

ORIGINAL**Development of the “Awareness of Parental Responsibility” scale for becoming first-time fathers, with their wives during their first pregnancy**Momoe Ogasawara¹ and Mari Haku²¹Graduate School of Health Sciences, Tokushima University, Tokushima, Japan, ²Department of Midwifery, Institute of Biomedical Sciences, Tokushima University, Tokushima, Japan

Abstract : This study aimed to develop and validate the “Awareness of Parental Responsibility (APR)” scale for first-time fathers with a wife who is pregnant with their first child. This study was conducted in three stages. Data were obtained from 92 fathers in the pilot study and 396 fathers in the main survey. We analyzed construct validity, reliability, and criterion-related validity using the collected data. The APR was ultimately confirmed through confirmatory factor analysis (CFA) to comprised 4 factors and 27 items : “Positive responses to children,” “Imagining life with a child,” “Sense of gender role division,” and “Imagining the practice of childcare.” Cronbach’s alpha coefficient of the total scale was .87. The CFA results indicated a consistent fit between the model and data, with values of χ^2/df ratio = 2.42, Goodness-of-Fit Index (GFI) = 0.870, Adjusted Goodness-of-Fit Index (AGFI) = 0.845, Comparative Fit Index (CFI) = 0.895, Root Mean Square Error of Approximation (RMSEA) = 0.060. The composite reliability (CR) value for the entire scale was 0.774, with values ranging from factors 1 to 4 of 0.697, 0.810, 0.794, and 0.941, respectively. This was considered to be sufficiently reliable. Thus, APR is a valid and reliable tool for assessing readiness to become a father from the perspective of “A Parental,” it can also be used to verify the effectiveness of preparatory education for becoming a parent. *J. Med. Invest.* 73:166-175, February, 2026

Keywords : Awareness of Parental Responsibility, first-time father, first-time pregnant wife, scale development

INTRODUCTION

In Japan, amid a rapidly aging society with declining birth-rates, issues such as child abuse and postpartum depression are drawing attention. The socio-economic downturn and restrictions on interpersonal interaction during the COVID-19 pandemic continue to cast a significant shadow over the environment for having and raising children (1, 2). The importance of both parents taking on roles proactively, regardless of gender, has long been recognized in child-rearing, yet gender norms remain deeply entrenched (3). Therefore, men are often placed in a situation where they are excluded from the process of giving birth and raising children (4). The rate of men taking childcare leave, who are expected to play a crucial supporting role for women, stands at 40.5% and is on an upward trend ; however, it remains insufficient (5). The interim evaluation of “Healthy Parent and Child 21,” the national movement plan for maternal and child health in the 21st century (from 2001 to 2024), indicated that the number of fathers experiencing childcare fatigue and anxiety may increase in the future (6). Increased childcare stress is associated with increased depressive symptoms in fathers (7) ; therefore, the burden of childcare should be reduced as much as possible. According to a meta-analysis by Tokumitsu *et al.* (8), the prevalence of depression among fathers in Japan is highest at 13.2% during the 3- to 6-month period.

Considering that the paternity leave uptake rate for men with children of the same age is 7.5% (5), fathers are expected to return to work after completing their paternity leave and

balance both work and childcare responsibilities. The Ministry of Health, Labor and Welfare has been implementing ‘Support for fathers struggling with childbirth and childcare’ as one of its prenatal and postnatal support initiatives since fiscal year 2021. In 2025, the Childcare Leave Act was amended, and measures were expanded to enable flexible working arrangements for both men and women, including revisions to childcare leave and the addition of telework as an alternative measure for reduced working hours (for children under 3 years old) (9, 10). However, such support remains significantly inadequate compared with that provided for women. This is not only because much of the content targets mothers and children, but also because society’s recognition of men taking a central role in childcare is low. Consequently, even resources available to men are not actively promoted for their use, and men themselves often remain unaware of what they can access. These factors contribute to low rates of actual utilization.

In the past, support for those becoming parents emphasized initiatives that empower individuals during the process of parenthood. In addition to prenatal and postnatal education, parenting education is being implemented in schools and communities (11, 12). Furthermore, to enable parents to fulfill their child-rearing responsibilities more smoothly, it is necessary to measure and understand their readiness for parenthood. Consequently, scales have been developed to assess attitudes toward children and attitudes toward childbirth and childcare (13, 14). Ogasawara *et al.* (15) proposed that men’s readiness for parenthood develops before their partner becomes pregnant. They considered this readiness through four perspectives : awareness of becoming a parent, positive feelings toward children and childcare, self-efficacy regarding interacting with children, and views on gender role division and investigated it. However, they pointed out that the perspective of “APR” had not been sufficiently examined.

After awareness of his partner’s pregnancy, the man begins

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Address correspondence and reprint requests to Mari Haku, Department of Midwifery, Institute of Biomedical Sciences, Tokushima University, Tokushima, Japan and Fax : +81-88-633-9080. E-mail : haku@tokushima-u.ac.jp

to envision the child to be born and himself as a parent and proceeds to prepare for parenthood. Men's perceptions of themselves as fathers and caregivers are affected by their upbringing and peer groups. Consequently, when they have limited experience spending time with young children or lack role models, they may struggle to form a clear image of fatherhood before their own children are born (16, 17).

The possible self is a concept referring to the process of imagining one's future self during adolescence. The recognition that one might become that future-self is associated with emotions, actions, and motivation directed toward that future image (18). In particular, individuals who positively recognize the possible self of becoming a parent are more likely to choose parenthood and readily accept the existence of their child and their role as a parent (19). Perceiving oneself as a potential future parent and holding positive feelings toward the existence of children and raising them marks the beginning of development of "APR." On the one hand, having a positive image can serve as a driving force for action, but to analyze and overcome difficulties, it is necessary to maintain a realistic perspective (20). To acquire the role of a parent, it is important not only to have a positive image of life with children, but also to be able to realistically imagine oneself raising children. To develop an "APR," it is essential to recognize that the role of a parenthood is one's own responsibility.

When men have a sense of gender role division that suggests they should not take on childcare or household responsibilities, they tend to consider childcare not their role, making it difficult for them to develop an "APR." Men who are androgynous in their gender role orientation are considered to be more proactive and responsible in childcare than other types (21). It is thought that the less biased one is toward gender role orientation, the less one is constrained by the perception of gender role division, making it easier to "APR." Therefore, it is considered that lower gender role division perceptions are more likely to lead to "APR."

To "aware something as own responsibility" involves possessing empathy. Empathy is the ability to recognize another person's internal state and respond vicariously, and it is strongly associated with ethical responses and caring (22). The higher one's empathy, the more ability they have to feel another person's situation or psychological state as if it were their own. Then the higher one's empathy, the more they can imagine things happening to themselves that aren't currently happening to them and respond in a way that leads to a better state. In the process of becoming a parent, it is necessary to enhance empathy in order to perceive what is happening to your child or partner as something that could happen to oneself.

This study defines the state of having an "APR" as the ability to positively accept the existence of children and the various changes that arise from raising them, while facing the reality of children and life with children, and concretely grasping how one acts oneself. If we can measure the "APR" of first-time fathers, it will serve as a useful tool for examining the development of readiness for parenthood tailored to each man's individual state of preparedness. Furthermore, understanding how much one's readiness to become a parent has increased can also contribute to verifying the effectiveness of preparatory education for parenthood.

THE AIM OF THE RESEARCH

This study was conducted to develop the "APR" scale for becoming first-time fathers, with their wives during their first pregnancy (22 to 36 weeks of pregnancy), and to determine its reliability and validity.

MATERIALS AND METHODS

The development of the APR comprises three steps (Figure 1): Phase 1 aimed to develop a draft scale based on prior research. Phase 2 aimed to conduct a pretest and determine the survey items. Phase 3 aimed to confirm the validity and reliability of the final scale. Statistical analysis of the data was performed using IBM SPSS Statistics Base version. 29.0.1, IBM SPSS Regression/Advanced Statistics/Amos version. 29.0, and Microsoft Excel

Phase 1 : Item Development of draft APR Conceptual Framework and Item Selection

The APR was developed based on relevant literature such as Mercer's Maternal Role Attainment theory (23) and the possible-selves concept (18). As a conclusion, the conceptual framework of this scale was composed of "Empathy," "Sense of gender role division," "Positive emotions toward children" and "Imaging of life with children." Items based on these concepts comprised 4 concepts and a total of 93 items.

1) "Empathy" (19 items)

"Empathy" denotes the capacity to feel and respond to what is happening to others as if it were happening to oneself (various affective states) (22). Men become more empathetic toward the emotions felt by their children when their partners become pregnant (24). Parents' empathy enhances their emotional responses toward their children (25). Conversely, low empathy is associated with a greater tendency toward antisocial and aggressive behavior, particularly aggression toward children, and is linked to increased risk of partner and child abuse (26).

2) "Sense of gender role division" (14 items)

"Sense of gender role division" indicates a view that household roles should be divided gender. Individuals who are not obsessed with gender role division before childbirth tend to have higher levels of interaction with their partner, engage in cooperative behaviors, and show greater parental willingness to engage in childcare (27). Men who espouse traditional notions of masculinity in parenting, meaning those with a stronger sense of gender role division, are more negative toward seeking psychological support and exhibit higher levels of self-stigmatization regarding such requests (28). Moreover, individuals who are less obsessed with gender roles: such as notions of masculinity or femininity are less prone to postpartum depression (29). In life with children, those not obsessed with gender-based division tend to naturally focus on children and childcare, making it easier for men to fulfill their parental roles.

3) "Positive emotions toward children" (34 items)

"Positive emotions toward children" indicates a state of positively perceiving and accepting one's own children or caring for children. When men develop a strong attachment to the fetus in the partner's womb, they consider themselves responsible for that child after birth (30). Men who feel happy upon realizing his partner is pregnant and has high strong affinity toward the child exhibits high paternal role behavior during his wife's pregnancy (31).

4) "Imaging of life with children" (26 items)

"Imagining of life with children" indicates how one envisions children transforming their lives, how they plan to accommodate childcare within their lifestyle and daily schedules, and the extent to which they have concrete ideas about their own actions. Men shift their relationships with those around them to center on their child and partner when their partner becomes pregnant

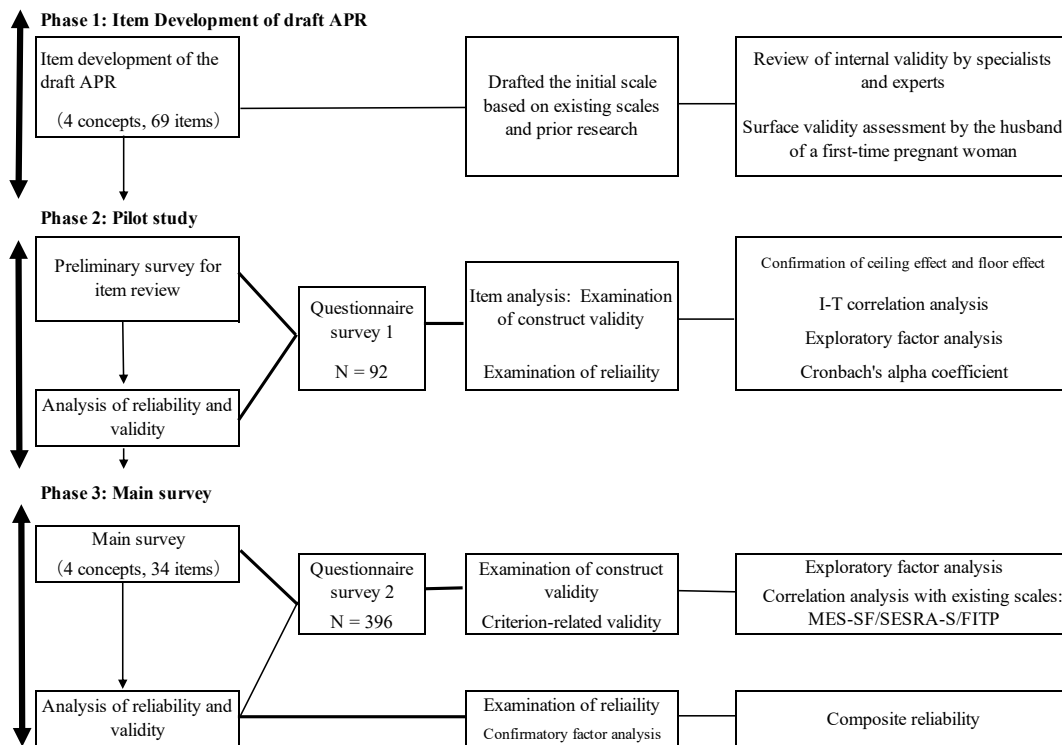


Figure 1. APR Development Process

A short form of the Multidimensional Empathy Scale = MES-SF, A short-form of the scale of egalitarian sex role attitudes = SESRA-S, A Scale of Father Identity in the Transition Period = FITP.

(17). The less the gap between ideal and reality, the greater the self-acceptance (32). To accept oneself as a parent and perceive life with one's child as an own business, it is crucial to realistically envision the changes in one's role and relationships with others after the child is born. The difficulty in accepting reality hinders the transition into parental roles (33) and leads to child abuse (34).

Examining Validity for the draft APR

We examined the content validity and surface validity of the draft scale comprising 4 concepts and 93 items. Content validity was reviewed by a panel of 13 individuals: 3 expert educators in the field of maternal nursing and midwifery, 3 midwives with over 10 years of professional experience, and 7 graduates of master's programs in maternal nursing and midwifery studies. The relationship between the four dimensions and the draft scale items was investigated using a four-point scale (1. Not valid, 2. Somewhat lacking in validity, 3. Mostly valid, 4. Valid). The item-level content validity index (I-CVI) was calculated to assess the validity of each individual item. The I-CVI was evaluated using the criterion ≥ 0.78 , as indicated by Flanagan & Beck (35). As a result, 24 items with an I-CVI below 0.78 were deleted: 11 items on 1) "Empathy," 7 items on 2) "Sense of gender role division," 4 items on 3) "Positive emotions toward children" and 2 items on 4) "Imagining life with children." Based on the open-ended responses, we revised the phrasing to make the final verb easier for respondents to understand. For 3) positive emotions toward children, the phrase "in my belly" was added to enable responses about feelings toward the child during pregnancy. For 4) "Imagining life with children," the phrase "with children and wife" was added to clarify "with whom." These and other revisions were made to create a draft scale comprising 69 items: 1) "Empathy" 8 items, 2) "Sense of gender role division" 7 items,

3) "Positive emotions toward children" 30 items, 4) "Imagining of life with children" 24 items. The Scale-Content Validity Index (S-CVI) was 0.94.

Surface validity was assessed by soliciting opinions from 12 husbands of first-time mothers, focusing on the ease of response: no items requiring revision were identified. Based on these considerations, we developed a draft scale consisting of 4 concepts and 69 items for the pilot study.

Phase 2 : Pilot study

This pilot study was conducted from August 2023 to September 2024.

Survey Methods

The survey was conducted at five hospitals, one clinic, and one family support center using the 69 items of the draft scale.

Participants were husbands (males) whose wives were pregnant with their first child (from 22 weeks to 37 weeks of pregnancy). At the time of the survey, the participants, their spouses, and their fetuses did not have any conditions requiring ongoing medical care. They were 18 years of age or older at the time of the survey, employed, and living as a couple only. Survey forms were distributed after explaining the research purpose to participants, both in writing and verbally and their consent. Survey forms were collected either by mail in sealed envelopes, via collection boxes, or through online input.

The background information from the subjects included age, occupation, employment status, plans to take paternity leave, and gestational age (in weeks or months). "APR" was measured using a five-point Likert scale: Strongly agree, Agree, Neither agree nor disagree, Disagree, and Strongly disagree. Higher scores indicated a greater tendency to "APR."

Analysis Method for Exploratory Factor Analysis

A ceiling effect was evaluated when the value of the mean \pm standard deviation was 5.0 or higher, and a floor effect was evaluated when it was 1.0 or lower. Item-item analysis confirmed the I-T correlation. A correlation coefficient of ≥ 0.7 was considered a strong relationship, while < 0.4 was considered weak. Confirmation of construct validity was performed using factor analysis. Prior to conducting the initial Exploratory factor analysis (EFA), the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO measure) and Bartlett's test of sphericity were verified. Factor analysis was conducted using the principal factor method with Promax rotation, and eigenvalues, scree plots, and cumulative contribution rates were examined. Factor loadings ≥ 0.4 were considered appropriate for inclusion as factors, and reliability coefficients (Cronbach's alpha) were verified.

Results of Exploratory Factor Analysis.

The questionnaire was distributed to 400 husbands of first-time pregnant spouses using each facility. Responses were collected from 108 individuals (response rate 27.0%). After eliminating responses with missing values or that did not meet the gestational week criteria, 92 valid responses (valid response rate 23.0%) were analyzed.

Ceiling effects resulted in the elimination of 29 items: 4 "Empathy" items, 2 "Sense of gender role division" items, 16 "Positive emotions toward children" items, and 7 "Imagining life with children" items. No floor effects were observed. Reversed items were processed and I-T correlations were conducted. Three items with non-significant correlations: one item on "Sense of gender role division," one item on "Positive emotions toward children" and one item on "Imagining life with children" were eliminated. For items with a correlation coefficient exceeding 0.7, since they may indicate the same content (34), we confirmed the question content but decided to adopt all of them as their content differed (Q21 and Q24: Housework and childcare; Q34 and Q62: Motivation for problem, solving and determination to do things properly; Q59 and Q61: Sense of fulfillment and happiness in life with children; Q85 and Q87, Q87 and Q90: Bathing, holding, diaper changing).

EFA was conducted with 37 items (KMO = 0.714, Bartlett's test of sphericity: $p < 0.001$). After eliminating 3 items with factor loadings < 0.4 , a 4-factor structure (3 items for "Empathy," 4 items for "Sense of gender role division," 13 items for "Positive emotions toward children," 14 items for "Imagining life with children") comprising 34 items were confirmed.

Cronbach's alpha was .89, and reliability was confirmed for the subscale range from .78 to .90. Based on the above, the 34 items were adopted.

Phase 3: Main survey (Confirming the validity and reliability of the final scale)

Survey Methods

Using the 34 items confirmed in the pilot study, the survey was conducted at five hospitals, one clinic, and one family support center. The research participants and survey methods were the same as in the pilot study, and the survey was conducted from October 2024 to March 2025. The following scales for verifying concurrent validity were also surveyed simultaneously.

1) A short form of the Multidimensional Empathy Scale (MES-SF)

10 items based on the original draft were created by Kino *et al.* (36), and their reliability and validity have been confirmed. It assesses the individuality involved in the emotional products and cognitive processes associated with empathy. It uses a 5-point

Likert scale, with higher scores indicating greater empathy. The alpha coefficient in this study was .52.

2) A short-form of the scale of egalitarian sex role attitudes (SESRA-S)

15 items on the original draft were created by Suzuki (37), and their reliability and validity have been confirmed ($\alpha = .89$). Measures whether individuals have a sense of gender role division within the household, including housework and childcare. Higher scores indicate a more egalitarian sense of gender role division, while lower scores indicate a more traditionalist sense. The alpha coefficient in this study was .86.

3) A Scale of Father Identity in the Transition Period (FITP)

21 items were developed by Matsuda (38) and validated for reliability and validity ($\alpha = .91$). This is a 4-point Likert scale, with the higher the score, the more it indicates a positive feeling or image about becoming a father within the relationship among the three parties: the wife, the child (fetus), and oneself. The alpha coefficient in this study was .92.

Analysis Methods for Model Fitness

Confirmatory factor analysis (CFA) was conducted on the factor structure model obtained from exploratory factor analysis (EFA), and fit indices were calculated to verify the model's goodness of fit. The indices used were Chi-Middle-Numerator (CMIN), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). The smaller the χ^2/df ratio, the better the fit, with < 3.0 being the standard (39). CFI ranges from 0 to 1, with values closer to 1 indicating a better fit. A value over 0.95 is considered a good model (40, 41). GFI and AGFI range from 0 to 1, with values closer to 1 indicating a better fit. Values exceeding 0.85 are considered good fits, and values exceeding 0.9 are considered excellent fits (40, 41). The smaller the RMSEA, the better the fit: < 0.05 is considered good, and < 0.08 is considered an acceptable range for a model (42). Validity was assessed by confirming criterion-related validity and evaluating it using Spearman's rank correlation analysis. Internal consistency was assessed using composite reliability (CR). The CR value of 0.6 or higher was used as the criterion (43).

ETHICAL CONSIDERATION

This study was conducted with the approval of the Tokushima University Hospital Research Ethics Committee for Life Sciences and Medicine (No.4384) and with the permission of the head of the relevant research facility.

After the purpose and procedures of this study were explained, as well as the potential risks and rights of participants, all participants provided informed consent. The questionnaire included a checkbox to indicate consent, which was obtained by checking this box.

RESULTS

The questionnaire was distributed to 869 husbands of first-time pregnant spouses using each facility. Of the 444 responses collected (response rate: 51.1%), 396 were analyzed as valid responses (valid response rate: 45.6%) after excluding those with missing values or failing to meet the gestational week criteria.

Participant Characteristics

In the main survey, the mean age was 33.4 (5.6) years old. Among full-time workers, 378 (95.5%) commuted to their workplace, 13 (3.3%) worked primarily from home full-time, and 5

Table 1. Participant Characteristics

	Phase 2 (n = 92)	Phase 3 (n = 396)
	Mean \pm standard deviation	
Age (years)	32.8 \pm 4.92	33.4 \pm 5.62
Occupation	n (%)	
Full-time employee	92 (100.0)	391 (98.7)
Employees at the workplace	87 (94.6)	378 (95.5)
Telecommuting workers	5 (5.4)	13 (3.3)
Part-time employee	0 (0.0)	5 (1.3)
Weeks of pregnancy		
22~23w (6 months)	32 (34.8)	52 (13.1)
24~27w (7 months)	12 (13.0)	64 (16.2)
28~31w (8 months)	16 (17.4)	102 (25.8)
32~35w (9 months)	19 (20.7)	135 (34.1)
36~37w (10 months)	13 (14.1)	43 (10.9)

(1.2%) were part-time workers. Pregnancy month : 6 months (22-23 weeks) : 52 (13.1%), 7 months (24-27 weeks) : 64 (16.2%), 8 months (28-31 weeks) : 102 (25.8%), 9 months : 32-35 weeks : 135 (34.1%), 10 months : 36 weeks and beyond : 43 (10.9%) (Table 1).

Construct validity, reliability

The EFA was conducted with 34 items (KMO = 0.896, Bart-

lett's test of sphericity : $p < 0.001$). The CFA was conducted on a four-factor structure with eigenvalues of 1.0 or greater (Guttman-Kaiser criterion), and four items with factor loadings below 0.4 were removed. Three items showing cross-loadings were also removed, ultimately confirming four concepts comprising 27 items (Table 2 and 3). The first factor, composed of 15 items, represented "Positive responses to children." The second factor, consisting of 5 items, represented "Imagining life with a child." The third factor, comprising 4 items, represented "Sense of gender role division.". The fourth factor, made up of 3 items, represented "Imagining the practice of childcare."

The scale ranges from 27 to 135 points, with higher scores indicating a greater tendency to "APR." The scale score had a mean of 109.1 (11.2) points, with an overall Cronbach's alpha coefficient of .87 and subscale coefficients ranging from .80 to .89.

Confirmatory Factor Analysis (CFA)

Using the 27 items resulting from EFA, CFA was conducted to assess model fit. Models A through D were compared.

The path coefficients between latent and observed factors ranged from 0.33 to 0.86. Correlations between latent factors were observed between Factor 1 and Factor 3 ($r = 0.33$, $p < 0.001$), Factor 1 and Factor 4 ($r = 0.66$, $p < 0.001$), Factor 2 and Factor 4 ($r = 0.28$, $p < 0.001$), and Factor 3 and Factor 4 ($r = 0.33$, $p < 0.001$) (Figure 2). A comparison of model fit was conducted for Model A (all paths included), Model B (only the paths between the first and second factors, which showed no

Table 2. Average value of each APR item (n=396)

Domain	Item Number	Items	Average (SD)
1	Q1	When I hear a child crying, I worry about what might be wrong.	3.97 (.84)
	Q2	When a child is crying alone, I feel I must help them.	4.15 (.85)
	Q3	If a child is crying, I will try to comfort them.	3.69 (.97)
2	Q4	I think it is better for mothers to be the primarily carers of children. (Reversal)	3.63 (1.02)
	Q5	I think it is better for the housework to be done primarily by mothers. (Reversal)	3.76 (1.05)
	Q6	I would like to leave the children to my wife. (Reversal)	3.91 (.86)
	Q7	After giving birth, women should focus on raising their children. (Reversal)	3.47 (1.00)
3	Q8	I am willing to proactively solve problems that arise with children.	4.38 (.63)
	Q9	I look forward to parenting.	4.28 (.76)
	Q10	I feel a bond with my child.	3.67 (1.01)
	Q11	I am changing my life for my pregnant spouse and child.	3.67 (.92)
	Q12	I am thinking about what I can do for my child.	4.23 (.71)
	Q13	I will prioritize my child above all else.	4.15 (.76)
	Q14	I am interested in talking about parenting.	4.35 (.64)
	Q15	I imagine life with my child is fulfilling.	4.22 (.76)
	Q16	The thought of becoming a father fills me with great happiness.	4.24 (.79)
	Q17	As a father, I intend to do my best.	4.49 (.62)
	Q18	I look forward to giving my child a bath.	4.09 (.92)
	Q19	When I am thinking of a name for my child, I am happy.	4.17 (.80)
4	Q20	Once life with my child begins, I expect I will not be able to eat meals at a leisurely pace.	3.88 (.94)
	Q21	Once life with my child begins, I will not expect my free time will decrease.	4.29 (.74)
	Q22	Once life with my child begins, I expect there will be times when I can't work as much as I'd like.	3.80 (1.01)
	Q23	Once life with my child begins, I expect I will not be able to take leisurely baths anymore.	3.63 (1.04)
	Q24	I imagine myself bathing my child.	4.13 (.81)
	Q25	I imagine myself holding my child.	4.37 (.73)
	Q26	I imagine myself changing my child's diaper.	4.22 (.81)
	Q27	Once life with my child begins, I expect I will be sleep-deprived.	4.27 (.79)

Table 3. Results of exploratory factor analysis of the APR (n = 396)

Factor and Cronbach's alpha	Item Number	Items	Factor loading			
			1	2	3	4
Factor 1 α = .89	Q15	I imagine life with my child is fulfilling.	0.721	-0.047	-0.098	0.094
	Q16	The thought of becoming a father fills me with great happiness.	0.718	-0.131	0.003	0.069
	Q13	I will prioritize my child above all else.	0.707	0.128	-0.031	-0.083
	Q12	I am thinking about what I can do for my child.	0.701	0.145	0.038	-0.085
	Q9	I look forward to parenting.	0.680	-0.052	-0.004	0.051
	Q17	As a father, I intend to do my best.	0.669	0.077	0.012	0.023
	Q10	I feel a bond with my child.	0.648	-0.103	-0.007	-0.019
	Q19	When I am thinking of a name for my child, I am happy.	0.614	-0.037	-0.020	-0.038
	Q14	I am interested in talking about parenting.	0.571	0.112	0.040	0.091
	Q8	I am willing to proactively solve problems that arise with children.	0.568	0.086	0.128	-0.096
	Q3	If a child is crying, I will try to comfort them.	0.553	-0.113	-0.022	0.017
	Q2	When a child is crying alone, I feel I must help them.	0.535	-0.057	-0.045	-0.006
	Q18	I look forward to giving my child a bath.	0.527	-0.084	0.063	0.279
	Q11	I am changing my life for my pregnant spouse and child.	0.467	0.178	0.097	-0.247
Q1	When I hear a child crying, I worry about what might be wrong.	0.423	-0.100	-0.091	0.087	
Factor 2 α = .80	Q21	Once life with my child begins, I will not expect my free time will decrease.	-0.026	0.741	-0.007	0.061
	Q22	Once life with my child begins, I expect there will be times when I can't work as much as I'd like.	-0.034	0.660	-0.077	0.108
	Q23	Once life with my child begins, I expect I will not be able to take leisurely baths anymore.	-0.018	0.656	-0.071	0.065
	Q20	Once life with my child begins, I expect I will not be able to eat meals at a leisurely pace.	0.093	0.653	0.026	-0.080
	Q27	Once life with my child begins, I expect I will be sleep-deprived.	-0.085	0.623	0.033	0.034
Factor 3 α = .81	Q5	I think it is better for the housework to be done primarily by mothers. (Reversal)	-0.045	0.020	0.843	0.003
	Q4	I think it is better for mothers to be the primarily carers of children. (Reversal)	-0.017	-0.079	0.694	0.113
	Q6	I would like to leave the children to my wife. (Reversal)	0.037	0.015	0.678	0.027
	Q7	After giving birth, women should focus on raising their children. (Reversal)	-0.008	-0.051	0.637	-0.058
Factor 4 α = .84	Q26	I imagine myself changing my child's diaper.	-0.083	0.110	0.078	0.793
	Q25	I imagine myself holding my child.	0.084	0.048	0.014	0.761
	Q24	I imagine myself bathing my child.	0.149	-0.002	-0.050	0.701

An exploratory factor analyses was conducted the principal factor method and promax rotation. The Kaiser-Meyer-Olkin test value was 0.896. Bartlett's test of sphericity was significant (p<0.01). Total Cronbach's α coefficient was .87. APR = Awareness of Parental Responsibility

significant correlation, were excluded), Model C (only the paths between the second and third factors were excluded), and Model D (paths between the first and second factors and between the second and third factors were both excluded). As a result, since there was virtually no difference in the model fit results for all models, Model A (χ^2/df ratio = 2.42, GFI = 0.870, AGFI = 0.845, CFI = 0.895, RMSEA = 0.060) was adopted (Table 4). The CR value for the entire scale was 0.774, with values ranging from factors 1 to 4 of 0.697, 0.810, 0.794, and 0.941, respectively. This shows that it is sufficiently reliable.

Criterion-related validity

Significant positive correlations were confirmed between the total APR score and MES-SF (r = 0.25, p < 0.001), SESRA-S (r = 0.26, p < 0.001), and FITP (r = 0.75, p < 0.001).

The first factor was significantly correlated with MES-SF (r = 0.22, p < 0.001) and FITP (r = 0.77, p < 0.001). The second factor correlated significantly with MES-SF (r = 0.27, p < 0.001) and FITP (r = 0.12, p = 0.017), Factor 3 with SESRA-S (r = 0.53, p < 0.001), FITP (r = 0.33, p < 0.001), Factor 4 with MES-SF (r = 0.13, p < 0.001), SESRA-S (r = 0.21, p < 0.001), and FITP

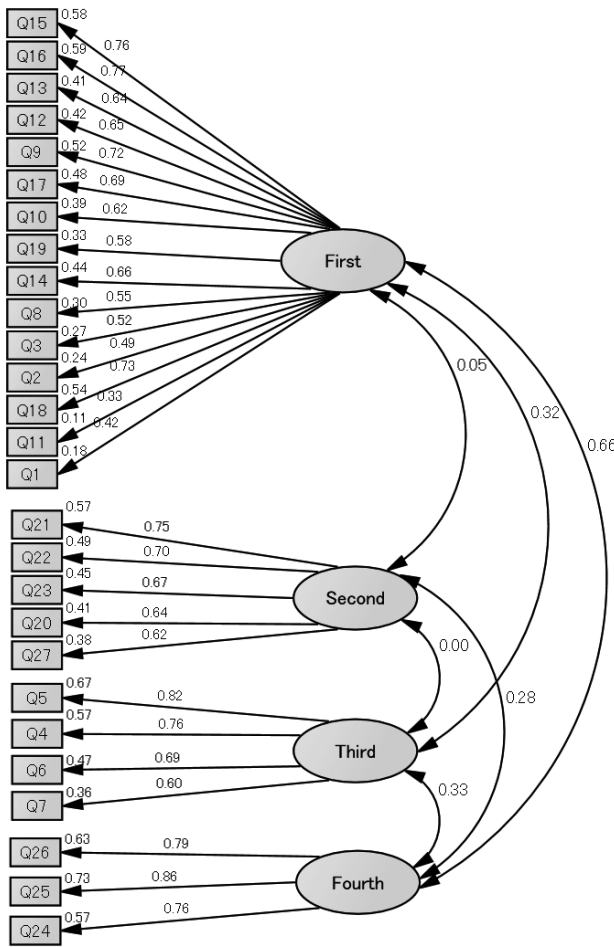


Figure 2. Confirmatory factor analysis results of parental responsibility awareness based on model A, which been presented in Table 4.

Note : APR = Awareness of Parental Responsibility. The path coefficients between latent and observed factors ranged from 0.33 to 0.86. Correlations among latent factors were significant between Factors 1 and 3 ($r = 0.33, p < 0.001$), Factors 1 and 4 ($r = 0.66, p < 0.001$), Factors 2 and 4 ($r = 0.28, p < 0.001$), and Factors 3 and 4 ($r = 0.33, p < 0.001$). The composite reliability (CR) value for the entire scale was 0.774, with values ranging from Factor 1 to 4 of 0.697, 0.810, 0.794 and 0.941, respectively.

($r = 0.57, p < 0.001$) (Table 5), respectively.

DISCUSSION

In the draft version, this scale comprised four factors : “Empathy,” “Sense of gender role division,” “Positive emotions toward children,” and “Imagining life with children.” However, based on the main survey, it was consolidated into four factors : “Positive responses to children,” “Imagining life with a child,” “Sense of gender role division,” and “Imagining the practice of childcare.”

At the draft scale stage, it comprised 34 items across four factors : 3 items for “Empathy ;” 4 items for “Sense of gender role division ;” 13 items for “Positive emotions toward children ;” and 14 items for “Imagining life with children.” However, in this survey, “Empathy” was not extracted as a single factor. Three items demonstrating compassion toward children within “Empathy,” the ability to recognize child’s internal state and respond vicariously, were included in “Positive responses to children.” Additionally, three items were included in the draft scale under “Imaging of life with children” were extracted as the fourth factor, “Imagining the practice of childcare.”

Men tend to exhibit heightened emotional responsiveness toward children as their empathetic awareness and reactions increase (25), and this is associated with positive parenting, characterized by parental warmth and nurturing positive communication, and reasonable expectations for children (44). This does not mean that “Empathy” is unrelated to “APR” : rather, it was included in the first factor because it is a crucial element of “Positive responses to children.”

The first factor, “Positive responses to children” indicates a state where one feels joy and happiness toward one’s own children or caring for children, perceives them positively, and accepts them. Regarding attachment as a positive emotion or response toward children, studies have reported the existence of attachment toward the fetus (45) and bonds formed during pregnancy predict bonds with the newborn (46). A man’s positive reactions toward his child during his spouse’s pregnancy foster bonding with the child and are more likely to lead to role behaviors (31). The foundation for perceiving parenthood as one’s own business is believed to stem from positive responses to children, fostering bonds with them, and creating a virtuous cycle that further enables the identification of parenthood as one’s own business. The second factor, “Imagining life with a child”, refers to the image of how life with children will change one’s own life. The extracted content was negative, focusing on the loss of the

Table 4. Results of Confirmatory Factor Analysis for the Relationship between Four Type Model Fit Index of Awareness of Parental Responsibility (n = 396)

Model	χ^2	df	CMIN/df	GFI	AGFI	CFI	RMSEA
A	770.922***	318	2.42	0.87	0.845	0.895	0.060
B	771.601***	319	2.42	0.87	0.846	0.895	0.060
C	770.925***	319	2.42	0.87	0.846	0.895	0.060
D	771.692***	320	2.41	0.87	0.846	0.895	0.060

Structural equation modering was used for the analysis. χ^2 = chi-squire, Chi-Middle-Numerator = CMIN, Goodness-of-Fit Index = GFI, df = degree of freedom, Adjusted Goodness-of-Fit Index = AGFI, Comparative Fit Index = CFI, Root Mean Square Error of Approximation = RMSEA.

*** $p < 0.001$.

Note : Model A adopts all the covariance paths for the 27 items and four factors. Model B is a model that eliminates the paths between the first and second factors. Model C is a model that eliminates the paths between the second and third factors. Model D is a model that eliminates the paths between the first and second factors, and between the second and third factors.

Table 5. Correlations among the APR and three scales (n = 396)

	Total APR Items	First Factor: Positive responses to children	Second Factor: Imagining life with a child	Third Factor: Sense of gender role division	Fourth Factor: Imagining the practice of childcare
MES-SF	0.25**	0.22**	0.27**	-0.03	0.13**
SESRA-S	0.26**	0.09	0.05	0.53**	0.21**
FITP	0.75**	0.77**	0.12*	0.33**	0.57**

Spearman's rank coefficient test. ** p < 0.001. * p < 0.05.

A short form of the Multidimensional Empathy Scale = MES-SF.

A short-form of the scale of egalitarian sex role attitudes = SESRA-S.

A Scale of Father Identity in the Transition Period = FITP.

temporal and mental leeway experienced in one's previous life. Holding unrealistic notions, such as imagining parenthood as romantic, creates a gap between these fantasies and the reality of becoming a parent, hindering the transition into parenthood (33). Understanding the various changes that occur when transitioning from childlessness to parenthood reduces the gap between expectation and reality. This is a factor that helps individuals develop APR and facilitates adaptation. In Japan, the division of household chores and childcare between spouses continues to be based on traditional gender roles, and the burden of household chores and childcare remains heavily skewed toward wives (47). Even when men desire to balance work and childcare, achieving this balance is difficult in practice, and many find themselves compelled to prioritize work (48). When parents are unable to adapt due to gender role division consciousness during the process of parenthood, it lowers marital satisfaction (49). If they feel the role is not their responsibility, it also impacts postpartum mental health (7) and hinders the fulfillment of parenthood. "Sense of gender role division" significantly impacts the harmony of families raising children, making it a crucial factor for individuals to perceive parenthood as their own business. The fourth factor, "Imagining the practice of childcare", identified three specific activities: changing diapers, holding the baby, and bathing the baby, are widely recognized and performed by men as part of their role as fathers. These contents are the aspects men most readily recognize as their role, partly because prenatal education focused on acquiring these skills is also provided. Conversely, when they do not recognize these as their role, analysis suggests that they are in a situation in which it is difficult for them to perceive parenthood as their own business. This is evident when considering "Positive responses to children," "Imagining life with a child," and "Sense of gender role division." Traditional measures of readiness for parenthood have primarily focused on assessing whether individuals hold positive attitudes towards children and childcare, and how they interact with the fetus and their partner (50). Being able to envision oneself practicing parenting behaviors while imagining life with a child evaluated by the second factor indicates that one perceives the child's existence and daily life concretely and realistically considers how to respond to them.

Significant positive correlations were confirmed between the total APR score and MES-SF, SESRA-S, and FITP. The first, second, and fourth factors correlated moderately to strongly with FITP, while the third factor correlated moderately with the SESRA-S. It was indicated that APR encompasses perspectives such as high empathy, low sense of gender role division, and holding positive emotions and images about becoming a parent.

The above indicates that this scale encompasses all attributes captured in the conceptual analysis: "Empathy," "Sense of gender role division," "Positive emotions toward children," and "Imagining life with children." Since the necessary components for "APR" have been identified, it can be concluded that this scale

enables the confirmation of parental readiness in men who are about to become a father for the first time.

Reliability was assessed by calculating Reliability was assessed by calculating Cronbach's alpha coefficient. A Cronbach's alpha coefficient of 0.7 or higher is considered the standard (51). This scale demonstrated high values, with an overall coefficient of .87 across all 27 items and coefficients ranging from .80 to .89 for each factor, confirming internal consistency. Additionally, the CR value of 0.6 or higher is considered desirable (39). CR is based on the factor loadings in a CFA. Our overall CR for all 27 items was 0.774, with subscale values ranging from 0.697 to 0.941. This indicates that the internal consistency is better.

Regarding model fit in confirmatory factor analysis, a smaller χ^2/df ratio indicates better fit, with < 0.3 considered the benchmark (40). GFI and AGFI range from 0 to 1, with values closer to 1 being better: values exceeding 0.85 are considered good fit (41, 42). The smaller the RMSEA, the better the fit: values < 0.05 indicate a good fit, and values < 0.08 are considered acceptable (44). Although the AGFI value fell slightly short of the acceptable criterion, it was very close, and the RMSEA was within the acceptable range. Comparing the model assuming paths between all factors with a model excluding paths between factors without significant associations revealed virtually no difference in results, thus failing to disprove the appropriateness of the four-factor structure model connecting all paths. The path coefficients generally show high values and are statistically significant, indicating that the influence of the factors on the observed variables is sufficiently large. Therefore, this scale has been confirmed to be logically stable.

Feasibility of Utilizing This Scale

This measure not only assesses whether individuals view child-rearing positively but also evaluates how realistically they perceive the changes brought about by life with children, such as physical burdens and impacts on daily life. The smaller the gap between ideals and reality, the easier it is to progress toward self-acceptance and to acquire new roles smoothly. Therefore, this scale can be considered a useful measure for determining whether men are in a state conducive to acquiring parental roles and how high their readiness to become parents has reached. A low score on this scale indicates that the individual requires more attentive parenting support. This enables the provision of tailored prenatal and postnatal support and the utilization of community resources, potentially contributing to the prevention of postnatal depression in men and child abuse. Furthermore, we believe that using it to evaluate the effectiveness of prenatal childcare support programs can also lead to the development and implementation of effective programs.

Limitations and Challenges of This Study

Physical and mental ill health, as well as socially unstable circumstances, are risk factors for child abuse (52), and it is

recommended to assess the readiness of men from diverse backgrounds. The subjects of this survey were defined as individuals who are employed and in good physical and mental health. Therefore, the impact on items extracted as factors related to “APR” is undeniable. Further consideration is needed to develop a scale that can assess readiness for parenthood among men from diverse backgrounds. This survey also set the spouses’ pregnancies to be at 22 weeks or later. Men’s readiness to become fathers begins when they become aware of their spouse’s pregnancy and must be progressively heightened throughout the pregnancy. Going forward, it will be necessary to explore the potential to use this approach throughout the period from early pregnancy to childbirth. It is important to continue research aimed at further improving APR for clinical application.

The items were concentrated on the first factor. It was considered that the limitations of the statistical processing method of explanatory factor analysis could not be ignored.

CONCLUSION

The scale measuring how men experiencing fatherhood for the first time “Awareness of Parental Responsibility” consists of 27 items across four factors: “Positive responses to children,” “Imagining life with a child,” “Sense of gender role division,” and “Imagining the practice of childcare.” Its reliability and validity have been confirmed.

This scale not only enables the measurement of men’s readiness for parenthood from the perspective of “APR,” but also contributes to verifying the effectiveness of preparatory education for parenthood.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTOR CONTRIBUTIONS

O.M. and H.M. conceived the research, designed the study, and interpreted the data. O.M. performed the data analysis. O.M. and H.M. reviewed the draft manuscript and consented to its submission. They are responsible for accurately and faithfully resolving issues appropriately at all stages of the research. All authors read the final manuscript and approved its publication.

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INSTITUTIONAL REVIEW BOARD STATEMENT

This study was conducted in compliance with the guidelines of the Declaration of Helsinki. It was also carried out with the approval of the Tokushima University Hospital Research Ethics Committee for Life Sciences and Medicine (Approval No. : 4384) and the permission of the heads of the relevant research facilities.

INFORMED CONSENT

Informed consent was obtained from all research participants.

DATA AVAILABILITY STATEMENT

The data supporting the finding of this article will be made available from the authors on reasonable request.

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