
 (p-value 0.0001), ‘ , ‘ ,
 ‘ , 3.72 (p-value 0.0001),
 ‘ , ‘ , 2.73 (p-value 0.0001),
 ‘ , ‘ , 3.92 (p-value 0.0001),
 ‘ , ‘ , 3.74 (p-value 0.0001),
 ‘ , ‘ , 2.65 (p-value 0.0057),
 가 가 가 ‘ , ‘ , 3.09
 (p-value 0.0001), ‘ , ‘ ,
 1.92 (p-value 0.0001),
 ‘ , ‘ , 2.97 (p-value 0.0001) (18).

< 18>

	Parameter Estimate	Odds Ratio	Pr>Chisq	95% wald confidence
	0.23	1.58	0.0001	1.25 - 2.01
60				
20	0.89	20.67	0.0005	2.68 - 158.91
30	0.71	17.31	0.0016	2.30 - 30.12
40	0.46	13.48	0.04	1.79 - 101.34
...				
	0.32	1.86	0.0005	1.38 - 2.50
	0.34	4.07	0.0072	3.12 - 5.32
	0.62	5.43	0.0058	3.01 - 9.80
1 3	0.21	2.16	0.0698	1.60 - 2.91
	0.34	2.47	0.0214	1.59 - 3.85
	-0.2	0.81	0.0140	0.59 - 1.11
	0.21	1.23	0.0654	0.82 - 1.85
()				
	-0.47	0.47	0.0027	0.3 - 0.75
	0.2	0.94	0.0819	0.69 - 1.27
5				
10-19	0.35	0.82	0.0802	0.40 - 1.66

< 18>

-

	Parameter Estimate	Odds ratio	Pr>Chisq	95% wald confidence
1-2	0.22	0.68	0.0942	0.52-0.89
30				
1 2	-0.31	0.46	0.042	0.31-0.68
1 3ka (가)				
	0.34	1.98	0.0001	1.48-2.64
	0.66	3.77	0.0001	2.66-5.34
가 가				
	0.37	2.09	0.0002	1.42-3.08
가 . . .				
	0.66	3.78	0.0001	2.50-5.70
가				
	0.54	2.99	0.0001	2.22-4.02
	0.68	3.94	0.0001	3.03-5.11
	0.72	4.28	0.0001	3.20-5.73
가 .				
	0.51	2.82	0.0001	2.01-3.96
	0.65	3.72	0.0001	2.43-5.71

< 18>

-

	Parameter Estimate	Odds ratio	Pr>Chisq	95% wald confidence
	0.5	2.73	0.0001	2.05-3.64
	0.68	3.92	0.0001	2.38-6.47
	0.66	3.74	0.0001	1.94-7.21
가 가	0.48	2.65	0.0057	1.32-5.28
	0.56	3.09	0.0001	2.31-4.14
	0.32	1.92	0.0001	1.45-2.54
	0.54	2.97	0.0001	1.82-4.84

4.2

Logistic regression
3가 (CHAID, C4.5, CART) 가 .

4.2.1 가

가
p-value 0.05
(Odds Ratio)가
(19).

< 19> 가

	1=	. 2=
	1=	, 2=
	1=	, 2= , 3=
		/mmHg
		/mmHg
	1=	, 2=
	1=	, 2=
	1=	
	2=	
	3=	
	4=	
	1=	

4.2.2 가

가 (, 1998).
가 1
0.5² 가 .
Default 가 .
(, 1998),
가
1,
가 3 1
가 가 가 6
Tree 가
(Subtree) Tree
, Cross-validation 가

4.2.3 Cross Validation 가

가

¹
²
³ Data ÷ 100

¹/
'

(Cross-validation test) 가 .
 1,147 75% (Train), 25% 가
 (Validation) Sampling 3가
 (Accuracy ratio), (Sensitivity), (Specificity) .
 1 , 가 5
 3가 (21).

< 20> , ,

$$: (=1 =1) + (=2 =2) /$$

$$: (=1 =1) / (1)$$

$$: (=2 =2) / (=2)$$

, (Accuracy ratio)

, (Sensitivity)

, (Specificity)

4.2.4 가

가 5 Cross-validation 가 가
 가 , 가
 (21).
 가 CART , 가 가
 CART , 가 가 C4.5

(21). 가 Logistic regression 가
 , CHAID , Logistic regression 가
 .

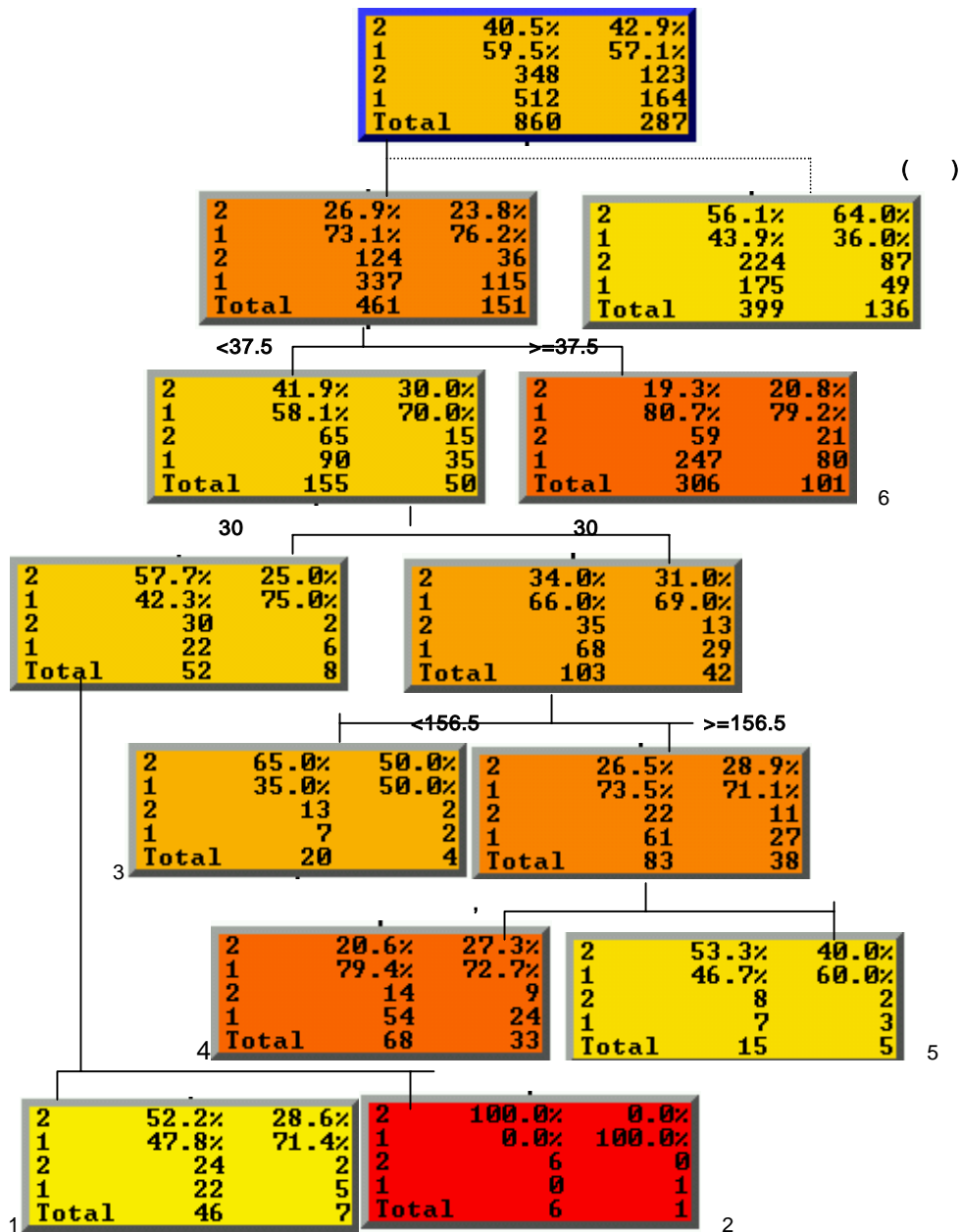
< 21> 가

	CHAID		C4.5		CART		Logistic regression	
	가	가	가	가	가	가	가	가
Set 1	69.42	63.07	74.42	68.64	75.23	67.94	69.42	66.90
set 2	71.86	68.29	71.51	66.55	75.70	67.94	69.42	66.90
set 3	70.35	68.64	74.88	69.69	75.35	68.29	69.53	71.08
set 4	72.56	66.90	72.91	65.16	76.40	68.99	69.42	67.25
set 5	73.60	71.43	75.58	71.08	73.95	68.99	70.23	70.38
	71.56	67.67	73.86	68.22	75.33	68.43	69.60	68.50
set 1	73.86	66.39	53.69	45.38	59.38	49.58	53.98	50.42
set 2	66.29	60.00	65.73	57.39	66.85	55.65	53.98	50.42
set 3	75.57	70.73	64.37	58.54	67.53	58.54	52.87	50.41
set 4	61.22	53.64	75.35	70.00	67.87	60.00	57.34	57.27
set 5	60.87	57.94	60.29	54.76	65.22	57.14	56.81	54.76
	67.56	61.74	63.89	57.21	65.37	56.18	55.00	52.66
set 1	66.34	60.71	88.78	85.12	86.22	80.95	80.12	78.57
set 2	75.79	73.84	75.60	72.67	81.94	76.16	80.12	78.57
set 3	66.80	67.71	82.03	78.05	80.66	75.61	80.86	86.59
set 4	80.76	75.14	71.14	62.15	82.57	74.58	78.16	73.45
set 5	82.14	81.99	85.83	83.85	79.81	78.26	79.22	82.61
	74.39	71.88	80.68	76.37	82.24	77.11	79.70	79.96

가
가 ,
70.3% , 47.8% .
가

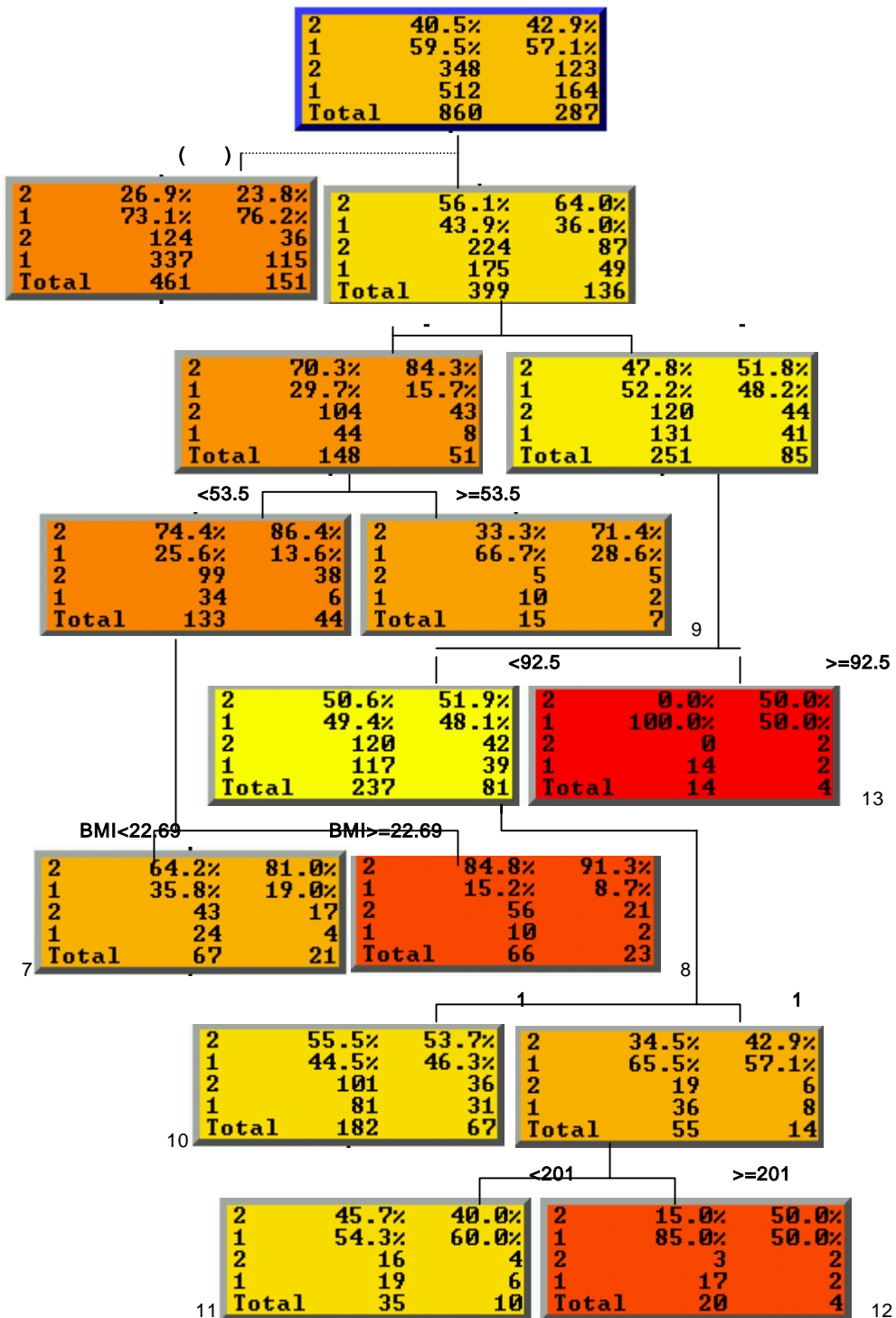
53.5 가 53.5
74.4% , 가 53.5 33.3% (9).
, 가 53.5 BMI 22.69
가 BMI가 22.69 64.2%가
(7), BMI가 22.69 84.8% (8).

,
가 가 92.5mmHg
50.6%가 . 92.5mmHg
1 34.5% ,
1 55.5% (10).



< 2>

(1)



< 3>

(2)

5

41.1% (2001) 43%가
, , , , , ,
, , , , , ,
가 .
35.2%,
46.4% 1.58
,
(2002 Torres-Harding), (2001)
가 .
(1983)
가 , (2001) 20 30
20.67 , 60 20 가
(1984)
,
가
(p-value 0.002),
(p-value 0.06).
, ,
가 (p-value 0.03),
(p-value
0.06). 가 1.86
(1984) 가 가
, C
가

, 가 (Mcdonald 2002).

(2000 Watt).

(1991)

가

, 가

가 5.43

, 2.47

(1998)

가

가

(1998)

가

가

()

0.47

가

(1998)

(24.14%) 가

가 5-6

(25.0%) 가

가 16

17

가

가

(1996)

Kroenke

가

(1995)

Goldberg(2001)

가

가

가

가

가

가 3.77

2.99 , 3.94 , 3.09 1.92

가

가 가

26.9% 40.5%

가 37.5 19.3%

40.5% (6).

가 37.5 30

156.5mg% 65.0% (3).

가 37.5 30

156.5mg%

20.6% (4).

가 37.5

30 156.5mg%

53.3% (5).

가

70.3% 가

47.8%

가 53.5

, BMI가 22.60 84.8% 가 (8).

가 53.5 , BMI가

22.69 64.2% (7)

가 53.5

33.3% 가 71.4% (9).

92.5mmHg

1 55.5% (10).

92.5mmHg 1 201mg%

45.7% (11).

92.5mmHg 1

201mg% 15.5% , 가

50% (12).

84.8% , 가 53.5 BMI가 22.69 가
(8).
, , , ,
, BMI .
가 .

6

가

가

가

41.1%가

35.2% 46.4% 가

(odds ratio) 1.58 , 60 20 20.67

1.86

가

가

5.43

2.47

0.47

30 1 2 0.46

3.77 , 가 2.09 , 가

3.78 , 가 2.99 , 3.94 , 4.28 ,

2.82 , 3.72 ,
 2.73 , 3.74 , 2.65
 , 가 3.09 , 1.92 .
 ,
 (:)
 , 26.9%
 40.5% , 가 가 ‘
 , 37.5 19.3% 가 (6). ‘ , 가 37.5 41.9%
 가 , 30 , 156.5mg%
 20.6%
 (4). ‘ , ,
 , 53.5 BMI가 22.69
 84.8% 가 (8).
 ‘ , ,
 , , , , , , BMI,
 .
 ,
 , , ,

Enterprise Miner

SUSI-K 1998; 9: 169-186.

1999.

2001; 11(3):
408-410.

가
1997; 2(1): 96-113.

. 1976; 15(4): 1-14.

가
2000.

가
2001.

2000; 7(1): pp 17~25.

1984.

1991.

() 가 1996; 17(4): 19-23.

2002.

1995;7(2):270-278.

2000; 314-390.

1999.

2001.

53

2001;348-349.

1998;24(1): 138-152.

1983.

53

2001; 420-421.

2000.

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ABSTRACT

An Exploratory Study of Fatigue Related Factors of School Personnel by using Data Mining Techniques

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The purpose of this paper was to identify general characteristics of school personnel with recent fatigue which was the most frequent among subjective symptoms, and to explore fatigue related factors by evaluating physical health status, perceived health status, life style, and symptoms through using data mining techniques.

The first study made a data of the 1,147(male 545, female 602) who were elementary, middle, or high school personnel, answered a questionnaire, and received physical examination in Seoul School Health Center from September to November in 2000.

The second study investigated the differences between fatigue group and non-fatigue group for demographic characteristics, physical health status, perceived health status, symptoms, and laboratory values by frequency, chi-square, t-test, or simple logistic regression analysis, and then selected significant variables as input variables of a decision tree analysis of SAS E-Miner.

Further more, to find the most suitable and predictable model, the study assessed CHAID, C4.5, CART, and logistic regression through a cross-validation method.

Study results were as follows:

In general characteristics, the fatigue consisted of 41.1%(male 35.2%, female 46.4%) of the 1,147 school personnel.

In physical health status of male, the proportion of the fatigue of hypertensive group (18.37%) was lower than that of normotensive group (36.90%). The each mean of the systolic and diastolic blood pressure of fatigue group was also lower than that of non-fatigue group in male

In simple logistic regression to examine the relationship between selected variables and fatigue, the odds ratio of female over male was 1.58, and age 20s over 60s 20.67, middle over high school personnel 1.86.

In current perceived health status including the healthy, the average, the poor, and the presence of self-reported disease, the odds ratio of the poor over the healthy was 5.43. and the average over the healthy 4.07.

In life style, the odds ratio of 'irregular eating habit nearly everyday' over 'regular eating habit' was 2.47, but past-smoker over nonsmoker 0.47, 'greater than or equal to 1 hour & less than 2 hours' over 'less than 30 minutes' in exercise duration 0.46.

In each odds ratio of yes over no symptom, insomnia 3.77, a lot of cough with sputum 2.09, chest pain during exercise or after eating 3.78, palpitation 2.99, dizziness 3.94, severe short of breath during exercise 4.28, occasional epigastric pain 2.82, decreased abdominal pain after antiacids ingestion 3.72, belching after eating 2.73, bitter sensation in throat 3.92, loss of appetite and weight 3.74, frequent dark colored stool 2.65, abdominal fullness 3.09, loose stool or constipation 1.92, lower abdominal pain improved after defecation 2.97.

Finally, the most predictable model was CART. In CART model, if health perception was healthy, and age was greater than or equal to 37.5 years, the proportion of the fatigue was only 19.3%. If health perception was healthy, age was less than 37.5 years, exercise duration was greater than or equal to 30 minutes, cholesterol value was greater than or equal to 156.5 mg%, and eating habit was not salty, the proportion of the fatigue was still 20.6%. However, if health perception was not healthy, symptom was severe short of breath during exercise, age was less than 53.5 years, and BMI was greater than or equal to 22.69, the proportion of the fatigue was up to 84.8%.

Therefore, fatigue related factors in school personnel were age, gender, perceived health status, subjective symptoms, exercise, smoking, eating habit, cholesterol, BMI, and blood pressure rather than only physical health status.

Key words: fatigue, data mining, school personnel

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