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Attempt to apply Integrated Information Theory to family system : Focus on marital relationship

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ABSTRACT: The purpose of this study is to apply the schema of integrated information theory which explains the stereoscopic phenomena of consciousness to the family system and to examine "what kind of properties the family system with high problem solving abilities possess?". The integrated information theory assumes that consciousness phenomena are caused by neuron's differences and interaction. The hypothesis in this study is that "the couple who has the higher score in both difference and communication has higher problem solving abilities and resilience than the other couples". In study 1, a questionnaire survey was conducted with 111 married couples (average age of 45.04) and in study 2, a questionnaire survey was conducted with 82 college students (average age of 20.14) asking about the relationship between parents. As a result of the analysis, it was shown that there are three differences between the couple: "way of thinking", "preference" and "ability". Although the hypothesis of this study was not supported, it was suggested that the couple's "way of thinking" and "preference" are small and the couple communicates has a positive relationship with problem solving abilities and family resilience. We will discuss the way to catch the difference and advance our study.

KEY WORDS: Integrated information theory, Family system, Difference, Communication, Problem Solving.

Introduction

Families face various problems and are constantly looking for clues to solutions. It is very important support and the essence of care for such family to draw out the ability to solve family problems. However, in family therapy

and family psychology, the theory that gives a clear explanation to the question "what kind of properties the family system with high problem solving abilities possess?" has not been completed. Establishing the theory to explain this question will clarify and realize the method of support for the family with the problem and it will be useful for family support.

First, we will briefly explain system theory in family therapy. Family therapy developed

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under the influence of general system theory and cybernetics introduced by Bateson (1972). In family therapy, we refer to system theory such as chaos theory of Prigogine (1980), autopoiesis of Maturana & Varela (1980), and have a clinical and research history on the development of family system theory. And the application of general system theory so far to families was about self-regulation and change. Bateson's theory of schismogenesis explains that amplification of deviations in which the differences produce amplifiable differences. In the dissipative structure theory and complex system of Prigogine, it is also explained that due to the action of motion called fluctuation, the slight difference is cumulatively amplified through the positive feedback process, and a simple initial condition develops into a more complex and unpredictable structure. Using these system theories as the backgrounds, we focused on the concept of time, and an information recurrent model that explains the system based on the speed at which information recurrences within the system (Wakashima, Sato & Hasegawa, 2000; Wakashima, 2001; Wakashima & Matsui, 2003; Wakashima & Matsui, 2004; Wakashima & Matsui, 2005) has been presented. However, after that, family therapy has become a trend of shifting paradigm from system theory to narrative theory, and in recent years there has been no progress in the development of family system theory.

In such circumstances, the authors' attention is the integrated information theory of Tononi

(2004) and Tononi, Boly, Massimini & Koch (2016). In recent years, the integrated information theory was presented by Tononi (2004) while brain science researchers explain the phenomenon of consciousness. The number of neurons in the whole brain is about 100 billion. About 80 billion neurons are lined up in the cerebellum. The thalamus-skin system consists of the cerebral cortex and the thalamus, where about 20 billion neurons line up. When cerebellum is removed due to some reason, language and exercise become difficult. On the other hand, consciousness phenomenon has no problem. In other words, the stereoscopic phenomenon of consciousness cannot be explained by the number of neurons. This integrated information theory is a theory which elucidates such a problem. In this theory, it is assumed that phenomena of consciousness are caused by neuronal differences (diversity) and interaction. Consciousness is created by difference and comprehensive action. This agrees with the viewpoint of the system theory which considers "the whole is not the sum of the parts." This study is an attempt to apply brain's integrated information theory to family system.

In this study, we apply integrated information theory's schema to family system. First of all, we target couples and measure the difference between them and the amount of interaction for and clarify how these are related to family's problem solving abilities and family resilience. The problem arises as "What is the difference?" "What is interaction?" "What is created stereoscopically (like consciousness)?" when

applying the framework of integrated information theory to family systems. Unfortunately, we do not have complete answers to these questions. We repeated the discussion, but this study is in chaos. Under such circumstances, in this study, when applying the stereoscopic function of consciousness in the brain to the family system, we selected the family problem solving abilities and family resilience as variables to measure the function of the family system. The reason for this is that it is necessary to assume variables that measure the function itself, rather than the structure of the family, such as satisfaction or cohesiveness.

In contrast, the hypothesis is clear. In order to verify the following hypothesis, this study was carried out. “The married couple who has high score in couple’s difference and communication has higher problem solving abilities and family resilience compared to the other couples”.

Differences between married couple may increase information volume, but may reduce interaction. If interaction is not done, couple’s problem solving and resilience will decline. On the other hand, if interaction occurs even if there is a difference between married couple, the increased amount of information is considered to have a positive influence on couple’s problem solving and resilience. The main point of this study is to examine this point.

(Study 1: For married couples)

Purpose

The purpose of study 1 is to examine “what

kind of properties the family system with high problem solving abilities possess”. We measure the difference and the amount of interaction between marital couple, and we examine how these are related to family’s problem solving ability and family resilience. The hypothesis in study 1 is “The married couple who has high score in couple’s difference and interaction has higher problem solving abilities and family resilience compared to the other couples .”

Method

A questionnaire survey was conducted for 111 married couples living in the Kanto, Chubu and Tohoku districts (222 of people, average 45.04±11.24 years old). On the cover page of the questionnaire, we attached explanations on the survey (survey purpose, introduction of counseling agency, handling of personal information, feedback of results, agreement) and request to answer only with agreement. We sent a questionnaire by mail and asked to send it back with a sealed envelope regardless of whether or not it was answered.

Scale

The following five scales were used. ①Scale to measure difference between married couple (21 items, 5 point scale) , ②Communication Scale (14 items, 7 point scale) ③Problem Solving Inventory (33 items, 5 point scale) (Hayashi, 1985) ④ Family Resilience Inventory (30 items, 4 point scale) (Ohyama & Nozue, 2013) ⑤ Items for measuring desirability (1 item, 5 point scale).

These scales was created and examined by 12

graduate students majoring in clinical psychology divided into two groups (A group and B group) of 6 people. Group A was in charge of creating and discussing the scale to measure the difference between married couple, group B chose Communication Scale, Problem Solving Inventory, Family Resilience Inventory. In addition to discussion in each group, we set up a general review meeting with a psychological researcher and both groups twice. At the general review meeting the validity of the scale content prepared and examined by each group was reviewed. Below is the process of scale creating and discussion in each group.

Group A: Creating a scale to measure married couple's differences

Six graduate students examined what kind of difference between married couples affects the couple's conflict situation. Discussions were held five times in total. In the first round of talks, we discussed about "difference" between married couple. In the second round of discussion, we examined what to ask and how to measure differences between married couples, with reference to the measure of marital interaction (Itakura, 2013). In the third round, we examined that point in more detail, as a result, we discussed to grasp the differences between married couples by category, and to assume to distinguish between couple by five categories (personality, ability, money usage, preference, way of thinking). In the fourth round of discussion, we examined the items included in those five categories and finally adopted 21 items. After that,

questionnaires were created on the fifth talk. "The scale to measure the difference between the couple" was created, and it is five-point scale from "1. the same" to "5. different". Also, in order to eliminate the influence of the bias of social desirability on the data obtained, we set five-point items (from "1. not agree" to "5. totally agree") to measure the extent to which the married couple applies about the idea "married couple's opinions must agree in general". In the meantime, we have conducted two general discussion meetings and amended item contents and categories.

Group B: Selection of scale to measure Communication Scale and family problem solving ability

First, six people were divided into two groups (α group and β group). The α group was in charge of selecting the Communication Scale, and the β group was in charge of selecting the scale measuring the family problem solving ability. Initially, we chose a scale for reference in each group. We set up two discussion meetings in group B, and discussed the validity of using that scale. As a result, we adopted the total of 14 items with reference to 12 items of "direct communication Scale" of Itakura (2013), and 2 items of "father and mother spend a lot of time to talk together", "father and mother often eat dinner together", the subscale of the scale for "good relationship between father and mother", from "paternal relationship questioning the relationship between the father and the mother" of Hida & Kariya (1992). As a scale to measure the problem solving ability of

the family, we chose 33 items which Hayashi (1985) analyzed the problem solving inventory prepared by Heppner & Peterson (1982), and applied to the family. We adopted the four

factors extracted by Takahashi et al. (2013) (a factor of Confirm possibility of problem handling, a factor of Confidence about family capacity, a factor of Anxiety about problem

Table 1: Factor analysis result of scale to measuring difference between married couple (Factor pattern after Promax rotation)

	I	II	III
I. Way of thinking ($\alpha=.86$)			
7. Thinking of educational expenses	.780	-.143	.014
17. Parenting policy	.744	.035	-0.54
20. Policy of life	.648	.135	-.252
8. Thinking of savings	.625	.104	.080
18. How to engage with parents' home	.617	-.189	.094
6. Concept of living (food, clothing and house) cost	.563	.197	.107
19. Thinking of way to spend after retirement	.562	.128	-.100
9. How to spend money for hobbies	.383	.309	.083
II. Preference ($\alpha=.82$)			
15. Preference of outside going out	-.015	.811	-.085
11. Food preference	-.095	.638	-.007
13. Interior preference	.087	.630	.017
14. TV program preference	-.050	.618	.076
16. Hobby	.006	.617	.049
12. Clothing preference	.047	.592	.063
III. Ability ($\alpha=.58$)			
2. Academic ability	-.169	.186	.528
4. Life skill (housework, self management)	.174	-.062	.520
3. Physical ability	-.140	.064	.486
5. Mental strength	.287	-.127	.421
Factor correlation			
	I	II	III
I	-	.626	.312
II		-	.318
III			-

solving, a factor of Sense of difficulty grasping the problem) as hypostatic factors. In addition to this, we also adopted Family Resilience Inventory of Ohyama & Nozue (2013).

Result

(1) Examination of the factor structure of the scale to measure difference between married couple

In order to examine the factor structure of the difference between the married couple, factor analysis of the scale for measuring the difference between the married couple was conducted. First, 10 people who has missing values were excluded from the analysis. Next, we excluded 15 people who answered "5. totally agree" to the item that measures desirability (married couple's opinions must agree in general) from the analysis. As a result, 197 people were chosen for analysis. Factor analysis by the principal factor method was carried out. And after considering the eigenvalue head and the content of the items included in each factor, factor analysis using the main factor method and promax rotation was performed again based on three factors with high contribution ratio. As a result, three items that did not show a sufficient loading amount (.35) for any factor were excluded, and three factors 18 items were extracted (Table 1).

As the items showing a high factor loading for factor I were "thinking of educational expenses", "parenting policy", "Policy of life", etc., we interpreted them as the factors of "way of thinking". As the items showing a high factor loading for factor II were "preference of

going out", "food preference", "interior preference", etc., we interpreted them as the factors of "preference". As the items showing high factor loading for factor III were "Academic ability", "Life skill (housework, self management)", "Physical ability" etc., we interpreted them as the factors of "ability".

(2) Examination of reliability of each scale

Next, we examined the reliability of ② Communication Scale, ③ Problem Solving Inventory, and ④ Family Resilience Inventory (Table 2). Communication Scale, subscale of Problem Solving Inventory : "Confirming possibility of problem handling", "Confidence about family capacity", subscale of Family Resilience Inventory : "Connection", "Trust in family ability" were confirmed as $\alpha = 0.7$ or more, the sufficient reliability was verified. On the other hand, the subscales of the Problem Solving Inventory : "Anxiety about problem solving", "Sense of difficulty grasping the problem", the subscale of the Family Resilience Inventory : "Balance between relationships and

Table 2: Consideration of reliability

Table 2: Consideration of reliability	
② Communication scale	α
1. Communication scale	.948
③ Problem Solving Inventory (PSI)	α
1. Confirm possibility of problem handling	.844
2. Confidence about family capacity	.837
3. Anxiety about problem solving	.621
4. Sense of difficulty grasping the problem	.609
④ Family Resilience Inventory (FRI)	α
1. Connection	.821
2. Trust in family ability	.890
3. Balance between relationships and individuals	.227
4. Spirituality	.655
5. Socio-economic resources	.496

individuals", "Spirituality", "Socio-economic resources" were below $\alpha= 0.7$, and sufficient reliability could not be obtained. It is considered that the α coefficient became low since the number of items was small in any of the subscales for which reliability could not be obtained. In consideration of the above, in this study all subscales were used for analysis.

(3)Examination of relationship between “Couple’s difference”, “Communication”, “Problem Solving Abilities” and “Family Resilience”

First, for each subscale on the scale of ① to ④, the average score of husband and wife was calculated and used as a pair score for analysis. Also, we complemented the missing value by mean. Next, we excluded 7 pairs including

Table 3: Crosstab of "Way of thinking" and "Communication"

		Communication		total
		low	high	
Way of thinking	low	9	78	87
	high	6	11	17
total		15	89	104

those who answered "5. totally agree" to items that measure desirability (married couple's opinions must agree in general). As a result, 104 pairs were analyzed.

Round "way of thinking", "preference ", "ability", which are subscales of the ①scale to measure the difference between married couples, and pairs above the pair score 4 points (corresponding to "4. slightly different" in the 5 methods) were grouped into high difference couple, and pairs with less than 4 points were grouped into low difference couple. In addition,

Table 4: Result of two way analysis of variance: "Way of thinking" and "Communication" as independent variables

Way of thinking	low		high		main effect		
	low	high	low	high	Way of thinking	Communication	interaction
Confirm possibility on problem handling	3.44 (0.52)	3.88 (0.46)	3.13 (0.57)	3.68 (0.67)	2.83	10.44***	0.16
Confidence about family capacity	3.57 (0.62)	4.05 (0.46)	3.22 (0.54)	3.70 (0.77)	4.76*	9.10***	0.00
Anxiety about problem solving	2.80 (0.70)	2.73 (0.52)	2.86 (0.48)	2.83 (0.55)	0.27	0.09	0.02
Sense of difficulty grasping the problem	2.31 (0.53)	2.25 (0.64)	2.67 (0.61)	2.77 (0.69)	5.05*	0.02	0.17
Connection	3.21 (0.41)	3.59 (0.34)	2.97 (0.47)	3.22 (0.52)	7.01**	7.33**	0.31
Trust in family ability	2.94 (0.43)	3.29 (0.34)	2.90 (0.39)	3.06 (0.39)	1.44	5.13*	0.73
Balance between relationships and individuals	3.17 (0.47)	3.57 (0.36)	2.80 (0.34)	3.30 (0.51)	7.00**	14.46****	0.19
Spirituality	2.90 (0.59)	3.21 (0.41)	2.70 (0.46)	3.03 (0.35)	2.00	5.57*	0.00
Socio-economic resources	3.14 (0.52)	3.46 (0.45)	3.29 (0.46)	3.27 (0.47)	0.01	1.09	1.39

upper row: average lower row: standard deviation

* $p < .05$, ** $p < .01$, *** $p < .005$, **** $p < .001$

round ②the Communication Scale scores and pairs above the pair score 5 points (corresponding to "4. a little" in the 7 methods) were grouped into high communication couple, and pairs with less than 5 points were grouped into low communication couple.

1. "way of thinking" and "communication" as independent variables

The crosstabulation table after grouping is shown below (Table 3). A χ^2 test of binary arrangement of high / low in "way of thinking" \times high / low in "communication" was performed, and it was significant ($\chi^2 = 7.17$, $df = 1$, $p < .01$), and it indicated that there was a lot of "communication" with the low in "way of thinking". Since each cell was $n=5$ or more, 2×2 analysis of variance was performed with the "way of thinking" and "communication" as independent variables, the Problem Solving Inventory and Family Resilience Inventory as dependent variables.

As a result of analysis (Table 4), no interaction was observed. The main effect of the "way of thinking" was significant on "Confidence about family capacity" ($F(1,100) = 4.76$, $p < .05$), "Sense of difficulty grasping the problem" ($F(1,100) = 5.05$, $p < .05$), "Connection" ($F(1,100) = 7.01$, $p < .01$), "Balance between relationships and individual" ($F(1,100) = 7.00$, $p < .01$). The score in the low couple of "way of thinking" was significantly higher than that in the high couple in "Confidence about family capacity", "Connection", "Balance between relationships and individuals"(problem solving abilities and

family resilience was high). In the "Sense of difficulty grasping the problem", the score in the low group of "way of thinking" was significantly lower than that in the high group (problem solving abilities was high). In addition, the main effect of "communication" was significant on "Confirm possibility of problem handling" ($F(1,100) = 10.44$, $p < .005$), "Confidence about family capacity" ($F(1,100) = 9.10$, $p < .005$), "Connection" ($F(1,100) = 7.33$, $p < .01$), "Trust in family ability" ($F(1,100) = 5.13$, $p < .05$), "Balance between relationships and individuals" ($F(1,100) = 14.46$, $p < .001$), "Spirituality"($F(1,100) = 5.57$, $p < .05$), the score in high couple on "communication" was significantly higher than that in the low couple (problem solving abilities and family resilience was high).

2. "preference" and "communication" as independent variables

The crosstabulation table after grouping is shown below (Table 5). A χ^2 test of binary arrangement of high / low in "preference" \times high / low of "communication" was performed, and it was significant ($\chi^2 = 4.64$, $df = 1$, $p < .05$), and it indicated that there was more "communication" with the group low in "preference". Since each cell was $n=5$ or more, 2×2 analysis of variance was performed with the "preference" and "communication" as independent variables, the Problem Solving Inventory and Family Resilience Inventory as dependent variables.

Since the interaction in "Anxiety about problem solving" ($F(1,100) = 4.09$, $p < .05$)

was significant in the analysis results (Table 6), simple main effects were examined. As a result, in the low "communication" score couples, the couples with the low scores in "preference" had significantly lower score in "Anxiety about problem solving" than those with high scores (problem solving abilities was high) ($F(1,100) = 4.95, p < .05$). Next, the main effect of "preference" was significant in "Confirm possibility of problem handling" ($F(1,100) = 8.27, p < .01$), the score with low couple in "preference" was significantly higher than that with high couple (problem solving abilities was higher). In addition, the main effect of "communication" was significant in "Confirm possibility of problem handling" ($F(1,100) =$

Table 5: Crosstab of "Preference" and "Communication"

		Communication		total
		low	high	
Preference	low	7	66	73
	high	8	23	31
total		15	89	104

10.67, $p < .005$), "Confidence about family capacity" ($F(1,100) = 11.96, p < .005$), "Connection" ($F(1,100) = 13.44, p < .001$), "Trust in family ability" ($F(1,100) = 8.76, p < .005$), "Balance between relationships and individuals" ($F(1,100) = 19.17, p < .001$), "Spirituality" ($F(1,100) = 6.89, p < .05$), the score in the "communication" high couple was higher than the "communication" low couple (problem solving abilities and family resilience

Table 6: Result of two way analysis of variance: "Preference" and "Communication" as independent variables

Preference	low		high		main effect		
	low	high	low	high	Preference	Communication	interaction
Confirm possibility of problem handling	3.57 (0.53)	3.93 (0.43)	3.09 (0.48)	3.63 (0.58)	8.27**	10.67****	0.39
Confidence about family capacity	3.51 (0.80)	4.06 (0.44)	3.35 (0.37)	3.83 (0.67)	1.73	11.96***	0.05
Anxiety about problem solving	2.50 (0.61)	2.74 (0.49)	3.10 (0.45)	2.74 (0.60)	4.04*	0.17	4.09*
Sense of difficulty grasping the problem	2.21 (0.57)	2.30 (0.70)	2.66 (0.52)	2.37 (0.57)	1.90	0.30	0.98
Connection	3.27 (0.45)	3.55 (0.38)	2.98 (0.40)	3.51 (0.40)	2.28	13.44****	1.30
Trust in family ability	3.00 (0.51)	3.29 (0.34)	2.91 (0.32)	3.18 (0.38)	0.54	8.7***	0.07
Balance between relationships and individuals	3.14 (0.60)	3.55 (0.41)	2.91 (0.25)	3.50 (0.35)	1.46	19.17****	0.68
Spirituality	2.88 (0.56)	3.23 (0.39)	2.79 (0.54)	3.07 (0.43)	1.08	6.89*	0.09
Socio-economic resources	3.18 (0.51)	3.46 (0.46)	3.22 (0.49)	3.37 (0.46)	0.03	2.59	0.22

upper row: average lower row: standard deviation

* $p < .05$, ** $p < .01$, *** $p < .005$, **** $p < .001$

was high).

3. "ability" and "communication" as independent variables

The crosstabulation table after grouping is shown below (Table 7). A χ^2 test of binary arrangement of high / low in "ability" \times high / low of "communication" was performed, and it showed no significant difference. Since the cell which is low in both "ability" and "communication" was less than $n=5$, binary arrangement analysis of variance was considered inappropriate. Three pairs of low "ability" couple- low "communication" couple were excluded from the analysis, and one-way analysis of variance was performed with three groups of low "ability" - high "communication" couple ($n=22$), high "ability" - low

Table 7: Crosstab of "Ability" and "Communication"

		Communication		total
		low	high	
Ability	low	3	22	25
	high	12	67	79
total		15	89	104

"communication" couple ($n=12$), high "ability" - high "communication" couple ($n=67$) as independent variables and the Problem Solving Inventory and Family Resilience Inventory as dependent variables. As the result of analysis (Table 8), "Confirm possibility of problem handling" ($F(2, 98) = 7.2, p < .005$), "Confidence about family capacity" ($F(2, 98) = 6.95, p < .005$), "Connection" ($F(2, 98) = 5.65, p < .01$), "Trust in family ability" ($F(2, 98) = 5.35, p < .01$), "Balance between relationships and individuals" ($F(2, 98) = 11.19, p < .001$),

Table 8: Result of one-way analysis of variance: "Ability" and "Communication"

Ability	low Ability- high Communication	high Ability- low Communication	high Ability- high Communication	F value
Confirm possibility of problem handling	3.92 (0.56)	3.28 (0.56)	3.83 (0.47)	7.20***
Confidence about family capacity	3.90 (0.42)	3.42 (0.67)	4.04 (0.54)	6.95***
Anxiety about problem solving	2.79 (0.34)	2.82 (0.66)	2.72 (0.57)	0.24
Sense of difficulty grasping the problem	2.42 (0.61)	2.44 (0.63)	2.28 (0.68)	0.54
Connection	3.49 (0.46)	3.14 (0.48)	3.56 (0.36)	5.65**
Trust in family ability	3.16 (0.41)	2.94 (0.45)	3.30 (0.33)	5.35**
Balance between relationships and individuals	3.44 (0.46)	2.98 (0.49)	3.57 (0.36)	11.19****
Spirituality	3.11 (0.47)	2.85 (0.57)	3.22 (0.38)	4.05*
Socio-economic resources	3.47 (0.50)	3.25 (0.52)	3.42 (0.45)	0.88

upper row: average lower row: standard deviation

* $p < .05$, ** $p < .01$, *** $p < .005$, **** $p < .001$

“Spirituality”(F (2, 98) = 4.05, $p < .05$) was significant.

Multiple comparisons were performed by Tukey's HSD method (5% level). In "Confirm possibility of problem handling", "Confidence about family capacity", "Connection", "Balance between relationships and individuals", the score with high “ability” – low “communication” couple was significantly lower than the one with other two groups (problem solving abilities and family resilience was low). In "Trust in family ability" and "Spirituality", the score with high “ability” – low “communication” couple was significantly lower than the one with high “ability” – high “communication” couple (family resilience was low). From the above results, it was shown that the “communication” high couple had higher scores of dependent variables (problem solving abilities and family resilience was high) than the low “communication” couple.

Discussion

(Examination of the factor structure of the scale to measure difference between married couple)

Three factors were extracted as a result of factor analysis of the scale to measure difference between married couple, "way of thinking", "preference", and "ability". It is considered that the couple's "way of thinking" and "preference" are cognitive dimensional differences, and "ability" is a behavioral dimension difference.

(Examination of reliability of each scale)

First of all, sufficient reliability was confirmed in "way of thinking" and "preference" on the scale to measure difference between married couple. Reliability was somewhat lower in "ability", and it was considered to cause due to few items. On the "Communication" scale, high reliability was confirmed. On the "Problem Solving Inventory", sufficient reliability was confirmed in the "Confirm possibility of problem handling" and "Confidence about family capacity". On the other hand, the reliability was somewhat lower in "Anxiety about problem solving" and the "Sense of difficulty grasping the problem". On the Family Resilience Inventory, high reliability was confirmed in "Connection" and "Trust in family ability". On the other hand, the reliability was low in "Balance between relationships and individuals", "Spirituality", and "Socio-economic resource". The reason why the reliability is low with some factors is considered to be that the number of items is small.

(Examination of relationship between “Couple's difference”, “Communication”, “Problem Solving abilities” and “Family Resilience”)

In order to examine “what kind of properties the family system with high problem solving abilities possess?”, we conducted analysis of variance with "Difference between married couples" and "communication" as independent variables, and "Problem solving abilities" and

"Family resilience" as dependent variables. The hypothesis in this study was "the group with high score in different between couples and communication has the higher problem solving abilities between couple and family resilience compared to other groups", but there was no result to support this hypothesis.

In this study, the following results were obtained. The first point is that the couple with a high "communication" has higher problem solving abilities and family resilience than the low couple. The factors showed a significant difference were "Confirm possibility of problem handling" and "Confidence about family capacity" of "Problem Solving Inventory", and "Connection" and "Trust in family ability" of "Family Resilience Inventory". In these factors, items related to the execution of action to solution, the sense of effectiveness of problem solutions, and the moderate connection of families are summarized. Based on the above, it was shown that families that take a lot of communication between married couple have a moderate connection between family members and high sense of effectiveness of problem solutions, and execute the action to solutions.

The second point is that the couple with low in "way of thinking" has the higher problem solving abilities and family resilience than the high couple. The factors showed a significant difference in the "way of thinking" were "Confidence about family capacity" and "Sense of difficulty grasping the problem" of "Problem Solving Inventory", and "Connection" and "Balance between relationships and

individuals" of "Family Resilience Inventory", items related to the execution of action to solution, the sense of difficulty grasping the problem, and the moderate connection of families are summarized in these factors. Based on the above, it was shown that families with small difference of "way of thinking" between married couple have a moderate connection between family members and less sense of difficulty grasping the problem and execute the action to solutions compared to families with large differences.

The third point is that the couple with low in "preference" has higher problem solving abilities than the high couple. The factors showed a significant difference in the "preference" was "Confirm possibility of problem handling" factor of "Problem Solving Inventory". In this factor, items related to the execution of action to solution are summarized. From the above, it was shown that families with small difference of "preference" between married couples execute actions to solution compared to the other families.

The fourth point is that the result showed that the couple who has low "communication" and low difference of "preference" has lower "Anxiety about problem solving" than the other couples. Even when the amount of communication between married couple is small, it was shown that families with small "preference" between couple has lower anxiety about solving the problem.

(Study 2: Evaluating parents (couple) from a child's perspective)

Purpose

The purpose of study 2 is to examine “what kind of properties the family system with high problem power possess?” as in study 1, from a child's perspective. As in study 1, the hypothesis in study 2 is "the married couple who has high score in couple's difference and communication has higher problem solving abilities and family resilience compared to the other couples". The reason for conducting the same study as study 1 from the child's perspective is as follows. It is because there is a possibility that children who are third parties than couple themselves may be able to properly grasp the couple's difference and the amount of communication.

Method

A questionnaire survey was conducted for 82 university students (average 20.14 ± 1.42 years old). The survey sheets were distributed at lecture time and after the explanation of survey they were asked to respond only with agreement.

Scale

The following five scales were used. ① Scale to measure difference between married couple (21 items, 5 point scale), ② Communication Scale (14 items, 7 point scale), ③ Problem Solving Inventory (33 items, 5 methods) (Hayashi, 1985), ④ Items for measuring desirability (1 item, 5 methods).

Items for ① Scale of measuring difference between married couple, ② Communication Scale, ④ Measuring desirability, prepared in study 1 were used and they evaluated on their parents. ③ Problem Solving Inventory was evaluated about their families.

Result

(1) Examination of the factor structure of the scale to measure difference between married couple

In order to examine the factor structure of the difference between the couple, factor analysis of the scale to measure difference between married couple was conducted. First, 3 people who has missing values were excluded from the analysis. Next, we excluded 6 people who answered "5. totally agree" to the item ④ Measuring desirability (my parents believe that married couple's opinions must agree in general) from the analysis. As a result, 70 people were chosen for analysis.

Factor analysis by the principal factor method was carried out. And after considering the eigenvalue head and the content of the items included in each factor, factor analysis using the main factor method and promax rotation was performed again based on three factors with high contribution ratio. As a result, 4 items not showing sufficient factor loading (.35) for any factor were excluded, and 12 items of 3 factors were extracted (Table 9). Items that showed high factor loading for factor I were interpreted as factors related to “preference” since they are "Food preference", "Interior preference", "Clothing preference" etc. Items

that showed a high factor loading for factor II were interpreted as factors related to "way of thinking" since they are "Thinking of way to spend after retirement", "Academic ability", "How to engage with parents' home" etc. Items that showed high factor loading for factor III were interpreted as factors related to "ability" since they are "Mental strength", "Religious

beliefs", "Life skill (housework, self management)".

(2) Examination of reliability of each scale

Next, we examined the reliability of the ② Communication Scale and the ③ Problem Solving Inventory (Table 10). The Communication Scale, the subscale of

Table 9: Factor analysis result of scale to measure difference between married couple (Factor pattern after promax rotation)

	I	II	III
I. Preference ($\alpha=.73$)	.959	-.026	-.198
11. Food preference	.663	-.109	.174
13. Interior preference	.502	.180	.011
12. Clothing preference	.391	.062	.053
14. TV program preference			
II. Way of thinking ($\alpha=.77$)	-.056	.804	-.035
19. Thinking of way to spend after retirement	-.021	.640	-.064
2. Academic ability	.013	.586	-.047
18. How to engage with parents' home	.201	.502	.127
20. Policy of life	.200	.395	.220
6. Concept of living (food, clothing & house) cost			
III. Ability ($\alpha=.58$)			
5. Mental strength	.119	-.231	.727
21. Religious beliefs	-.141	.205	.520
4. Life skill (housework, self management)	-.055	.082	.485
Factor correlation	I	II	III
I	-	.499	.430
II		-	.559
III			-

"Problem Solving Inventory" : "Confirm possibility of problem handling", "Confidence about family capacity" were confirmed to be $\alpha=0.7$ or more, and sufficient reliability was confirmed. On the other hand, the subscale of the "Problem Solving Inventory" : "Anxiety about problem solving" and "Sense of difficulty grasping the problem" were less than $\alpha=0.7$, and sufficient reliability was not obtained. It is considered that the α coefficient became low since the number of items was small in any of the subscales for which reliability could not be obtained. In addition, the fact that the number of samples was slightly small is also considered to be one factor to lower the α coefficient. In consideration of the above, all subscales were used for analysis in this study.

(3) Examination of relationship between "Couple's difference", "Communication" and "Problem solving abilities"

First, we complemented the missing value of ① the scale to measure difference between married couple by mean. We excluded 6 people who answered "5. totally agree" to the item ④

Table 10: Consideration of reliability

② Scale to measure the Communication volume		α
1. Communication volume		.921
③ Problem Solving Inventory (SPI)		α
1. Confirm possibility of problem handling		.883
2. Confidence about family capacity		.764
3. Anxiety about problem solving		.575
4. Sense of difficulty grasping the problem		.619

Measuring desirability (my parents believe that married couple's opinions must agree in general) from the analysis. As a result, 76 people were chosen for analysis.

The "preference", "way of thinking", "ability", which is a subscale of the scale ① Measuring the difference between married couple were rounded, and the scales with more than 4 points (corresponding to “4. Slightly different” in 5 methods) was grouped in high difference couple and the scales less than 4 points were grouped in low difference couple. In addition,

Table 11: Crosstab of "Preference" and "Communication"

		Communication		total
		low	high	
Preference	low	11	37	48
	high	13	15	28
total		24	52	76

Table 12: Result of two way analysis of variance: "Preference" and "Communication" as independent variables

Preference	low		high		main effect		
	low	high	low	high	Preference	Communication	interaction
Confirm possibility of problem handling	3.42 (0.78)	3.56 0.81	3.23 0.68	3.36 0.59	1.04	0.50	0.00
Confidence about family capacity	3.29 (0.98)	3.72 (0.53)	3.26 (0.71)	3.40 (0.55)	1.13	2.97	0.79
Anxiety about problem solving	2.55 (0.90)	2.47 (0.71)	2.67 (0.62)	2.53 (0.65)	0.26	0.33	0.02
Sense of difficulty grasping the problem	2.18 (0.87)	2.21 (0.79)	2.40 (1.00)	2.31 (0.64)	0.60	0.02	0.07

upper row: average lower row: standard deviation

* $p < .05$, ** $p < .01$, *** $p < .005$, **** $p < .001$

round ② Communication Scale scores and the scales with more than 5 points (corresponding to “5. A little bit” in 7 methods) was grouped in high communication couple and the scales with less than 5 points was grouped in low communication couple.

1. “preference” and “communication” as independent variables

The crosstabulation table after grouping is shown below (Table 11). A χ^2 test of binary arrangement of high / low in “preference” \times high / low in “communication” was performed and it was significant ($\chi^2 = 17.05$, $df = 1$, $p < .001$), it indicated that low couple in “preference” has more “communication”. Since each cell was $n=5$ or more, 2×2 analysis of variance with the “preference” and “communication” as independent variables, and “Problem Solving Inventory” as dependent variable was performed. The results of the analysis (Table 12) with the preference (high group / low group) and communication (high group / low group) as independent variables, the interaction, the preference, and the main

Table 13: Crosstab of “Way of thinking” and “Communication”

		Communication		total
		low	high	
Way of thinking	low	17	39	56
	high	7	13	20
total		24	52	76

effect of communication were not seen.

2. “way of thinking” and “communication” as independent variables

The crosstabulation table after grouping is shown below (Table 13). A χ^2 test of binary arrangement of high / low in “way of thinking” \times high / low in “communication” was performed, but it was not significant. Since each cell was $n=5$ or more, 2×2 analysis of variance with the “way of thinking” and “communication” as independent variables, and “Problem Solving Inventory” as dependent variable was performed.

As a results of analysis (Table 14), no interaction was observed. The main effect of the “way of thinking” was significant in “Confidence about family capacity” ($F(1,72) = 16.96$, $p < .001$), “Anxiety about problem

Table 14: Result of two way analysis variance: “Way of thinking” and “Communication” as independent variables

Way of thinking	low		high		main effect		
	low	high	low	high	Way of thinking	Communication	interaction
Confirm possibility on problem handling	3.44 (-0.46)	3.58 (-0.77)	3.01 (-1.12)	3.27 (-0.70)	3.31	0.95	0.08
Confidence about family capacity	3.51 (-0.49)	3.77 (-0.49)	2.71 (-1.21)	3.22 (-0.53)	16.96****	5.47*	0.54
Anxiety about problem solving	2.43 (-0.56)	2.44 (-0.74)	3.05 (-0.99)	2.64 (-0.50)	4.61*	1.11	1.16
Sense of difficulty grasping the problem	2.13 (-1.04)	2.14 (-0.79)	2.71 (-0.39)	2.54 (-0.52)	5.06*	0.15	0.18

upper row: average lower row: standard deviation

* $p < .05$, ** $p < .01$, *** $p < .005$, **** $p < .001$

solving" ($F(1,72) = 4.61, p < .05$), "Sense of difficulty grasping the problem" ($F(1,72) = 5.06, p < .05$). "Confidence about family capacity" was significantly higher in the low couple of "way of thinking" than in the high couple (problem solving abilities was high). "Anxiety about problem solving" and "sense of difficulty grasping problems" were significantly lower in the low couple of "way of thinking" than in the high couple (problem solving abilities was high). Also, the main effect of communication was significant in "Confidence about family capacity" ($F(1,72) = 5.47, p < .05$). The score of "communication" high couple was significantly higher than the low couple (problem solving abilities was high).

3. “ability” and “communication” as independent variables

The crosstabulation table after grouping is shown below (Table 15). A χ^2 test of binary arrangement of high / low of “ability” \times high / low of "communication" was conducted but it was not significant. Since each cell was $n=5$ or more, 2×2 analysis of variance with the

Table 15: Crosstab of "Ability" and "Communication"

		Communication		total
		low	high	
Ability	low	14	36	50
	high	10	16	26
total		24	52	76

"ability" and "communication" as independent variables, and "Problem Solving Inventory" as dependent variable was performed .

From the results of the analysis (Table 16), the significant difference were not observed neither in interaction, the main effect of "ability" and "communication".

Discussion

(Examination of the factor structure of the scale to measure difference between married couple)

Three factors were extracted as a result of the examination of the factor structure of the scale to measure difference between married couple, "preference", "way of thinking", and "ability". The same factors were extracted from study 1 which was the survey conducted from married couples’ perspective. It was shown that the couple and the child recognize the same three

Table 16: Result of two way analysis of variance: "Ability" and "Communication" as independent variables

Ability	low		high		main effect		
	low	high	low	high	Ability	Communication	interaction
Confirm possibility on problem handling	3.15 (6.20)	3.56 (0.67)	3.55 (0.81)	3.37 (0.93)	0.28	0.37	2.50
Confidence about family capacity	3.11 (0.87)	3.67 (0.52)	3.50 (0.74)	3.55 (0.63)	0.65	3.27	2.32
Anxiety about problem solving	2.79 (0.69)	2.47 (0.60)	2.37 (0.79)	2.52 (0.87)	1.05	0.20	1.68
Sense of difficulty grasping the problem	2.46 (0.97)	2.27 (0.77)	2.07 (0.87)	2.16 (0.72)	1.52	0.06	0.44

upper row: average lower row: standard deviation

* $p < .05$, ** $p < .01$, *** $p < .005$, **** $p < .001$

differences as the difference between the couple.

(Examination of reliability of each scale)

First of all, sufficient reliability was confirmed in "preference" and "way of thinking" on the scale to measure difference between married couples. On the other hand, the reliability was somewhat lower in "ability" and it is considered to have low reliability due to few items. In the "communication" scale, high reliability was confirmed. On the "Problem Solving Inventory", sufficient reliability was confirmed in "Confirm possibility of problem handling" and "Confidence about family capacity". On the other hand, reliability was somewhat lower in "Anxiety about problem solving" and "Sense of difficulty grasping the problem". The reason why the reliability is low with some factors is considered to be that the number of items is small.

(Examination of relationship between "Couple's difference", "Communication" and "Problem solving abilities")

In order to examine "what kind of properties the family system with high problem solving abilities possess?", we conducted analysis of variance with "Difference between married couples" and "communication" as independent variables, and "Problem Solving Inventory" as dependent variables. The hypothesis in this study was " The married couple who has high score in couple' s difference and interaction has higher problem solving abilities and family

resilience compared to the other couples", but there was no result to support this hypothesis.

In this study, the following results were obtained. The first point is that the couple with a high "communication" has higher problem solving abilities than the low couple. The factor showed a significant difference was "Confidence about family capacity" and items related to solution effectiveness are summarized in this factor. Based on the above, it was shown that families with large volume of "communication" between married couple feel highly effective in solving problems.

The second point is that the couple with a low difference of "way of thinking" has the higher problem solving abilities than the couple with a high difference of "way of thinking". The factors showed a significant difference were "Confidence about family capacity", "Anxiety about problem solving" and "Sense of difficulty grasping the problem". In these factors, items related to the sense of solution effect, anxiety about not being able to solve, and sense of not being able to grasp the problem are summarized. From the above, it was shown that families with a low differ "way of thinking" between married couples feel the high solution effectiveness and do not feel anxiety or sense of not being able to grasp the problem.

Comprehensive Discussion

1. Result summary and hypothesis verification

The purpose of this study was to examine "what kind of properties the family system with high problem solving abilities possess?". The hypothesis was " The married couple who has

high score in couple's difference and interaction has higher problem solving abilities and family resilience compared to the other couples”, but there was no result to support this hypothesis. The results obtained in this study generally showed that "a couple with a lot of communication" and "a couple with small differences of way of thinking and preferences" have high problem solving abilities and family resilience.

2. Achievement in family research

In this study, we got suggestions for the question "What is the difference in couple?". From this study, it was shown that there are three differences between married couples, "way of thinking", "preference", and "ability". There has not been any family research that focused on the differences between married couple and worked on the measurement. This study will be the foundation of the research focusing on the differences between married couples. Also, the scale to measure difference between the married couple developed in this study will be a useful tool for research focusing on the differences between married couples.

3. Challenges point in applying integrated information theory to family systems

There will be room for improvement in the scale to measure difference between the married couple developed in this study. In this study, the reliability of "ability" factor was somewhat low. The fact that the number of items was small may be one of the factors. It is necessary to increase the number of items and

refine the scale to measure difference between married couples.

From the results of this study, it was understood that small difference in “way of thinking” and “preference” between married couple and large volume of "communication" shows a generally positive relationship to problem solving and family resilience. This result is generally obvious result. We made an assumption that differences and interactions increase the amount of information, but, in our daily life, there are few scenes that require a lot of information volume. Functions that demonstrate the high amount of information may be in special circumstances or urgent circumstances. It is necessary to advance the research assuming a context that requires a lot of information volume.

Next, when assuming a family system, how to think about the difference is the biggest challenge point. After finishing this study, we came to assume two alternatives for differences. First, the existence of individual itself is a unique existence, and the difference similar to the difference in the characteristics of neurons is the possibility of being established by the individual itself. In that case, as a research design, we set the existence of two or more members, and think that the number of individuals is the magnitude of the difference. Secondly, in the case of family systems, it is necessary to measure the differences in the roles of each member in their families. From the viewpoint on how various differences are creating some difference in the family system, it is considered that assuming differences in

roles is more direct than measuring "way of thinking", "preference" and "ability". In this study, the suggestion on clinical implications is refrained until clarifying the above problem. We will review the above issues again and will continue to attempt applying integrated information theory to family system.

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The Effect of way of mother's communication with father's image to their children on father's image and family function

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ABSTRACT. In this research, the purpose was to examine the influence of father's image transfer from mother to child on father image of their child. We focused on two aspects of how to convey father's image by mother, management side and content side. A questionnaire survey was conducted for 217 college students (97 males, 120 females). As a result of the factor analysis, the management aspect of how to convey father's image by mother was constructed with "Peaceful" "Callousness" "Involving" "awkwardness" "serious" in management side and "reference to father's presence" "mother's perspective to the father" in the content aspect. Covariance structure analysis was conducted to examine the effect of mother's father image transmission on family function through mediation of father's image. As a result, it was suggested that referring to father's day-to-day situation on the content side and "peaceful" "serious" on the management side by mothers promotes family functions by mediating a positive father's image perceived by their child.

KEY WORDS: *mother, father's image, adolescents, management communication*

Introduction

1. Characteristics of fatherless home

In Japan, there are situations that often "mother-child adherence / father absence". This is the situation where the distance between mother and child is close and father is absent in the family. The term "absence of father" as used herein includes not only physical absence of home for work etc. but also psychological/functional absence, it has been discussed as a cause of various problems held by children and parent-child relationship with mother-child adherence (Ogata, 2011). Accordi

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-ng to Minuchin(1974), who focused on the structure of the family and advocated structured family therapy, the healthy family has stronger parents relationships than parent-child relationships and clear generation boundaries, and with the two extreme states such as the relationship between mother-child or father-child is adhesion or poor it may cause pathology to the family. "Mother-child adherence / father absence" is exactly equivalent to the family structure showing this pathology, and it can be said that there is a risk of family problems. Empirical studies on the relationship between parent-child relationship and psychological adaptation of children suggest that the discord between father-child relationships is related to low self-esteem and

emotional instability of the child (Maejima, Oguchi, 2001), and young man who experienced with hikikomori tends to have a negative image against his father (Hanashima, 2007). On the other hand, it has been reported that young female who are close to their mothers and have a low sense of self-control also have low in degree of mental independence and high in degree of depression (Mizumoto, Yamamoto, 2010). Therefore, it can be said that festering father-child relationship or mother-child adherence will increase the risk of child’s inclination to pathology. Regarding family relationship, it is shown that the relationship between two parties is related to the relationship with other family members. At the result of examination on connection between parent-child relationship and parents’ relationship in adolescence performed by Itakura and Hasegawa (2012), it was reported that there were no connection between parents’ ties and mother-child ties but a positive correlation was observed between parents’ ties and father-child ties. In addition, since a negative correlation was found between mothers’s negative evaluation of father evaluated by the youth and the positive evaluation of mother evaluated by the youth, it was pointed out that mother-child adherence was established by sharing the negative evaluation of the father between mother and child (Tobita & Kariya, 1992; Itakura & Hasegawa, 2012). Therefore, it can be said that father-child relationship is related to father’s evaluation by mothers and marital relationship, mother-child adherence causes weak

relationship of father-child and a vicious circle like escalating the pathology of families and children.

In order to prevent families from falling into such a vicious circle, it is important for father to involve with the family and to make a good relationship with the wife and child. However, in many cases it is practically difficult for many fathers who have work to spend time to communicate with their families. According to the survey by Kajiwara and Matsubara (2007), it indicates that 71% of the subject answered “unable to spare time to take care of child due to the volume of work” and 27% of the subject answered “consider the childcare is a women’s job” as the reason for father’s childcare rate is low in Japan. Based on these results, the reason why father does not participate in childcare is compiled into two points that the difficult situation caused by the long working hours and the traditional role consciousness of Japan which childcare is a mother’s role (Wakashima, Suenaga, & Noguchi, 2008). As for the latter, it includes a vicious circle as father acquires the identity as "earnings" by leaving childcare to mother, but on the other hand, they cannot acquire the identity as “father” since there is not enough communication with the child at home and it makes them to concentrate on the role as a “income provider” and become isolated from the family even more (Wakashima, Suenaga, & Noguchi, 2008). Therefore, the strength of father’s traditional role consciousness results in increasing working hours and decreasing involvement in families. Furthermore, when a

father encounters child's problem, he leaves it to a mother who has a large amount of information about child, or even if he exercises authority in the family it doesn't work in the circumstance that the intimacy from early childhood is lacking between child and father and it even cuts off the emotional exchange with the child, it ends to strengthen mother-child adherence and weaken father-child relationship (Tamura, 1997). In other words, when a father encounters child's problem, even if father is not actually physically absent, father will leave child's problem to mother, so that the relationship between fathers will be weakened. Meanwhile, even if father is involved, there is a situation that child lacks intimacy and does not work effectively. Therefore, in order to prevent such a situation and to maintain a good relationship of father and child it is necessary to consider a method of preventing the dilution of the existence of father in the family when the direct communication is difficult between father and child.

2. Transmission of father's image from mother to their child

Hasegawa (2005) states the problem of "absence of father" in Japanese families is that not actual absence of father but father's existence is not mentioned or mentioned negatively. In addition, he states the importance of mothers composing child's father statue based on constructivism perspective. Constructivism is the idea that the reality is a world that is perceived through individual

subjectivity and that it is being created by interaction between individuals and others (Hasegawa, 1991). Hasegawa (2005) intervened that the mother told the children about father's past brave episode, as the mother felt the father feeble in the family whose child had problem behavior. As a result, the problem behavior of child improved, so it can be thought that by referring to the brave aspect of the father by mother, child's father's image shifted from the "weak father" to the "father with a brave aspect", the reality for child was reconstructed. In families father is physically absent, unless a conversation about father is held by the families, father will be informatively absent and the sense of father's absence will be strengthened. Such a situation leads the communication between father and other family members to a difficult direction and creates a situation where no direct conversation is carried out between father and the family even if father is present. At this time, as information against father's real existence, fathers and other family members treat as if father is not there, and it can be said that communication is done with father's absence. Therefore, based on the position that the reality is formed by the interaction of communication, in the case where it is difficult for father and child to direct communicate, it is possibility that father's image can be constructed informationally by mother telling child about father.

A few studies have been conducted as "indirect communication" about communication that mother convey father's

image to their child. It has been reported that for the group with little direct communication between father and child, young people in the group with more information transmission on father between mother and child have higher family satisfaction than the group with less information transmission (Itakura, 2013). The high degree of family satisfaction associates is related to the the strength of the connection between child and father and the strength of the connection between the parents (Koiwa, 2010), it is considered that child strengthens the connection with father as the image of father existing as information by mother conveying the image of father to their child. In addition, since it is reported that information transmission on father between mother and child increase the cohesiveness of family (Itakura, 2010), an informational father image is considered to enhance family function. However, empirical studies have not been made on the influence on the family function through child’s image of father created by the transmission of father’s image from mother to their child. Therefore, in this research we examine the influence of the transmission of fatherss image from mother to their on the family function by mediating father’s image perceived by children.

3. Introduction of communication theory

Regarding communication that mothers convey father’s image to their child, focus is placed on the positive and the negative of information, and the point of "how to communicate" has not been considered. The

theory of human communication (Watzlawick, Bavelas, & Jakson, 1967) proposes five axioms as means by which communication influences the behavior of others. Based on the 2nd axiom "All communications have aspects of content and relations, the latter classifies the former, it is meta communication," it is said that there are two aspects of communication. They are the content aspect which is the conversation content itself and a management aspect which is the meaning attached to the conversation contents. The latter is a communication that manages a conversation and it is called "management communication" (Hasegawa, 2003). Management communication, in non-language includes body movement such as nod or gesture, face expression, tone or gaze, in language includes particles, auxiliary verbs, interjections, and nodding (Okuno, 2013). Hasegawa (2005) state that management communication is more important, not communication content. Furthermore, he is advocating the effectiveness of topic-free model that problems are solved by not intervening with the content of communication, but by intervening in that management (Hasegawa, 2005) . In addition, it is suggested that management communication can be used as a means to change the system in a psychological clinical setting (Wakashima, 1997).

Therefore, it is necessary to consider not only the content of information but also the way of communicating by nothing the point of "how to communicate" about how to convey the image of father by mother. Therefore, in

this research, we conduct a study “how” to convey rather than “what” to convey while mother conveys father’s image, by focusing on the management aspect and content side of communication based on the theoretical point of view of the theory of human communication.

4. Hypothesis of this study

In this research, we examine the influence of mother’s communication of father’s image to their child is conveyed on the family function through mediation of fathers image. on the family function through child’s image of father created by the way mother’s communication of father’s image to their child, in order to present the finding that mother’s’s way of communication of father’s image is to prevent the pathology of child and family due to the absence of father. Furthermore, the following hypothesis model was set up based on the indication that the management aspect and the conversation contents are related to each other (Okuno, 2009) on how to convey father’s image by mother.

Methods

1. Preliminary survey

1) Survey target

42 university students in Japan (42 valid responses, 17 men, 25 females, $M=20.19$, $SD=1.58$) was survey target.

2) Questionnaire form

We request to reply with free description on the following with the instruction of “please respond to the recent situation of the family” on the survey. Regarding the circumstance of mother talking about her husband, we asked for answer what and how mother talks about her husband on the following 8 items on free description. The 8 items were ①Contents ② Reason ③Frequency ④ Status ⑤ Phrase ⑥ Attitude ⑦Facial expression ⑧Gaze.

Analysis: The results obtained were classified by using the KJ method, and question items were created. We referred Itakura (2013) who created question items on father-related information transmission between mother and child when creating question items on the content side.

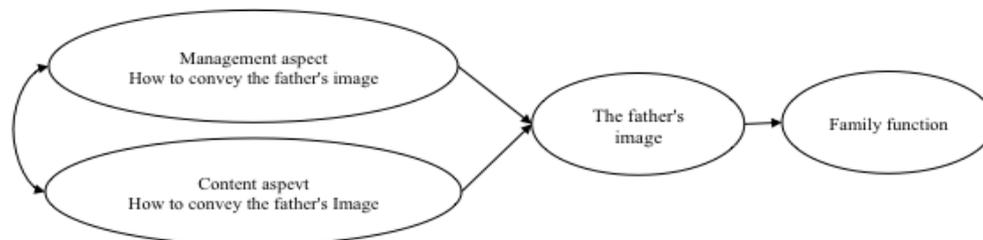


Figure 1: Hypothesis model in this study

2. The survey

1) Survey subjects: We analyzed 217 people who answered that their parents are healthy (97 men, 120 females, $M=19.89$, $SD=1.06$) after distributing questionnaires to 237 college students.

2) Questionnaire form

We distributed the questionnaires using a part of the lecture time of the university. Also, we explained and gained consent that the individual is not specified because the answer is processed statistically and that the survey result is not used except for research.

(1) Face sheet

We asked for gender, age, family composition.

(2) Question regarding how mother convey father’s image

It is a question about how to convey the image of father by mother created from the preliminary survey. We asked for responses in the six laws of "management does not apply at all (1 point)" to "very applicable (6 points)" for 45 items on the management side and 13 items on the content side.

(3) Question on father’s image (Hanashi -ma, 2007)

Five items with large factor loads were selected for "strict nonflexibility", "intimacy", "respect and trust", "emotion understanding", "affection" and "facing attitude", respectively. We asked to answer in the 6 methods of "not applicable at all (1 point)" to "very applicable (6 points)" for all 30 items.

(4) Family function measurement scale (Kusada, Okado, 1993)

We asked to answer in the 5 methods of “absolutely not (1 point)” to “always (5 points)” on 10 items of adaptability, 10 items of cohesiveness, the total of 20 items.

3) Analysis

The factors were extracted by conducted the factor analysis on management aspect and the content aspect from the questions about how mother conveys father’s image. Furthermore, multiple regression analysis was performed with father’s image, extracted factor, family function as dependent variable. Based on the prediction of multiple regression analysis, we tried to construct a model by covariance structure analysis using Amos from the four aspects of management aspect of father image transmission by mother, content aspect father image transmission by mother, father image and family function.

Results

1. Consideration on how to convey father’s image by mother

1) Management side

From the 45 items on the management side, average values and standard deviations were calculated for each item in order to exclude items where extreme score bias was observed. The 3 items of “When mother talks about the father, she gets stuck in a story.” ($=0.93$), “The mother looks down when she talks about the father.”($=0.94$), “The mother talks like a soliloquy when she talks about the father.”($=0.93$), shows the floor effect and were deleted. After that, the factor analysis on 42 items on the management side was performed

using maximum likelihood method and promax rotation. As a result, 5 factors (23 items) were extracted considering the attenuation rate of eigenvalues and interpretability. To select factor items, factor analysis by maximum likelihood method and promax rotation was performed repeatedly with the condition of the contribution ratio of each factor is contributed

by .40 or more. At the end five factors were determined from 23 items. Table 1 shows the final factor pattern and factor correlation after promax rotation.

The first factor was labelled "peaceful" as it shows mother talks about the father in bright atmosphere like " When the mother talks about the father, she smiles ", " When the mother

Table 1: Results of factor analysis on the items of management aspect of how to convey father's image by mother

Item description	F1	F2	F3	F4	F5
peaceful $\alpha=.901$					
When the mother talks about the father, she smiles.	0.92	-0.05	-0.09	0.04	0.05
When the mother talks about the father, she has sweet expression.	0.9	-0.04	-0.09	0.1	0.14
The mother talks humorously and funny about the father.	0.86	0.21	0.01	0.02	-0.08
The mother talks happily about the father.	0.77	-0.18	0.11	0.13	-0.11
When the mother talks about the father, she has light and bright tone	0.74	0.07	-0.06	-0.01	-0.07
When the mother talks about the father, she is not active.	-0.57	0.09	-0.03	0.13	0.1
The mother talks about the father when he is.	0.55	0.05	0.21	-0.11	0.04
Callousness $\alpha=.902$					
When the mother talks about the father, she rolls her eyes.	0.14	1.01	-0.04	-0.18	0.13
When the mother talks about the father, she uses cool tone.	0.11	0.95	0.01	0.03	0.16
When the mother talks about the father, she has unpleasant expression.	-0.13	0.68	0	0.15	-0.07
When the mother talks about the father, she looks tired.	-0.16	0.67	-0.01	0.1	-0.04
When the mother talks about the father, she looks sullen.	-0.12	0.66	0.01	0	-0.1
When the mother talks about the father, she do not sound pleasant.	0.07	0.6	-0.08	0.2	-0.1
When the mother talks about the father, she uses the phrase to look him down.	0.01	0.6	0.22	-0.11	-0.07
Involving $\alpha=.760$					
When the mother talks about the father, she asks you for agreement.	-0.02	0.04	0.89	-0.04	0.08
When the mother talks about the father, she asks you for opinion.	0.03	-0.13	0.81	0.16	0.02
When the parents cannot communicate well, the mother talks to you about the father.	0.06	0.18	0.49	-0.06	-0.12
awkwardness $\alpha=.749$					
When the mother talks about the father, she talks hesitate.	-0.04	0.02	0.07	0.75	-0.08
When the mother talks about the father, she talks too formally	0.11	-0.15	0.01	0.75	0.14
When the mother talks about the father, she talks with more nervous than usual.	-0.02	0.2	-0.02	0.67	-0.01
serious $\alpha=.630$					
When the mother talks about the father, she talks calm.	0.09	-0.08	0.03	-0.09	0.77
When the mother talks about the father, she talks coldly with bland tone.	-0.19	0.08	-0.15	0.09	0.58
When the mother talks about the father, she has serious expression.	-0.12	0.11	0.16	0.19	0.54
factor correlation	F1	F2	F3	F4	F5
F1		-0.62	0.06	-0.39	-0.01
F2			0.27	0.42	-0.12
F3				0.01	-0.25
F4					0.27

talks about the father, she has sweet expression", " The mother talks humorously and funny about the father". The second was labelled “Callousness”as it shows mother’s’s negative attitude against the father like “When the mother talks about the father, she rolls her eyes”, “When the mother talks about the father, she uses cool tone”, “When the mother talks about the father, she has unpleasant expression ”. The third factor was labelled “Engulfment” as it is an act to involve child into parent relationship like “When the mother talks about the father, she asks you for agreement”, “When the mother talks about the father, she asks you for opinion”, “When the parents cannot communicate well, the mother talks to you about the father”. The fourth factor is labelled “awkwardness" as it shows high load on the items indicating passive attitudes like

the father, she talks too formally”. The fifth factor was labelled “serious” as it shows the “When the mother talks about the father, she talks hesitate”, ”When the mother talks about high load on the items indicating serious atmosphere like “When the mother talks about the father, she talks calm”, “When the mother talks about the father, she talks coldly with bland tone”. On cronbach’s coefficient alpha, the results were followings, "peaceful"; $\alpha=.901$, “Callousness”; $\alpha=.902$, "Involving"; $\alpha=.760$, "awkwardness"; $\alpha=.749$, “serious”; $\alpha=.630$. The third factor, the fourth factor and the fifth factor have an cronbach’s coefficient alpha of 0.8 or less, and it is necessary to pay attention to statistical interpretation, but we will use it for analysis in order to examine the management aspect in detail.

Table 2: Results of factor analysis on the items of content aspect of how to convey father’s image by mother

Item description	F1	F2
Reference to father’s presence $\alpha=.813$		
My mother talks about what my father is interested in.	0.89	-0.2
My mother talks about my father's hobby.	0.88	-0.12
My mother talks about memory with my father.	0.57	0.08
My mother talks about my father's past episode.	0.53	0.29
My mother talks about what my father thinks.	0.48	0.21
My mother talks about my father's day-to-day situation.	0.42	0.04
mother’s perspective to the father $\alpha=.633$		
My mother talks to about her dissatisfaction with my father.	-0.15	0.69
My mother talks frankly about my father.	0.05	0.62
My mother talks about my father's character.	0.29	0.44
Factor correlation	I	II
F1		0.36

2) Content aspect

To exclude items with extreme bias in score from 13 items of content side, the average value and the standard deviation were calculated. No floor effect or ceiling effect was seen. Factor analysis was conducted on 13 items on the content side by maximum likelihood method and promax rotation. As a result, two factors were extracted considering the attenuation rate of eigenvalues and interpretability. To select factor items, factor analysis based on maximum likelihood method and promax rotation was performed repeatedly, with the contribution ratio of each factor contributing more than .40. Finally, two factors were determined from nine items. Table 2 shows the final factor pattern and factor correlation after promax rotation.

The first factor consists of 6 items, and it shows high load on the content of father’s interest or his day-to-day situation such as “ My mother talks about what my father is interested

in ”, “ My mother talks about my father’s hobby ”, “ My mother talks about memory with my father”. Therefore, it was labeled as “reference to father presence”. The second factor consists of 3 items, and it shows high load on the content which shows how mother’s thinks about father such as “My mother talks to about her dissatisfaction with my father ”, “mother talks frankly about my father”. Therefore, it was beled as “mother’s viewpoint on father”. On cronbach’s coefficient alpha, the results were followings, “reference to father presence” ; $\alpha = .813$, “mother’s viewpoint on father” ; $\alpha = .633$.

2. Model structure on how to convey father’s image by mother, father’s image, and family function

Based on the hypothetical model (Fig. 1), we constructed a related model of how mothers transmit father’s image to their child , father images, and family functions. We analyzed

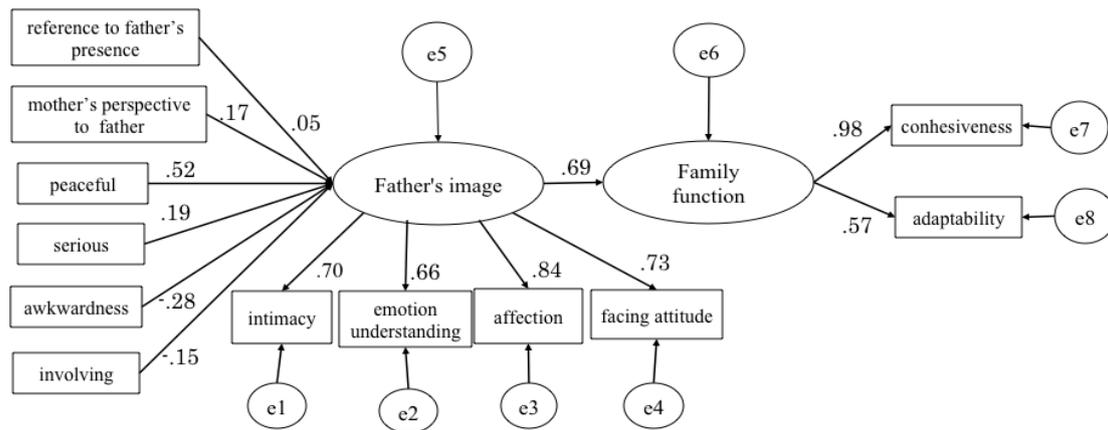


Figure 2: Prediction model of relation between how to convey father’s image by mother to children, father’s image, and family function

using data of 97 males and 119 females, total of 216 people ($M = 19.89$, $SD = 1.067$) and input the average value for the missing values for convenience of the analysis. In constructing the model, we conducted multiple regression analysis by stepwise method with management aspect and content aspect of father’s image told by mother to child as explanatory variables and father’s image as dependent variable. In addition, multiple regression analysis was performed using father’s image as explanatory variable and family function as dependent variable. We constructed the model by predicting the results of these multiple regression analysis. The model at this time is shown in Fig.2. In the following models, the correlation coefficient between explanatory variables is omitted due to the complication of the notation. The general fitness criteria of the model was set as $GFI > .90$, $AGFI > .90$, $RMSEA < .05$. At this time, the fitness index of the model was $\chi^2(38) = 100.980$ ($p < .000$), $GFI = .931$, $AGFI = .858$, $CFI = .925$, $RMSEA = .088$, $AIC = 180.980$.

After that, we corrected the model. When making modifications, we removed not meaningful paths and added paths within a range that is theoretically understandable with reference to the correction index. As a result, it was constructed with "peaceful" "serious" for “how to convey the father’s image by mother to child” as management aspect and “reference to father’s presence” as content aspect, “intimacy” “emotion understanding” “affection” “facing attitude” for father’s image, “cohesiveness” “adaptability” for family function in the final model. The model at this time is shown in Fig.3. The fitness index of the final model was $\chi^2(22) = 30.805$ ($p = .100$), $GFI = .971$, $AGFI = .940$, $CFI = .987$, $RMSEA = .043$, $AIC = 76.805$. Since model fitness improved, we adopted a model.

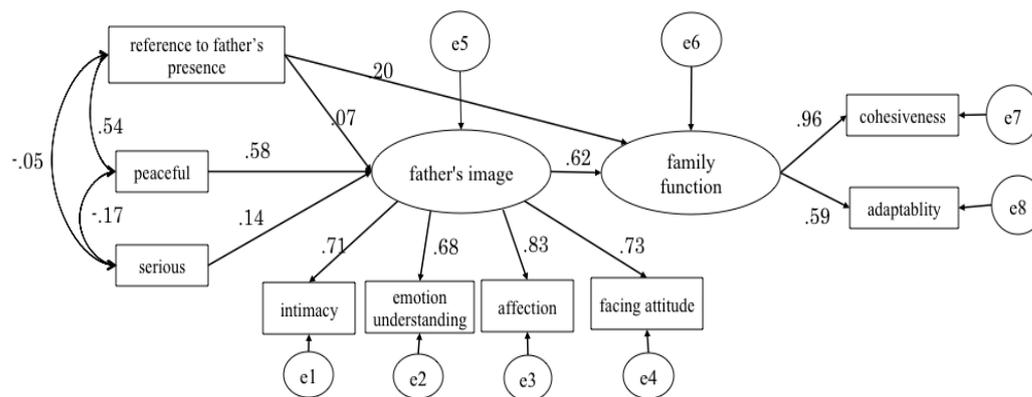


Figure 3: Final model of relation between how to convey father’s image by mother to children, father’s image, and family function.

Discussion

1) Communication behavior on how to convey father's image from mother to child

As a result of investigating on factors how mother's transmission of father image to their child is composed, 5 factors "peaceful" "coldness" "involving" "awkwardness" "serious" for management aspect, 2 factors "reference to father's presence" "mother's viewpoint of father" for content aspect were extracted. In the previous study, it was pointed out that the scene where of mentioning father between mother and child was the scene where mother praises father or talks positive image of father, or the involving scene which mother complains about father to child when parents fight (Toda et al. 2002; Yamamoto & Ito, 2012). In other words, the information on father was either positive or negative. However, in this study, we can say that by focusing on the management and content aspects of communication, it was possible to show the characteristics of mother's more specific behavior when conveying father's information from mother to child.

"Peaceful" and "coldness" from management aspect are composed with items that show mother's perception of father, and it can prove to indicate parents' relationship directly. "Involving" is an action that mother seeks consent from child and it involves child in parents' relationship. Moreover, it is considered to be an action to involve child in the married couple's conflict as it contains the item "When the parents cannot communicate well, the mother talks to you about the father".

However, if it is "involving" when referring to the positive aspect of father, it is considered to have a positive effect on father's image and it is necessary to examine the management items more carefully. "Awkwardness" is composed of factors such as mother talking uncomfortably, talking too formally, and is an avoidance attitude towards the reference to father. Finally, "serious" consists of items such as mother talking calmly, serious expression, which shows that the interpersonal distance with their child is centrifugal. From these factors, it can be considered to contain aspects how is mother's perception of father and how she maintains and communicates the interpersonal system with child in the management action related to the way mother transmits father's image to child.

In content aspect, In "reference to father's presence", mother shows father's day-to-day situation and father's specific episode. On the other hand, "mother's perspective to father" shows her viewpoint of father. Therefore, it indicates that there are two methods of presenting information such by talking father's day-to-day situation or his hobby or by talking her perspective and thought of father when mother conveys the information of father to child.

2) How to communicate effectively to improve father's image that their child perceives

In this study, It is shown that mother talking about father peacefully with a smile or bright tone, or mother talking calmly and seriously with a serious expression is effective to

improve father’s image that child perceives. From this, it is considered that even though talking “peacefully” on a daily basis, talking “seriously” when you need to tell father’s feeling or thought to child will improve father’s image that child perceives. Having mother talking about father “peacefully” doesn’t only constitutes child’s good father’s image but also leads to mother showing a good relationship with father, and it promotes the clarification of intergenerational boundaries (Minuchin, 1974). It is also indicated from the fact that management aspect’s “peaceful” has bigger influence on father’s image than content aspect’s “reference to father’s presence”. In other words, in addition to the actions to convey father’s information, parent’s good relationship is transmitted to child by management aspect “peacefully”, and it is considered to affect father’s image that child perceives positively. This is consistent with the finding (Toda et al., 2002) that the mother’s function to adjust father and child influences image of fathers recognized by their child by mediating parents’ good relationship.

Furthermore, among mother’s way of communicating father’s image, “seriousness” was also shown to be a mother’s management behavior to improve father’s image of child. “Serious” is composed of items such as “talk calmly” “talk coldly with bland tone” “being a serious expression”, at first glance it seems to act in a centrifugal (direction to collapse interpersonal relationship) in the interpersonal system. However, Okuno (2008) proposes “interactional space communication” as a

communication that elicits independence of the conversation partner while maintaining the sense of distance with the conversation partner. This is a communication used by experts in medical and educational situations, while indicating afferent using nod or gaze, etc. in non-language (direction to maintain interpersonal relationship), it also indicates efferent using affirm and honorific expression at the end of sentence in language. If the communication behavior of “serious” obtained in this research is also “interactional space communication”, it seems that movement of system in the opposite direction exists in language and non-language. In other words, there is a possibility that it may be afferent with non-language such as gaze and nodding. For the convenience of the questionnaire survey, we are unable to clarify the distinction in this study, but the communication behavior of “serious” enable to convey the necessary information to the other person clearly while mother talks about father without increasing the intimacy, and maintaining the interpersonal distance.

In the content aspect regarding how to convey father’s image by mother, since “reference to father’s presence” was included but “mother’s viewpoint of father” was not included in the model it is considered that mother talking about father’s hobby or father’s situation to child is more effective than mother’s perspective to father to improve father’s image of child. In addition, since “reference to father’s presence” has a moderately positive correlation with management aspect “peaceful”, it shows that

content aspect and management aspect of mother's transmission of father's image to their child are mutually related.

3) Relationship with family function evaluation

The family function scale used in this study was created by Kusada & Okado (1993) translating Olson's FACES III into Japanese. Olson's circular model consists of three dimensions of cohesion, adaptability, and communication. Cohesiveness is the emotional connection of families and adaptability indicates coping with problems and changes. The circular model assumes a curve linear hypothesis that familial function works best when adaptability and cohesiveness are intermediate levels. However, as a result of examining the reliability and validity in Japanese families, the curve linear hypothesis is not demonstrated and the stability is confirmed as a linear scale that the higher the cohesion is better (Kusada, 1995). In addition, in Noguchi (2009), it is reported that the stronger the family ties, the higher the youth's family satisfaction is. Therefore, we will consider it assuming that higher cohesiveness is positive for family in this study. From the results of this study, it is shown that "peaceful" and "serious" in mother's way of communicating father's image promotes cohesiveness of child's family recognition by mediating child's good father's image. Therefore, how mother tells child about father is considered to have influence on emotional ties in the family. In Japan, it is said that mother-child relationship is stronger than father-child relationship as it is

called "mother-child adherence / father absence", but by utilizing its characteristics, mother can communicate father's information to child to increase family cohesiveness.

In addition, this study suggested that a youth's good father's image has a positive influence on adaptability evaluation of family function. As mentioned above, family adaptability refers to how to solve family problems adaptively. It is reported that such problem solving is highly evaluated by children in youth who consider that fathers have authority in their families (Nakami & Katsurada, 2008). Father's authority mentioned here is regarded as on father's presence and an influence on the ultimate decision - making authority on the family. A good relationship between father and his family is necessary as a precondition for the decision power of father to effectively work on family problem solving. If the relationship between father and his family is not good, the problem solving by father will stay in the pretending situation that the family superficially or temporarily follows the decision of father (Tamura, 1997). Therefore, how to convey father's image to their child from mother becomes important. Based on the results of this study, it is important to show the good relationship of parents by management of reference about father in the situations like mother talking positive information on father in a bright atmosphere, sometimes talking about father seriously. It is considered that these management behaviors by mothers constitutes a good father's image of youth and brings

awareness of family relationship that father’s influence acts on family problem solving effectively.

4) Clinical implications

In this study, it was shown that the way mother conveys father’s image to child has an influence on father’s image of the youth and furthermore has a positive influence on the evaluation of the family function recognized by the youth. In case father-child relationship is not well due to lack of communication or conflict, mother’s peaceful transmission of father’s good image increases the intimacy between father and child. Sometimes, talking calmly with a serious expression also has an influence on father’s image and family function recognition of child.

On the other hand, in families whose father tends to be away due to work, direct communication between father and child is reduced. Moreover, it is difficult to show the good relationship between parents directly. Therefore, it can be said that it shows the possibility that mother influences the positive father’s image of their child and improves the evaluation of the family function by considering how mother to convey father’s image to their child. Furthermore, when treating family problems in psychological clinical situations, when the presence of a father and the position are weak, from the family structure approach it is assumed that the relationship between father and other members in the family is sparse, we can intervene on how mother refers to father. This research

suggests the possibility that the way mother to mention on father may help to change the family system by promoting recognition of family functions by mediating child’s father image.

Conclusion

In this study, it presented the communication relate to how mother conveys father’s image to their child and how the communication improves their child’s image of father and family function. In the way of transmitting father’s image, it is effective to convey it peacefully and seriously. And it shows that the evaluation of the family function of the young is also enhanced with positive father’s image created by the way mother communicated.

However, in this reserach, there is no focus on the direct communication between father and child. In the future, it is necessary to clarify the effect of transmission of father’s image by mother to their children by inputting direct communication of father-child as a variable in order to investigate whether father’s image of a youth is composed by the transmission of father’s image by mother to children. Furthermore, based on the findings obtained in this study, it will be important to accumulate case studies that have been utilized for actual clinical site support.

Appendix

This paper is with additional and modification from a part of the graduation thesis submitted to the Department of

Humanities and Social Sciences of Iwate University in 2015. We would like to express our sincere gratitude to everyone who cooperated in the research.

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Factors affecting workers' mental health based on gender differences
-From the perspective of workplace satisfaction, marital coping, and WLB-

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ABSTRACT. Correlations among workplace satisfaction, marital coping, and Work-Life Balance (WLB) were examined based on gender to identify factors affecting workers' mental health. The results indicated that "job content" in workplace satisfaction and "delegated dyadic coping by the self" as well as "negative dyadic coping by the partner" in marital coping directly affected the mental health of male workers. On the other hand, job content and "delegated dyadic coping of the partner" as well as "negative dyadic coping by the partner" directly affected the mental health of female workers. Moreover, it was suggested that in both men and women, job content and negative dyadic coping by the partner might affect workers' mental health, mediated by "commitment to work," which is one WLB factors.

KEY WORDS: *workplace satisfaction, marital coping, work-life balance, mental health levels*

Introduction

The current economic situation is severe, and problems related to workers' mental health have been attracting attention. Based on the Charter for Work-Life Balance and the Action Guidelines for Promoting Work-Life Balance, the Cabinet Office (2015) has been conducting measures to achieve work-life balance (WLB). It has been indicated that the deterioration of WLB could increase depression, anxiety disorders, and psychological stress responses (Shimizu, 2014). Therefore, it is considered necessary to maintain an appropriate WLB to sustain the mental health of workers.

Various factors have been identified as affecting workers' mental health. These include

working time, human relationships in workplaces, support of the boss and colleagues, the workload, discretion, and pay, among others (Fujino, Horie, & Hoshuyama et al., 2006). Moreover, Faragher, Cass, and Cooper (2005) conducted a meta-analysis and indicated that the satisfaction with work was strongly related to mental and psychological issues. Job satisfaction is an important factor that affects workers' mental health. When job satisfaction is high, mental health improves. On the other hand, when job satisfaction is low, workers' mental health deteriorates.

Factors related to the home in addition to work-related factors should be considered when discussing workers' mental health and WLB. Marital relationships are known to highly influence the mental health of married people, (Ito, Sagara, & Ikeda, 2004). Kawashima,

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Yoshitake, and Matsumoto (2014) examined correlations between marital coping and depression and indicated that when the frequency of affirmative marital coping increases, depressive tendencies decrease, and when the frequency of negative marital coping increases, depressive tendencies also increase. It has also been suggested that affirmative marital coping might decrease correlations between stress and anger as well as aggressiveness (Bodenmann, Meuwly, & Bradbury et al., 2010). These results suggest that dyadic coping between a husband and a wife might be one of the factors affecting workers' mental health.

Okubo, Matsuzaka and Takahashi et al (2011) surveyed workers' depression. The results indicated that workplace factors such as job and workplace satisfaction, workload, and work discretion affected depression in men under 39 years of age, whereas workplace factors did not affect the depression in women working in the same workplace, but the health levels and family/friend satisfaction levels affected depression in women. It is considered that the effects of workplace factors on mental health are stronger in men, compared to women. On the other hand, wives have more home-to-work conflicts, compared to husbands. When husbands perform a larger proportion of housework and childcare, the home-to-work conflicts of wives decrease (Matsuda, 2006). Shimada, Shimazu, and Kawakami (2012) examined correlations between WLB and mental health in double-income married couples having pre-school children. The results

indicated that negative spillover from work to home was positively correlated one year later with psychological stress responses in men. On the other hand, psychological stress responses in women one year later had a positive correlation with qualitative load at home, whereas it had a negative correlation with discretion at home. Also, Ito et al. (2004) suggested that satisfaction with marital relationships might have stronger effects on women's subjective well-being than workplace satisfaction. Moreover, Kato and Kanei (2006) focused on coping behaviors with Work-Family Conflict (WFC) and indicated that flexible role assignment between a husband and wife had positive effects on mental health and marital satisfaction in women. It is suggested that marital coping increases commitment to the home, which leads to an improvement in mental health levels.

However, only a few studies to date have comprehensively examined the correlations among workers' mental health, WLB, workplace factors, and home factors. Moreover, the effects of workplace factors and home factors on the achievement of WLB have not been clarified (Kato, 2009). Kanei (2002) suggested that men tend to place a heavier emphasis on work, whereas women do so on the family. In men, job satisfaction increases commitment to work, such as "always thinking about work even on holidays," and an increase in commitment to work predicts a deterioration of mental health. On the other hand, home factors such as role assignment between the husband and wife might have stronger effects

on the mental health of women. In the case of women, marital coping increases the commitment to home, such as “valuing time with family on holidays,” and the increase in commitment too home improves their mental health.

Based on the above considerations, this study considered workplace satisfaction as a workplace factor and marital coping as a home factor and investigated correlations among WLB, workplace satisfaction, marital coping and mental health based on gender, to identify factors that affect workers’ mental health. Figure 1 shows a model of the hypothesis of this study.

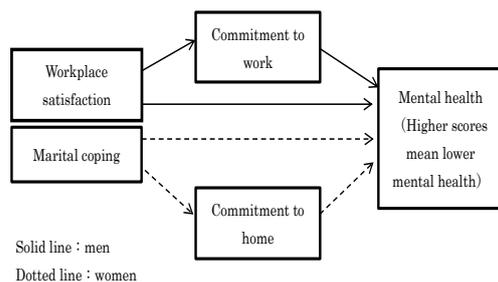


Figure 1. Model of the Hypothesis

Hypothesis 1: Workplace satisfaction would have a positive effect on mental health scores of men mediated by commitment to work. Moreover, workplace satisfaction would have a direct negative effect on mental health scores.

Hypothesis 2: Marital coping would have a negative effect on mental health scores of women mediated by commitment to the home. Moreover, marital coping would have a direct negative effect on mental health scores.

Methods

1. Participants

A questionnaire was administered to married workers aged 30-49 years (N=241) in a survey conducted from December 2016 to February 2017. The number of questionnaires distributed was 335, of which 241 were collected (response rate of 72%). Among them, responses with deficiencies (N=3) were excluded, and 238 datasets were analyzed.

2. Procedures

Questionnaires were distributed using the snowball sampling technique. The authors requested the participants to respond to the questionnaire through acquaintances and delivered it by hand or by post. The following explanation was given on the cover of the questionnaire; the data obtained through the survey would be anonymously processed statistically, such that individuals would not be identified. The privacy of the participants would be carefully protected, and the would be used only for fulfilling the objectives of the study. Participants can freely stop responding if they feel any difficulties in responding or do not feel like responding. Responses have to be made only if the participants agree with the objectives of this study.

3. Measures

(1) Mental health

The Japanese version of the Kessler Psychological Distress Scale (K6) developed by Kessler, Andrews, and Colpe et al. (2002) and translated by Furukawa, Kawakami, and Saitoh et al. (2008) was used. In this scale, the

mental health level is considered to be low when the score of adding the six-item score is high, whereas mental health is considered to be high when the score is low. Participants were requested to respond to all the six items using a five-point scale: 0 (*None of the time*), 2 (*Some of the time*), 3 (*Most of the time*), and 4 (*All of the time*).

(2) WLB

The WLB scale for husbands and wives developed by Ogata (2013) was used. This scale consists of four factors; “utilization of leisure time (e.g. “I enjoy my hobbies when I have time.” 5 items),” “commitment to home (e.g. “I value the time I spend with my wife (or husband) on vacation.” 7 items),” “commitment to work (e.g. “Sometimes I cannot get my job out of my mind even on vacation.” 7 items),” and “local community exchanges (e.g. “I have quite a few interactions with people in the community on my holidays.” 3 items).” Participants were requested to respond to all the 22 items using a four-point scale: 1 (*Not at all*), 2 (*No*), 3 (*Neither no or yes*), and 4 (*Yes*).

(3) Workplace satisfaction

The scale of satisfaction with the workplace environment, job content, salary, and human relationships (Adachi, 1998) was used. This scale consists of four factors; “job content (e.g. “I am interested in my job.” 9 items),” “workplace environment (e.g. “Opinions and demands of the staff are accepted in my company.” 8 items),” “salary (e.g. “My job performance and salary are well-balanced.” 6

items),” and “human relationships (e.g. “I have good human relations at my workplace.” 10 items).” Participants were requested to respond to all the 33 items using a four-point scale: 1 (*Unsatisfied*), 2 (*Rather unsatisfied*), 3 (*Rather satisfied*), and 4 (*Satisfied*).

(4) Marital coping

The Japanese version of the Dyadic Coping Inventory, developed by Bodenmann (2008) and translated by Kawashima et al. (2014) was used. This scale is composed of 10 factors; Stress communication by the self (e.g. “let my partner know that I appreciate his/her practical support, advice, or help,” 4 items), Supportive dyadic coping by the self (e.g. “I show empathy and understanding to my partner,” 5 items), Delegated dyadic coping by the self (e.g. “When my partner feels he/she has too much to do, I help him/her out,” 2 items), Negative dyadic coping by the self (e.g. “I blame my partner for not coping well enough with stress,” 4 items), Stress communication of the partner (e.g. “My partner lets me know that he/she appreciates my practical supports, advice, or help,” 4 items), Supportive dyadic coping of the partner (e.g. “My partner shows empathy and understanding to me,” 5 items), Delegated dyadic coping of the partner (e.g. “When I am too busy, my partner helps me out,” 2 items), Negative dyadic coping by the partner (e.g. “My partner blames me for not coping well enough with stress,” 4 items), Common dyadic coping (e.g. “We try to cope with the problem together and search for ascertained solutions,” 5 items), and Evaluation of dyadic coping (e.g.

“I am satisfied with the support I receive from my partner and the way we deal with stress together,” 2 items). Negative dyadic coping by the self and negative dyadic coping by the partner are invert items. This study focused on the concrete behaviors of marital coping. Therefore, two items for evaluating dyadic coping were excluded from the analysis.

Participants were requested to respond to all the 37 items using a five-point scale: 1 (*Very rarely*), 2 (*Rarely*), 3 (*Sometimes*), 4. (*Often*), and 5 (*Very often*).

(5) Basic attributes

The gender, age, employment status, occupations, positions, working hours, working

Table1. Demographics

	Men (N=140)	Women (N=98)	Total (N=238)
<Age>			
30~39 years old	94 (67.14%)	48 (48.98%)	142 (59.66%)
40~49 years old	46 (32.86%)	50 (51.02%)	96 (40.34%)
<Employment status>			
Regular staff	134 (95.71%)	66 (67.35%)	200 (84.03%)
Part-time workers	1 (0.71%)	31 (67.35%)	32 (13.45%)
Self-employed	5 (3.57%)	1 (1.02%)	6 (2.52%)
<Occupations>			
Sales work	32 (22.86%)	2 (2.04%)	34 (14.29%)
Clerical work	58 (41.43%)	59 (60.20%)	117 (49.16%)
Service business	2 (1.43%)	7 (7.14%)	9 (3.78%)
Professional work	28 (20.00%)	22 (22.45%)	50 (21.01%)
Technical work	17 (12.14%)	2 (2.04%)	19 (7.98%)
Others	1 (0.71%)	1 (1.02%)	2 (0.84%)
Unknown	2 (1.43%)	5 (5.10%)	7 (2.94%)
<Positions>			
Managerial positions	40 (28.57%)	7 (7.14%)	47 (19.75%)
Non-managerial positions	99 (70.71%)	89 (90.82%)	188 (78.99%)
Unknown	1 (0.71%)	2 (2.04%)	3 (1.26%)
<Working hours>			
Less than 40 hours per week	11 (7.86%)	45 (45.92%)	56 (23.53%)
More than 40 hours per week	129 (92.14%)	53 (54.08%)	182 (76.47%)
<The length of service>			
1-5 years	16 (11.43%)	30 (30.61%)	46 (19.33%)
6-10 years	51 (36.43%)	31 (31.63%)	82 (34.45%)
11-15 years	37 (26.43%)	19 (19.39%)	56 (23.53%)
16-20 years	15 (10.71%)	11 (11.22%)	26 (10.92%)
over 21 years	21 (15.00%)	7 (7.14%)	28 (11.76%)
<Transfers>			
Have	64 (45.71%)	32 (32.65%)	96 (40.34%)
Do not have	76 (54.29%)	66 (67.35%)	142 (59.66%)
<The number of children living together>			
0	34 (24.29%)	31 (31.63%)	65 (27.31%)
1	39 (27.86%)	15 (15.31%)	54 (22.69%)
2	52 (37.14%)	37 (37.76%)	88 (36.97%)
3	16 (11.43%)	14 (14.29%)	30 (12.61%)
4		1 (1.02%)	1 (0.42%)

Note) The numerical values on the left side indicate the number of respondents, and those in parentheses on the right side indicate the percentage.

days, the length of service, the presence of transfers, family members living together, and their age were inquired.

Results

1. Demographics

Table 1 shows the basic attributes of the participants. There were 140 men and 98 women. Their mean age was 37.53 years (SD=5.98). Their employment status was as follows; full time workers (N=200), part-time workers (N=329), and self-employed people (N=6). The occupations of the participants included the following, sales staff (N=34), clerical staff (N=117), service business (N=9),

professionals (N=50), technical staff (N=19), others (N=2), and unknown (N=7). Their job positions included, managerial positions (N=47), non-managerial positions (N=188), and unknown (N=3). The mean working hours per week of the participants was 43.83 hours (SD=12.88) and their length of service was as follows; 1-5 years (N=46), 6-10 years (N=82), 11-15 years (N=56), 16-20 years (N=26), and over 21 years (N=28). The number of those that had been transferred was 96, and those that had not been transferred was 142. The number of children living together was below; 0 (N=65), 1 (N=54), 2 (N=88), 3 (N=30) and 4 (N=1).

Table 2. Mean values and SDs of each sub-scale score

	Mean	SD
Mental health	3.90	3.83
WLB		
Utilization of leisure time	14.03	3.19
Commitment to home	23.18	3.42
Commitment to work	15.39	3.29
Local community exchange	6.83	2.40
Workplace satisfaction		
Job content	25.77	4.44
Workplace environment	21.04	3.9
Salary	16.09	3.58
Human relationships	29.06	4.44
Marital coping		
Stress communication by the self (SCS)	13.16	4.31
Supportive dyadic coping by the self (SDCS)	16.71	3.68
Delegated dyadic coping by the self (DDCS)	6.47	1.68
Negative dyadic coping by the self (NDCS)	15.91	2.89
Stress communication of the partner (SCP)	13.18	3.60
Supportive dyadic coping by the partner (SDCP)	15.87	4.76
Delegated dyadic coping by the partner (DDCP)	5.29	1.84
Negative dyadic coping by the partner (NDCP)	15.70	3.35
Common dyadic coping (DDC)	15.14	4.73

2. Calculation of sub-scale scores

The mean values and SDs of each sub-scale score of mental health were calculated for WLB, workplace satisfaction, and marital coping scales (Table 2).

3. Examination of the model

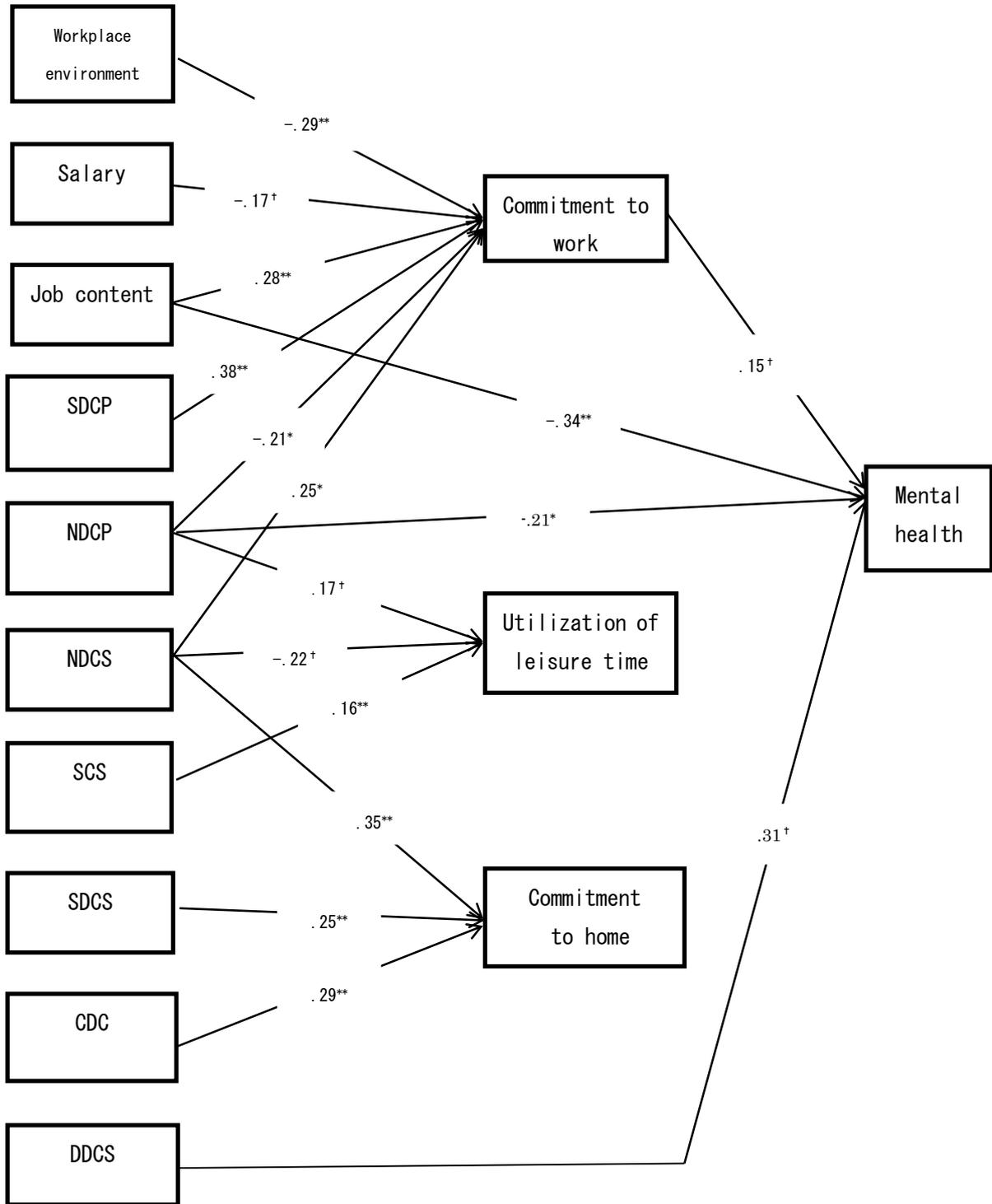
Path analysis was conducted based on gender using covariance structure analysis to examine the validity of the hypotheses. The results indicated the goodness-of-fit of the hypothesis model was rather low (Hypothesis 1: $\chi^2 = 91.94$, CFI = .852, RMSEA = .119, SRMR = .068, GFI = .844, AGFI = .671, Hypothesis 2: $\chi^2 = 73.05$, CFI = .855, RMSEA = .146, SRMR = .146, GFI = .848, AGFI = .489). Therefore, the hypothesis model was reexamined. Consequently, the model shown in Figure 2 was adopted for men and the model shown in Figure 3 was adapted for women. The results obtained by using the models are as follows:

- (1) Regarding WLB, workplace satisfaction affected commitment to work, and commitment to work had a positive effect on mental health scores regardless of the gender. Moreover, in women, marital coping affected local community exchanges and local community exchanges had a negative effect on mental health scores.
- (2) Regarding workplace satisfaction, job content had a direct negative effect on mental health scores, regardless of gender.
- (3) Concerning marital coping, negative dyadic coping by the partner had a direct positive effect on mental health scores in both genders.

Moreover, delegated dyadic coping by the self, had a direct positive effect on the mental health scores of men, whereas delegated dyadic coping of the partner had a direct positive effect on mental health scores of women. The goodness-of-fit indices of the model in men were $\chi^2 = 47.19$, CFI = .999, RMSEA = .014, SRMR = .035, GFI = .966, AGFI = .873, and those in women were $\chi^2 = 66.51$, CFI = .990, RMSEA = .035, SRMR = .057, GFI = .936, AGFI = .815.

Discussion

This study examined correlations among WLB, workplace satisfaction, marital coping, and mental health, to identify the factors that would affect workers’ mental health based on gender. Results indicated that the commitment to work had a positive effect on the mental health scores of men. Moreover, job content, negative dyadic coping by the self, and supportive dyadic coping by the partner also had positive effects on the commitment to work, whereas the workplace environment and negative dyadic coping by the partner had negative effects on the commitment to work. Furthermore, job content had a direct negative effect on mental health scores of men. On the other hand, it was indicated that negative dyadic coping by the partner might have a direct negative effect on mental health scores, whereas delegated dyadic coping by the self might have a positive effect on mental health

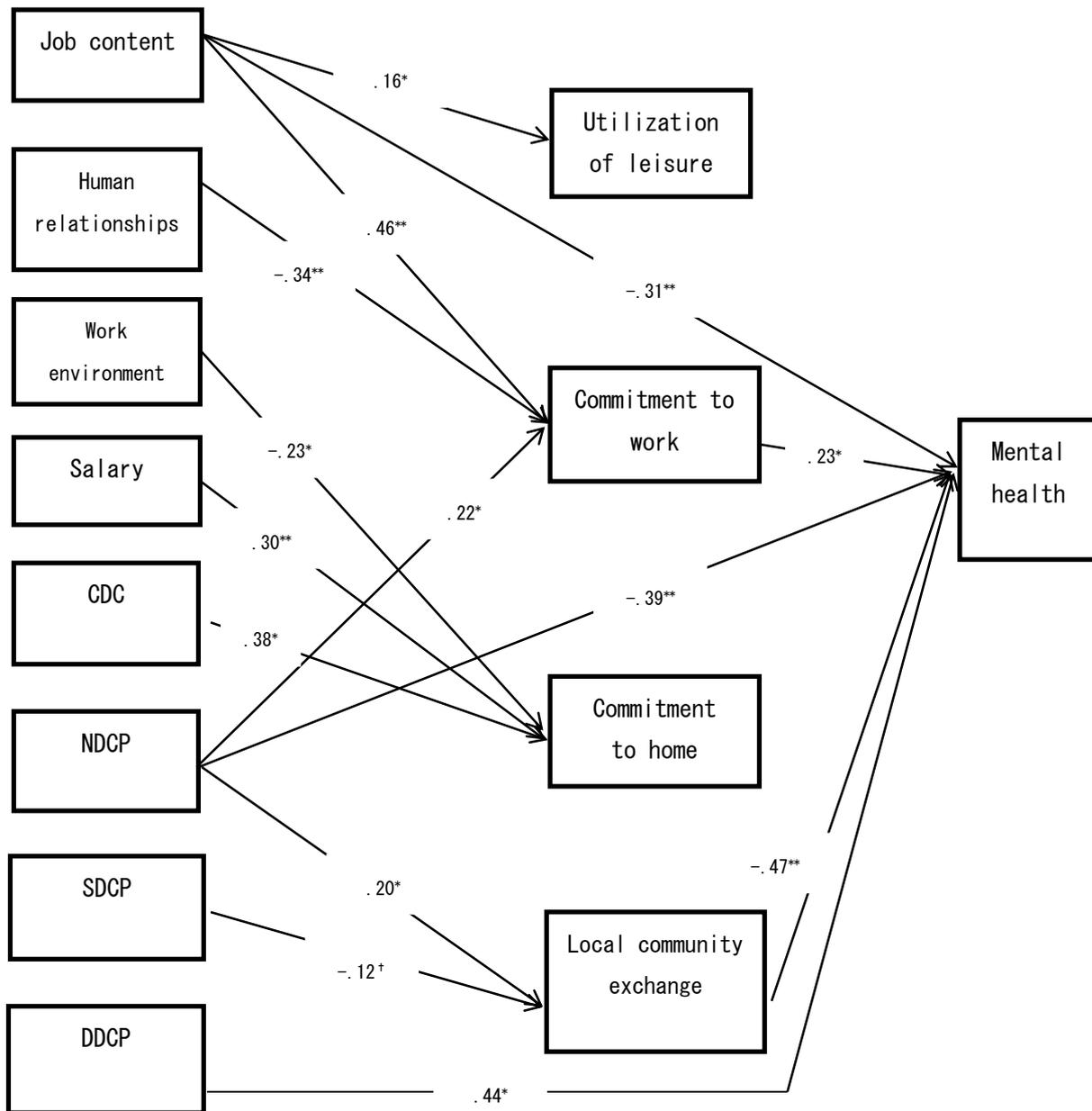


$P < .10^+$, $P < .05^*$, $P < .01^{**}$

Note) Only significant paths are indicated.

Note) Negative dyadic coping by the partner is an inverted item.

Figure2. The results of path analysis for men



$P < 10^{\dagger}$, $P < .05^*$, $P < .01^{**}$

Note) Only significant paths are indicated.

Note) Negative dyadic coping by the partner is an inverted item.

Figure3. The results of path analysis for women

scores. These findings partly supported Hypothesis 1.

In women, the commitment to work had a positive effect and local community exchanges had a negative effect on the mental health scores. Moreover, job content and negative dyadic coping by the partner had positive effects on the commitment to work, whereas human relationships had a negative effect on the commitment to work in women. Regarding local community exchanges, supportive dyadic coping of the partner had a negative effect and negative dyadic coping by the partner had a positive effect on it. Furthermore, negative dyadic coping by the partner had a direct negative effect on mental health scores and delegated dyadic coping of the partner had a direct positive effect on mental health scores. Job content had a direct negative effect on mental health scores also in women. These findings partly supported Hypothesis 2.

It has been indicated that job content directly affects mental health in both men and women. This result supports the idea that workplace factors are more difficult to manipulate than home factors (Higgins Duxbury, & Irving, 1992). When workers have complaints about their job content, in many cases, it is difficult to deal with it, which might directly affect their mental health. On the other hand, Thompson and Prottas (2006) indicated autonomy at work affected employees'

well-being. Moreover, it has been suggested that employees with high work engagement tend to be proactively involved in work, which has positive effects on their physical and mental health (Demerouti, Bakker, & Schaufeli et al., 2001). It could be possible that workers' mental health improves when their autonomy is valued, and workers are motivated to work.

It has been suggested that a person's mental health could decline when the marital partner shows a negative attitude to the person's stress regardless of gender. This result supports the crossover hypothesis (Westman & Jone, 2006), i.e. marital couples experiencing stress have many negative interactions and conflicts, and stress responses are propagated as a result. Moreover, marital coping has a stronger correlation with the quality of the marital relationship, compared to marital communication (Ledermann, Bodenmann, & Gagliardi et al., 2010). Negative attitudes and behaviors between married couples tend to escalate symmetrically (Watzlawick, Bavelas, & Jackson, 1967), which might deteriorate workers' mental health.

It has also been indicated that job content lowers the mental health scores of both men and women, mediated by the commitment to work. This result might be discussed from the perspective of being workaholic. Workaholic employees bring work into their homes and feel anxious

about leaving work, which deteriorates their mental health (Schaufeli, Taris, & Van Rhenen, 2008). Workers feeling that they must work excessively hard bring their work home, increase their psychological stress, and deteriorate the quality of the marital relationships, regardless of gender. On the other hand, it was suggested that local community exchanges might improve women’s mental health. Women tend to have interactions with people in the local community more often than men. Local community exchanges might play an important role in improving the mental health of women. The above results suggest that excessively high commitment to work might have negative effects on mental health. Therefore, stress buffering factors such as local community exchanges should be considered.

Furthermore, it was suggested that delegated dyadic coping by oneself might deteriorate the mental health of men, whereas delegated dyadic coping by the partner might deteriorate the mental health of women. Watanabe and Itakura (2017) reported that when a wife encourages a husband to take care of children, the wife’s home-to-work conflicts increased. On the contrary, when a mother suppressed a father’s involvement in childcare, her mental burden might decrease because she felt she was playing an important role as a

mother. Therefore, marital mental health might improve through decreasing the inconsistency between husbands’ delegate behaviors and wives’ needs. Moreover, Shimizu (2017) advocated in a keynote address that each person has an obligation called “*Yozou*” when they get married and start a family (Kozuka, Wakashima, and Hasegawa, 2018). *Yozou* is an active behavior that exceeds give-and-take relationships. “Delegated dyadic coping by the self” by men in this study is the *Yozou* to the home by men. However, further study on the issues below are required; Do women recognize it as *Yozou* to the home when men play a traditional role played by women? Shimizu (2017) suggested that admitting the diversity of family members is necessary for the home to (Kozuka, Wakashima, & Hasegawa, 2018). At home, each family member has a different position. Each family member thinks about how to behave, relate to one another, and the functions of the home, by maintaining these differences. In other words, “delegated dyadic coping by oneself,” i.e. men playing the traditional roles played by women implies that a married couple functions through copying “similarities instead of through admitting “differences”. It is possible that women would become deprived of their discretion at home because of this similarity. Therefore, women’s mental health might deteriorate as a result of “delegated

dyadic coping by the male partner". However, this study did not collect pair data on marital couples. Studies on WFC have investigated marital couples using pair analysis (Hammer, Allen, & Grigsby, 1997). In the future, data of married couples should be analyzed for conducting research with more elaborate designs.

This study indicated that workplace satisfaction did not affect the commitment to one's home in men, whereas the workplace environment and the salary affected the commitment to one's home in women. The above results differ from the findings of Okubo et al. (2011), i.e., men tend to bring work into their home more often than women. Approximately 70% of the female participants in this study were regular workers, which might have increased the degree of commitment to work. Workplace factors had a higher weight for these women, which might have increased its effect on the home. It is suggested that future studies take differences in employment status into consideration. Moreover, this study suggested the possibility that satisfaction with the job might directly improve mental health and commitment to work. On the other hand, it was also indicated that mental health deteriorated when satisfaction with the job content is mediated by commitment to work. The above results suggest that when a person is satisfied with the job content, his/her

mental health could be improved by work engagement. On the other hand, the work-life-balance might be lost when commitment to work increased through satisfaction with job content, which causes problems such as a workaholic leading to the deterioration of mental health. Based on the above results, it is suggested that both work engagement and workaholic processes should be examined in the future. This study comprehensively examined factors affecting workers' mental health, which might contribute to the achievement of workers' WLB and improve their mental health.

Note

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