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Research article

Association between mothers' problematic Internet use and maternal recognition of child abuse

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ABSTRACT

Background: There are few studies about mothers' problematic Internet use (PIU). Mothers' PIU may lead to inadequate parenting and child abuse.
Objective: This cross-sectional study aimed to clarify the association between mothers' PIU and their recognition of child abuse.
Participants and setting: We analyzed data collected of health examinations of children aged 4 months, 1.5 years, and 3 years which were carried out in Matsue City, Shimane Prefecture, Japan between April 2016 and March 2017. The number of the subjects were 1685, 1729, 1674, respectively.
Methods: We used logistic regression analysis to clarify the association between mothers' PIU (Young's Diagnostic Questionnaire for Internet Addiction score: ≥5) and their recognition of child abuse (selecting < True of me > for < I sometimes think that I am abusing my child > on a questionnaire survey), which was adjusted for covariates such as maternal age, number of children, daytime caretaker, social support, postpartum depression, and current smoking status of the parents.
Results: Based on the multivariate logistic regression analysis, the mothers' PIU was significantly correlated with their recognition of child abuse for children aged 4 months, 1.5 years, or 3 years [odds ratio (OR): 13.30, 95% confidence interval (CI): 1.26–139.98, OR: 7.02, 95% CI: 1.28–38.55, and OR: 28.06, 2.48–317.93, respectively].
Conclusion: This study revealed the possibility that mothers with PIU recognize child abuse more than mothers without PIU. However, further studies should be conducted to increase reliability and validity.

1. Introduction

Internet access has rapidly increased, and become indispensable for communication, information collection/transmission, and other facets of daily life. Parenting mothers use the Internet to exchange information and obtain emotional support (Hall & Irvine, 2009; McDaniel, Coyne, & Holmes, 2012; Plantin & Daneback, 2009). The Internet is a convenient tool, but there are concerns over problematic Internet use (PIU), which refers to a condition where difficulty in controlling Internet use negatively influences users'

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interpersonal relationships, social lives, and/or emotional stability (Ko, Yen, Yen, Chen, & Chen, 2012; Young, 1996). Furthermore, in a case report by Young (1996), the mother was engrossed in the Internet to the extent that she neglected cooking, cleaning, shopping, and other household duties, and consequently began to neglect her children. Thus, mothers' PIU may also increase the risk of child neglect.

To the best of our knowledge, there have been no studies in the English language on mothers' PIU. A few studies revealed that mothers' PIU led to sleep disorders in their children, negatively influencing their children's emotions and behaviors (Oka, Yamamoto, Hara, & Horiuchi, 2015). A sense of parenting burden, anxiety, and other negative emotions have been suggested to be associated with an increased risk of child abuse (Crouch & Behl, 2001; Crum & Moreland, 2017; Miragoli, Balzarotti, Camisasca, & Di Blasio, 2018). They have also been reported to be associated with mothers' PIU (Fujioka, Itose, Otake, & Tojiki, 2015).

In addition, other previous studies revealed an association between PIU and hostility/aggressive behaviors (Carli et al., 2013; Ko, Yen, Chen, Yeh, & Yen, 2009; Ko, Yen, Liu, Huang, & Yen, 2009; Lim et al., 2015; Xiuqin et al., 2010), but the causal relationship between these factors has yet to be clarified (Ko et al., 2012). When children are subject to their mothers' aggressiveness due to PIU, they may become victims of physical abuse, such as violence, or psychological abuse such as offensive statements. In previous studies, childhood abuse was found to be a predictor of future PIU (Schimmenti, Passanisi, Gervasi, Manzella, & Famà, 2014; Yates, Gregor, & Haviland, 2012). However, the association between mothers' PIU and abusing their children has remained unclear.

Therefore, the present study examined the association between mothers' PIU and their recognition of child abuse by them. Such recognition among mothers does not indicate their acts of abuse, but it clarifies their own feelings that they are abusing. As mothers who recognize that they are abusing their children are often anxious about parenting, it is necessary to identify mothers who are anxious about abusing their children and requiring parenting support from the perspective of abuse prevention (Yokoyama et al., 2011). By clarifying such an association, it may be possible to confirm that mothers' PIU leads to anxiety about child abuse. Moreover, it may reveal the possibility of these mothers developing PIU-related problematic parenting attitudes as a background factor associated with health problems in their children such as sleep disorders.

2. Methods

2.1. Study design and data sources

We conducted a cross-sectional study in Matsue City, Shimane Prefecture, between April 2016 and March 2017 to analyze data of the health examinations of children aged 4 months, 1.5 years, and 3 years. Matsue City is a provincial city and has a population of approximately 200,000 with a birth rate of 1700 births per year, and 99.5%, 98.3%, and 97.9% of children aged 4 months, 1.5 years, and 3 years participate in the health examinations provided in the city. Recorded data was obtained after administering the Young's Diagnostic Questionnaire (YDQ) for internet addiction to mothers (Young, 1998) during health examinations; these data were provided to us by Matsue City along with the data for children using unlinkable anonymization. Thus, the present study enrolled 1,733, 1,798, and 1754 children aged 4 months, 1.5 years, and 3 years, respectively.

The exclusion criteria included the following: multiple births (4 months: 22; 1.5 years: 26; and 3 years: 28) that may increase the risk of abuse (Lang, Cox, & Flores, 2013; Lindberg et al., 2012; Ooki, 2013; Yokoyama, Oda, Nagai, Sugimoto, & Mizukami, 2015), child abuse due to the mother's own mental disorder/developmental disability, or infants in care facilities due to parenting difficulty (4 months: 10 and 1.5 years: 9), and YDQ respondents other than mothers (4 months: 16; 1.5 years: 34; and 3 years: 52). In total, 1685 (866 boys, 819 girls) children aged 4 months, 1729 (899 boys, 830 girls) aged 1.5 years, and 1674 (804 boys, 870 girls) aged 3 years were included in the study.

Matsue city provided the data after removing personal identification information, including the name, address, and birth date, and supplementing ID numbers.

This study was approved by the ethics committee of the School of Medicine, Shimane University (Approved Number: 2519).

2.2. Measurements

Similar to the questions used by Yokoyama et al. in 2011, maternal recognition of child abuse was examined using a questionnaire during a health examination for infants, and those who selected < True of me > or < I sometimes think that I am abusing my child/children > were regarded as recognizing child abuse. To examine the association between mothers' recognition of child abuse by them and parenting attitudes, their answers (Yes/No) to the following 3 questions in a health examination questionnaire were examined to: "Do you sometimes strike your child?", "Do you get angry at your child all the time?" (only for mothers of children aged 1.5 and 3 years), and "Do you sometimes want to quit raising your child?".

PIU was assessed using the YDQ (Young, 1998), a scale consisting of eight questions regarding the pathological gambling criteria defined in the DSM- IV and answered with < Yes/No > . It is one of the most widely used PIU assessment scales (Carli et al., 2013; Cheng & Li, 2014; Lopez-Fernandez, Freixa-Blanxart, & Honrubia-Serrano, 2013; Wartberg, Kriston, Kegel, & Thomasius, 2016), and it has previously been used in surveys involving adult females (Bakken, Wenzel, Götestam, Johansson, & Oren, 2009), and demonstrated to have acceptable reliability and consistency, as represented by a Spearman-Brown coefficient of 0.729 for split-half reliability, Cronbach's alpha of 0.713 with a standardized item alpha of 0.759 (Johansson & Götestam, 2004), and Cronbach's alpha of 0.789 (Fisoun et al., 2011). Based on this scale, respondents who answered < Yes > to five or more of the eight questions were classified as addicted to the Internet. Only those who answered all the YDQ questions in the present study were analyzed.

2.3. Covariates

As factors associated with the risk of child abuse, maternal age (Ooki, 2013; Sidebotham, Heron, & ALSPAC Study Team, 2006; Sonobe et al., 2016; Yang, Peden-McAlpine, & Chen, 2007; Yoshioka-Maeda & Kuroda, 2017), number of children (Jabraeili, Asadollahi, Asghari Jafarabadi, & Hallaj, 2015), employment status (Jabraeili et al., 2015), social network (Berlin, Appleyard, & Dodge, 2011; Sidebotham et al., 2006), postnatal depression (Windham et al., 2004; Yoshioka-Maeda & Kuroda, 2017), and financial status (Jabraeili et al., 2015; Sidebotham et al., 2006) have been reported.

Based on the aforementioned findings, the following items were used as covariates: maternal age (elderly 35 ≥ , young ≤19, others 20–34), number of children (1, > 1), daytime caretaker (mother, other than mother), social support (Yes, No), and current smoking status of the mother and father (non-smoking or smoking). Regarding the last item, the present study used this variable considering that parental smoking itself is regarded as inappropriate parenting behavior (Clark, 2002), and it also reflects parental socioeconomic status because smoking rates are higher among individuals in lower socioeconomic positions (Fukuda, Nakamura, & Takano, 2005). In addition to these items, postnatal depression (Edinburgh Postnatal Depression Scale 9 ≥ , < 9) (Cox, Holden, & Sagovsky, 1987; O'Brien, Heycock, Hanna, Jones, & Cox, 2004) was also used for mothers with 4-month-old infants. The multicollinearity of the variables was examined by multivariate analysis.

2.4. Statistical analysis

The characteristics of the children were examined by calculating their numbers and proportions based on age. Subsequently, the association between mothers' PIU and their recognition of child abuse was examined based on age. Logistic regression analysis was performed with the mothers' recognition of child abuse as the dependent variable and mothers' PIU (YDQ ≥ 5) as the explanatory variable while incorporating the aforementioned covariates. Univariate logistic regression analysis was initially performed, followed by multivariate logistic regression analysis for three models: Model 1 incorporating maternal age and the number of children, Model 2 incorporating daytime caretaker, social support, and postnatal depression (in the case of 4-month-old infants), and Model 3 incorporating the current smoking status of the mother and father. To examine the association between mothers' recognition of child abuse by them and parenting attitudes, univariate logistic regression analysis was performed using maternal recognition of child abuse as a dependent variable and answers to the following questions as independent variables: "Do you sometimes strike your child?", "Do you get angry at your child all the time?", and "Do you sometimes want to quit raising your child?".

Sensitivity was analyzed using the data, assigning a score of 0 to questions without answers, to confirm changes in the results.

IBM SPSS Statistics 22 was used for the analysis, with the significance level set at < 5%.

3. Results

The characteristics of the children aged 4 months, 1.5 years, and 3 years are presented in Table 1. The proportions of mothers who recognized child abuse among children aged 4 months, 1.5 years, and 3 years were 0.7%, 1.4%, and 2.1%, respectively (Table 1). Recognition of such abuse was higher among mothers who answered "Yes" to "Do you sometimes strike your child?", "Do you get angry at your child all the time?", and "Do you sometimes want to quit being a mother?" than among those who answered "No" (Table 2). Moreover, the proportions of mothers who had a YDQ of ≥5 among children aged 4 months, 1.5 years, and 3 years were 1.1%, 1.4%, and 1.0%, respectively (Table1).

Tables 3–5 show the following results. Based on the univariate logistic regression analysis, mothers' PIU with children aged 4 months, 1.5 years, and 3 years was significantly correlated with their recognition of child abuse (odds ratio [OR]: 9.31; 95% confidence interval [CI]:1.13–76.84, OR:10.27, 95% CI 2.85–36.95, and OR:7.27, 95% CI 1.58–33.39, respectively. The multivariate logistic regression analysis yielded similar results. Mothers' PIU with children aged 4 months, 1.5 years, and 3 years was found to be significantly correlated with their recognition of child abuse (OR: 13.30, 95% CI: 1.26–139.98, OR: 7.02, 95% CI: 1.28–38.55, and OR: 28.06, 95% CI: 2.48–317.93, respectively: Tables 3–5). The sensitivity analysis also yielded similar results. The variables did not exhibit multicollinearity. The goodness of fit of the model based on the Hosmer-Lemeshow method was $p \geq 0.05$.

4. Discussion

The present study revealed an association between mothers' PIU and their recognition of child abuse. In the multivariate logistic regression analysis, the odds ratios for recognition of child abuse for mothers having infants aged 4 months, 1.5 years, or 3 years were 13.30-, 7.02-, and 28.06-times higher among those with a YDQ score of 5 or higher than those with lower scores.

This may be the result of mothers being engrossed in the Internet to the extent that they neglected parenting. As mindfulness or the ability to focus on the current situation is reduced during PIU (Sriwilai & Charoensukmongkol, 2016), these mothers may have difficulty in focusing on their children's conditions and appropriately managing them. Furthermore, mothers who answered "Yes" to "Do you sometimes strike your child?" and "Do you get angry at your child all the time?" had greater recognition of abuse. Although it is inappropriate to regard mothers who recognize abuse as actually abusing their children based only on this result, the self-reporting of child abuse by parents and that by children as victims of such abuse, which provide important evidence for diagnosis (Sierau et al., 2018), had moderate agreement rates in previous studies (Jouriles, Mehta, McDonald, & Francis, 1997; Tajima, Herrenkohl, Huang, & Whitney, 2004), suggesting a high likelihood of parents self-reporting child abuse to actually be abusing their children. PIU may also lead to physical and/or psychological abuse because it is associated with hostility and aggressive behaviors

Table 1
Characteristics of the children.

	4 months old (n = 1685)		1 year and 6 months old (n = 1729)		3 years old (n = 1674)	
	Total		Total		Total	
	n	%	n	%	n	%
Maternal Age (n = 1678)			(n = 1727)		(n = 1670)	
Elderly (≥35)	481	28.5	379	21.9	397	23.7
Young (≤19)	20	1.2	21	1.2	12	0.7
Others (20-34)	1177	69.9	1327	76.7	1261	75.3
Number of children (n = 1619)			(n = 1595)		(n = 840)	
1	711	42.2	685	39.6	374	22.3
> 1	908	53.9	910	52.6	466	27.8
Day caretaker (n = 1674)			(n = 1723)		(n = 1667)	
Mother	1571	93.2	507	29.3	231	13.8
Except mother	103	6.1	1216	70.3	1436	85.8
Social support (n = 1662)			(n = 1697)		(n = 1621)	
Yes	1628	96.6	1648	95.3	1569	93.7
No	34	2.0	49	2.8	52	3.1
Postnatal depression (n = 1266)						
Edinburgh Postnatal Depression Scale (< 9)	1169	69.4				
Edinburgh Postnatal Depression Scale (9 ≥)	97	5.8				
Mother's smoking status (n = 1672)			(n = 1724)		(n = 1632)	
Smoking	37	2.2	65	3.8	89	5.3
Non-smoking	1635	97.0	1659	96.0	1543	92.2
Father's smoking status (n = 1665)			(n = 1724)		(n = 1632)	
Smoking	566	33.6	606	35.0	538	32.1
Non-smoking	1099	65.2	1118	64.7	1094	65.4
Maternal recognition of child abuse (n = 1660)			(n = 1680)		(n = 1631)	
Yes	11	0.7	25	1.4	35	2.1
No	1649	99.3	1655	95.7	1596	95.3
Mother's YDQ (n = 1630)			(n = 1668)		(n = 1610)	
High (≥5)	18	1.1	25	1.4	17	1.0
Low (< 5)	1612	95.7	1643	95.0	1593	95.2

YDQ: Young's Diagnostic Questionnaire for Internet Addiction score.

Table 2
Risk ratio with 95% CI for the association of mothers' parenting attitude with maternal recognition of child abuse.

		4 months old		1 year and 6 months old		3 years old	
		Crude		Crude		Crude	
		OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Do you sometimes strike your child?	No	Ref		Ref		Ref	
	Yes	115.13(32.03-413.83)	< 0.001	49.84(21.13-117.58)	< 0.001	16.36(8.18-32.72)	< 0.001
Do you get angry at your child at all times?	No			Ref		Ref	
	Yes	—	—	14.45(5.97-34.96)	< 0.001	14.74(5.18-41.97)	< 0.001
Do you sometimes want to quit raising your child?	No	Ref		Ref		Ref	
	Yes	6.82(1.78-26.15)	0.005	25.61(10.53-62.30)	< 0.001	18.62(9.17-37.80)	< 0.001

Notes: OR: odds ratio; CI: confidence interval; ref: reference.

(Carli et al., 2013; Ko, Yen, Chen et al., 2009; Ko, Yen, Liu et al., 2009; Lim et al., 2015; Xiuqin et al., 2010), and withdrawal symptoms, such as dysphoric mood, anxiety, and irritability, may be exhibited when Internet use is interrupted (Paik, Oh, & Kim, 2014; Tao et al., 2010). Based on these findings, assuming that mothers who recognize abuse are actually abusing their children, the necessity of interrupting Internet use due to parenting may cause the mothers stress, and consequently increase their aggressiveness toward their children as the mechanism leading to recognized child abuse.

Conversely, as PIU may also develop in individuals who use the Internet to divert themselves from unpleasant emotions, such as feelings of helplessness, guilt, anxiety, or difficult interpersonal relationships (Elhai, Levine, & Dvorak, 2017; Ko et al., 2012; Kuss, Griffiths, Karila, & Billieux, 2014; Tao et al., 2010; Young, 2004), and mothers' recognition of child abuse by them is associated with parenting anxiety (Yokoyama et al., 2011), such mothers may excessively use the Internet to reduce their anxiety or divert themselves

Table 3
Adjusted risk ratio with 95% CI for the association of mothers' PIU with maternal recognition of child abuse in 4-month-old children.

		Crude		Model 1		Model 2		Model 3	
		OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
YDQ	Low (< 5)	Ref		Ref		Ref		Ref	
	High (≥5)	9.31(1.13-76.84)	0.038	7.85(0.93-66.14)	0.058	15.48(1.44-166.55)	0.024	13.30(1.26-139.98)	0.031
Maternal age	Others (20-34)	Ref		Ref		Ref		Ref	
	Elderly ≥35	0.54(0.12-2.51)	0.433	0.48(0.10-2.24)	0.349	0.34(0.05-2.07)	0.240	0.19(0.02-1.77)	0.144
	Young (≤19)	NA	—	NA	—	NA	—	NA	—
Number of children	1	Ref		Ref		Ref		Ref	
	> 1	3.54(0.76-16.43)	0.107	3.70(0.79-17.29)	0.097	4.96(0.88-27.92)	0.069	4.49(0.80-25.29)	0.088
Day caretaker	Other than mother	Ref				Ref		Ref	
	Mother	0.29(0.06-1.37)	0.119			0.44(0.08-2.49)	0.354	0.32(0.05-1.84)	0.200
Social support	Yes	Ref				Ref		Ref	
	No	11.15(2.32-53.66)	0.003			18.00(3.10-104.68)	0.001	10.52(1.09-101.24)	0.042
Postnatal depression	Normal (< 9)	Ref				Ref		Ref	
	High (≥9)	12.88(3.66-45.31)	< 0.001			22.91(5.41-96.95)	< 0.001	18.35(4.03-83.49)	< 0.001
Mother's smoking status	Non-smoking	Ref						Ref	
	Smoking	NA	—					NA	—
Father's smoking status	Non-smoking	Ref						Ref	
	Smoking	0.82(0.21-3.20)	0.780					0.49(0.09-2.67)	0.411

Notes: OR: odds ratio; CI: confidence interval; ref: reference; NA: not available; YDQ: Young's Diagnostic Questionnaire for Internet Addiction score.
Model 1: Adjusted for maternal age and number of children.
Model 2: Model 1 + adjusted for daytime caregivers, social support, and postnatal depression.
Model 3: Model 2 + adjusted for smoking status of mother and father.

Table 4
Adjusted risk ratio with 95% CI for the association of mothers' PIU with maternal recognition of child abuse in 1-year and 6-month-old children.

		Crude		Model 1		Model 2		Model 3	
		OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
YDQ	Low (< 5)	Ref		Ref		Ref		Ref	
	High (≥5)	10.27(2.85-36.95)	< 0.001	7.48(1.42-39.46)	0.018	7.61(1.45-40.12)	0.017	7.02(1.28-38.55)	0.025
Maternal age	Others (20-34)	Ref		Ref		Ref		Ref	
	Elderly≥35	1.85(0.78-4.41)	0.162	1.46(0.50-4.24)	0.485	1.51(0.52-4.39)	0.453	1.40(0.48-4.10)	0.543
	Young (≤19)	8.91(1.90-41.68)	0.005	9.55(1.67-54.55)	0.011	9.93(1.75-56.37)	0.010	9.10(1.55-53.05)	0.014
Number of children	1	Ref		Ref		Ref		Ref	
	> 1	1.03(0.41-2.57)	0.956	1.26(0.47-3.38)	0.642	1.24(0.46-3.33)	0.668	1.26(0.47-3.37)	0.641
Day caretaker	Other than mother	Ref				Ref		Ref	
	Mother	1.58(0.71-3.55)	0.264			0.66(0.21-2.04)	0.467	0.60(0.19-1.87)	0.380
Social support	Yes	Ref				Ref		Ref	
	No	2.95(0.68-12.90)	0.150			2.14(0.27-16.78)	0.470	2.03(0.24-16.88)	0.513
Mother's smoking status	Non-smoking	Ref						Ref	
	Smoking	1.05(0.14-7.88)	0.962					2.20(0.25-19.47)	0.479
Father's smoking status	Non-smoking	Ref						Ref	
	Smoking	0.34(0.12-1.01)	0.052					0.20(0.04-0.89)	0.034

Notes: OR: odds ratio; CI: confidence interval; ref: reference; NA: not available; YDQ: Young's Diagnostic Questionnaire for Internet Addiction score.
Model 1: Adjusted for maternal age and number of children.
Model 2: Model 1 + adjusted for daytime caregivers and social support.
Model 3: Model 2 + adjusted for the smoking status of mother and father.

from their heavy parenting burden. Indeed, in the present study, mothers who answered "Yes" to "Do you sometimes want to quit being a mother?" had greater recognition of abuse. Although Internet use may be a method to reduce anxiety or the sense of burden, attention should be paid to avoid excessive Internet use because that resulting from anxiety may lead to PIU (Elhai et al., 2017).

In the present study, mothers having 3-year-olds had the highest odds ratio. Parenting stress has been reported to increase when the child reaches the age of 2 and onward to preschoolers aged 3–5 (Meier, Musick, Fischer, & Flood, 2018; Skreden et al., 2008; O'Brien, 1996). When children are approximately 2–5 years of age, the parent–child relationship becomes more adversarial as the

Table 5
Adjusted risk ratio with 95% CI for the association of mothers' PIU with maternal recognition of child abuse in 3-year-old children.

		Crude		Model 1		Model 2		Model 3	
		OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
YDQ	Low (< 5)	ref		ref		ref		ref	
	High (≥5)	7.27(1.58–33.39)	0.011	18.73(1.77–197.83)	0.015	26.37(2.41–288.48)	0.007	28.06(2.48–317.93)	0.007
Maternal age	Others (20-34)	ref		ref		ref		ref	
	Elderly ≥ 35	1.28(0.61–2.69)	0.517	1.25(0.43–3.63)	0.681	1.17(0.40–3.45)	0.775	1.25(0.42–3.77)	0.688
	Young (≤19)	NA	—	NA	—	NA	—	NA	—
Number of children	1	ref		ref		ref		ref	
	> 1	1.28(0.49–3.34)	0.611	1.59(0.57–4.44)	0.381	1.66(0.59–4.70)	0.337	1.38(0.47–4.04)	0.559
Day caretaker	Other than mother	ref				ref		ref	
	Mother	1.64(0.71–3.82)	0.249			3.59(1.21–10.70)	0.022	3.43(0.99–11.91)	0.053
Social support	Yes	ref				ref		ref	
	No	4.19(1.42–12.36)	0.009			3.36(0.71–16.00)	0.128	4.05(0.81–20.13)	0.088
Mother's smoking status	Non-smoking	ref						ref	
	Smoking	3.08(1.16–8.16)	0.024					12.45(2.64–58.68)	0.001
Father's smoking status	Non-smoking	ref						ref	
	Smoking	0.97(0.47–2.01)	0.937					0.59(0.17–2.11)	0.421

Notes: OR: odds ratio; CI: confidence interval; ref: reference; NA: not available ;YDQ: Young's Diagnostic Questionnaire for Internet Addiction score.
Model 1: Adjusted for maternal age and number of children.
Model 2: Model 1 + adjusted for daytime caregivers and social support.
Model 3: Model 2 + adjusted for the smoking status of mother and father.

child's sense of self develops and they test the limits of their existence (Mazur, 2006). As parents feel that parenting is difficult when their children are arguing, ignoring parental requests, refusing to eat or obey, acting defiantly, throwing tantrums, needing fairly constant watch (Mazur, 2006; O'Brien, 1996), mothers with PIU need to continuously interrupt their Internet use to address their defiance, which may increase their stress. Furthermore, preschoolers aged 2.5 years or older are thought to be at high risk of injury, as they cannot yet accurately recognize dangers despite their physical growth and motor skill development (Dal Santo, Goodman, Glik, & Jackson, 2004). Therefore, after reaching the age of 3, children require the utmost care to prevent accidents. In such situations, stress due to limited Internet use is likely to increase in mothers with PIU, which may explain the high odds ratio for mothers of 3-year-olds in the present study.

The present study has 4 limitations: First, this was a cross-sectional study, and it did not clarify causal relationships. Therefore, cohort studies should be conducted to address this in the future. Second, the data collected in a single provincial city may not accurately represent national tendencies. Similar surveys should be conducted in urban areas to increase the number of samples in the future. Third, as mothers who recognize child abuse often develop anxiety (Yokoyama et al., 2011) and they may frequently use the Internet to resolve their parenting anxiety, some of the mothers involved in the present study may have had false positive results. Fourth, PIU has been demonstrated to be associated with mental disorders such as ADHD, depression, and obsessive symptoms. Among these symptoms, ADHD is the most closely associated with PIU (Ko et al., 2012). Although it was difficult to exclude mothers with ADHD in the present study, analysis was performed without those using infant care facilities, confirming that mothers who needed to use these facilities due to parenting difficulties associated with severe mental symptoms were excluded.

Despite these limitations, this study revealed an association between mothers' PIU and their recognition of child abuse. In previous studies, a sense of parenting burden, anxiety, and other negative emotions related to parenting, which have been suggested to be associated with an increased risk of child abuse (Crouch & Behl, 2001; Crum & Moreland, 2017; Miragoli et al., 2018), were also associated with mothers' PIU (Fujioka et al., 2015). The present study supported this finding, clarifying an association between mothers' PIU and their recognition of child abuse that may result from a heavy parenting burden and anxiety. As future perspectives, further studies are needed to clarify the influences of mother's PIU on their parenting behaviors and their children's growth/development.

5. Conclusion

On comparison of mothers with and without PIU having children aged 4 months, 1.5 years, or 3 years, the former had a 10- to 30-times higher odds ratios for recognizing child abuse in all cases. In order to confirm our results, it may be necessary to conduct further surveys, resolving the study limitations, and clarify the association between mothers' PIU and their recognition of child abuse.

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Declaration of Competing Interest

The authors declare no conflict of interest.

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