PCN Psychiatry and Clinical Neurosciences

REGULAR ARTICLE

Parental bonding and attachment in the hikikomori trajectory

Diana Corona, MD,[1,2] Taisei Kubo, MA,[3] Laura Orsolini, MD, PhD,[2] Ryoko Katsuki, MA,[1] Toshio Matsushima, MD, PhD,[1] Tomohiro Nakao, MD, PhD,[1] Umberto Volpe, MD, PhD[2] and Takahiro A. Kato, MD, PhD[3,4]*

Aim: Hikikomori, a social withdrawal syndrome, has been suggested to be rooted in family dynamics. Early parental bonding (PB) has been linked to attachment and adulthood relationship patterns, possibly impacting the emergence of hikikomori. These outcomes have been connected to early experiences of the parents themselves, suggesting their intergenerational 'transmission'; we conducted two online cross-sectional surveys to clarify the above hypothesis.

Methods: The first survey presents three groups: non-hikikomori adults (C), non-pathological hikikomori (Non-PH), and pathological hikikomori (PH); the second involved parents of individuals categorized according to the abovementioned groups. PB and attachment were evaluated through the parental bonding instrument (PBI) and Relationship Structures-Experiences in Close Relationships Scale (ECR-RS).

Results: PH was associated with lower PBI 'Care', higher 'Anxious' and 'Avoidant' attachment, and the combination of 'Affectionless Control' PB and 'Fearful-Avoidant' attachment. Non-PH was linked to paternal 'Neglect', especially when combined with 'Dismissing' and 'Fearful-Avoidant' attachment.

A mediation role of attachment-related 'Avoidance' between PB and hikikomori was confirmed. Parents of PH showed higher PBI 'Protection', 'Avoidant' and 'Anxious' attachment, and lower PBI 'Care': They were linked to paternal 'Affectionless Control' and 'Fearful-Avoidant' attachment. Paternal 'Neglect' was overrepresented in parents of Non-PH.

Conclusions: Our results suggest that PB and attachment are involved in the appearance of hikikomori. PH may be connected to family history of 'Affectionless Control' and 'Fearful-Avoidant' attachment, whereas Non-PH may be linked to 'Neglectful' parenting, which could promote attachment-related 'Avoidance'.

Specific interventions aimed at enhancing parents' sensitivity and mentalization could reduce the risk and the severity of hikikomori.

Keywords: *attachment, hikikomori, intergenerational transmission, mentalization, parenting.*

http://onlinelibrary.wiley.com/doi/10.1111/pcn.70014/full

'Hikikomori' is a condition of severe social withdrawal that typically emerges during adolescence or young adulthood.[1] Traditionally, pathological hikikomori (PH) implies a significant level of distress and/or functional impairment, but recently, a form showing no significant distress and functional impairment has been proposed as non-pathological hikikomori (Non-PH).[2]

First described cases were identified in Japan and date back to the 1970s; since then, it has become a major national health and social concern in the country, and starting from the 1990s, it has progressively gained the attention of the scientific community.[3] Moreover, in recent years, clinicians from many different countries worldwide have reported cases compatible with hikikomori,[4] in contrast with its initial identification as a culture-bound syndrome, unique to Japanese society.[5–8]

Albeit not being officially listed as a formal diagnosis in the DSM-5 (American Psychiatric Association 2022), it is included in the DSM-5-TR (Text Revision) within the section on 'Culture and Psychiatric Diagnosis', which reflects the growing awareness and recognition of hikikomori as a significant social and psychological phenomenon emerging in various parts of the world.[9]

Overall, published literature on hikikomori identified a plethora of factors which could potentially contribute to its onset and/or maintenance, suggesting it as a complex entity yet to be fully understood, implying a bio-psycho-socio-cultural etiopathogenetic model.[1,10] The involvement of specific psychiatric symptomatology, that is, depressive symptoms, social anxiety, and pathological personality traits, has been widely studied.[11–13] Moreover, specific patterns in affective relationships that frequently correlate with the condition (i.e. *amae* as a form of Japanese dependence and interdependence) have been identified as possible facilitators in its development.[14] Furthermore, the potential role of specific social and environmental factors has been addressed: In particular, early childhood experiences have been implied as 'natural' roots of hikikomori,[15] and the role of one's upbringing and family context has also been highlighted.[16–22]

Specifically, parental bonding (PB), namely, the parent's availability to deliver solace, support, emotional regulation, and protection

[1] Department of Neuropsychiatry, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan
[2] Unit of Clinical Psychiatry, Department of Clinical Neurosciences/DIMSC, Polytechnic University of Marche, Ancona, Italy
[3] Department of Psychiatry, Hokkaido University Graduate School of Medicine, Sapporo, Japan
[4] Hikikomori Research Lab @ Kyushu & Hokkaido, Fukuoka & Sapporo, Japan
* Correspondence: Email: takato.hokudai@gmail.com

Psychiatry and Clinical Neurosciences published by John Wiley & Sons Australia, Ltd on behalf of Japanese Society of Psychiatry and Neurology.

according to the child's needs, has been suggested to influence that child's attachment, view of the self, and implicit relationship patterns during adulthood.[23–27] Furthermore, early experiences of relationship and attachment style of the parents themselves have been addressed,[28] thus posing the basis of an intergenerational 'transmission' of these relationship patterns.[29,30]

Moreover, hikikomori often precludes an immediate contact between clinician and patients, so family gains a key role as primary contact point for developing indirect therapeutic interventions.[31,32] As such, familial environment could become a potential target of screening and early-prevention programs,[12,33–35] as the link between upbringing and difficulties to merge with society is clarified further.

Methods

This study was approved by the ethics committee of Kyushu University (25-84). To clarify the roles of 'early relationship experiences' and family functioning in the development of hikikomori, we conducted two different online cross-sectional surveys in Japan: a total of 1500 participants were recruited through an online research company (Cross Marketing, Inc. Tokyo) during June–July 2024. Before responding to the survey, participants were required to watch an explanatory movie about the purpose of this study and the protection of their personal information. Those who completed watching the movie were considered to have provided informed consent to participate in this study.

Participants and study design

Our first survey was conducted in a sample of Japanese adults, whereas the second survey's participants were parents of adult individuals. Both samples were divided into three groups: A control group with no hikikomori status (C), a Non-PH group, and a PH group, according to the hikikomori condition of the participants (first survey) and of the participants' offspring (second survey) as defined in the 'Measures' section.

In both samples, we explored the role of PB and attachment as possible predictors of hikikomori. PB was evaluated in its two different dimensions of 'Care' and 'Protection', as the four different styles proposed by Parker *et al.* (1979)[36]: 'Optimal', 'Affectionate Constraint', 'Affectionless Control', and 'Neglect'. Attachment was evaluated in its two dimensions of 'Anxiety' and 'Avoidance', as the four styles recognized by Bartholomew and Horowitz (1991)[37]: 'Secure', 'Preoccupied', 'Dismissing', and 'Fearful-Avoidant'.

Measures

To confirm the presence of hikikomori in the subjects and their offspring (in the first and second survey, respectively), participants were initially assessed through two screening sheets: the Hikikomori Diagnostic Evaluation-Screening questionnaire (HiDE-S)[38] and the Hikikomori Diagnostic Evaluation-Screening for Family (HiDE-SF).[39] These screening sheets distinguished subjects (or their offspring) in PH, Non-PH, and C as follows: Subjects classified as hikikomori included those (or whose offspring) who declared to have been going out for long outings three or less times a week for at least 6 months; among them, those who declared distress due to the frequency of their outings in at least one aspect of their functioning were classified as PH, whereas those who respected the criteria for physical hikikomori but declared distress in no area were classified as Non-PH. The remaining subjects were included in the C group, with the exception of those who declared a hikikomori condition in the past or those who had been presenting hikikomori symptoms for a short period of time (less than 6 months). Severity of hikikomori symptomatology was investigated through the 1-month version of Hikikomori Questionnaire-25 (HQ-25M).[40] Furthermore, the parental bonding instrument (PBI)[41] and the Relationship Structures-Experiences in Close Relationships Scale (ECR-RS)[42] were employed to evaluate PB and attachment, respectively.

Statistical analysis

All analyses were performed in R (Version 4.4.1, 2024). Normality of numerical data distribution was verified through Kolmogorov–Smirnov tests. Analysis of variance was performed either *via* ANOVA, in case of normality in residues distribution, or Kruskal–Wallis test, for non-normal distributions; when a significant group effect was detected, either pairwise t-tests or pairwise Wilcoxon tests were performed, according to normality of the distributions or lack thereof. *P*-values were adjusted through the Benjamini–Hochberg[43] method for all repeated tests on the same sample group.

Frequencies of qualitative variables were compared using Chi-squared tests.

The frequencies of subjects belonging to the three groups among the different combinations of attachment and PB styles were compared with pairwise exact binomial tests.

A parallel mediation model for PB and hikikomori symptomatology using attachment dimensions ('Avoidance' and 'Anxiety') as mediators was evaluated through PROCESS Model 4.[44]

This study was approved by the Ethics Committee of Kyushu University (25-84) and complied with all provisions of the Declaration of Helsinki.

Results

First survey

We recruited 511 participants: 269 belonged to the C group, whereas Non-PH and PH amounted to 154 and 88, respectively. Subjects with subthreshold symptoms for hikikomori were excluded, as illustrated in 'Measures' subsection.

Table 1 shows variations of demographic variables, as well as scores at evaluated scales and subscales and significance of comparative tests among the sample from our first survey, evidencing interesting differences among the three groups.

Analysis of variance showed significant differences among groups in regard to PBI scores (Table 1; maternal 'Care' $P = 0.0382$, paternal 'Care' $P = 0.0131$). Specifically, pairwise comparisons revealed that the PH group presented significantly lower levels at the 'Care' subscale, both in maternal ($P = 0.037$, Fig. 1a) and paternal PBI ($P = 0.028$, Fig. 1b), when compared with C.

Group differences were also confirmed at both ECR subscales (Table 1; ECR-Avoidance $P = 0.0017$, ECR-Anxiety $P = 0.0236$): When compared with C, the 'Avoidant' attachment subscale showed higher scores in PH ($P = 0.002$, Fig. 1c). The 'Anxious' attachment subscale showed significantly higher scores in the PH group when compared with Non-PH ($P = 0.028$, Fig. 1d).

Chi-squared tests showed a significant association between hikikomori and recalled PB with the paternal figure (Table 1; $P = 0.0006$): Interestingly, paternal 'Neglectful' parenting was overrepresented in the Non-PH group, while being underrepresented in the C group (Fig. 1e).

Hikikomori condition and attachment style were also proven to be nonindependent (Table 1; $P = 0.0017$): Whereas 'Fearful-Avoidant' attachment was overrepresented in the PH group, 'Dismissing' style was overrepresented and 'Preoccupied' style was underrepresented in Non-PH group (Fig. 1f).

When taking into account simultaneously PBI and ECR outcomes, further differences among the groups allowed for a more specific subtyping. In case of paternal PBI (Fig. 2a), our analysis showed an enrichment of Non-PH in both 'Neglect' + 'Dismissing' ($P = 5.45*10^{-9}$) and 'Neglect' + 'Fearful-Avoidant' ($P = 1.64*10^{-9}$), when compared with C; the same comparison showed lower values for 'Affectionless Control' + 'Preoccupied' in Non-PH ($P = 0.00025$). PH was more frequently represented in the combinations of 'Neglect' + 'Dismissing' ($P = 0.049$) and the 'Affectionless Control' + 'Fearful-Avoidant' ($P = 0.013$) styles, when compared with C; the same comparison showed lower representation of PH for 'Affectionless Control' + 'Preoccupied' in Non-PH ($P = 0.0086$). Moreover, PH showed

Table 1. Descriptive analysis of data from the first survey.

First survey ($n = 511$)

	Hikikomori condition (HiDE-S)	Control (C) ($n = 269$)		Non-pathological (non-PH) ($n = 154$)		Pathological (PH) ($n = 88$)		Test	
		mean	sd	mean	sd	mean	sd	ANOVA (F or K-W χ^2)	P-value
	Age	49.83	9.14	47.75	10.44	46.61	10.29	4.54	**0.0111-**
HQ-25M	Total	44.45	21.38	59.29	21.17	71.63	17.99	64.99	**$<2.2*10^{-16}$**
	Lack of socialization	22.17	10.18	29.21	9.89	33.44	8.52	53.82	**$<2.2*10^{-16}$**
	Physical isolation	12.62	7.03	18.64	7.51	23.05	5.96	86.22	**$<2.2*10^{-16}$**
	Lack of emotional support	9.66	6.16	11.44	6.60	15.14	6.15	43.25	**$4*10^{-10}$**
PBI mother	Overprotection	12.57	7.05	12.21	7.38	12.92	7.94	0.76	0.6856
	Care	24.03	8.65	23.71	7.83	21.38	8.66	6.53	**0.0382**
PBI father	Overprotection	11.72	6.96	10.36	6.52	11.85	7.59	4.43	0.109
	Care	21.88	8.83	20.03	8.73	19.07	8.64	4.37	**0.0131**
ECR	Avoidance	3.11	1.42	3.40	1.40	3.70	1.39	6.45	**0.0017**
	Anxiety	2.40	1.39	2.17	1.35	2.64	1.45	7.49	**0.0236**
		Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	χ^2	*P-value*
Gender	F	123	24.07%	79	15.46%	46	9.00%	6.79	0.1475
	M	146	28.57%	75	14.68%	41	8.02%		
	Other	0	0.00%	0	0.00%	1	0.20%		
Marital state	Married	218	42.66%	75	14.68%	40	7.83%	63.32	**$2*10^{-14}$**
	Unmarried	51	9.98%	79	15.46%	48	9.39%		
Colive w parent	No	202	39.53%	97	18.98%	46	9.00%	17.81	**0.0001**
	Yes	67	13.11%	57	11.15%	42	8.22%		
Early loss of parent	No	257	50.29%	148	28.96%	79	15.46%	5.25	0.0723
	Yes	12	2.35%	6	1.17%	9	1.76%		
PBI mother	Affectionless control	107	20.94%	54	10.57%	39	7.63%	7.80	0.2528
	Affectionate constraint	12	2.35%	5	0.98%	1	0.20%		
	Neglect	59	11.55%	45	8.81%	26	5.09%		
	Optimal	91	17.81%	50	9.78%	22	4.31%		
PBI father	Affectionless control	110	21.53%	50	9.78%	34	6.65%	23.73	**0.0006**
	Affectionate constraint	13	2.54%	1	0.20%	3	0.59%		
	Neglect	51	9.98%	58	11.35%	29	5.68%		
	Optimal	95	18.59%	45	8.81%	22	4.31%		
ECR	Dismissing	39	7.63%	37	7.24%	18	3.52%	21.21	**0.0017**
	Fearful-avoidant	36	7.05%	34	6.65%	22	4.31%		
	Preoccupied	75	14.68%	24	4.70%	20	3.91%		
	Secure	119	23.29%	59	11.55%	28	5.48%		

Statistically significant results are represented in bold.

significantly higher frequencies in 'Affectionless Control' + 'Fearful-Avoidant' than Non-PH ($P = 0.044$).

Interestingly, when exploring the combination of maternal PBI and ECR (Fig. 2b), statistically significant results emerged, which were not evident on previous qualitative analysis of maternal PBI alone. Non-PH is once again more likely to associate with the 'Neglect' + 'Dismissing' ($P = 0.022$) and the 'Neglect' + 'Fearful-Avoidant' ($P = 2.23*10^{-8}$) styles, when compared to C; Non-PH frequency is lower than C in 'Affectionless Control' + 'Preoccupied' ($P = 0.0015$) and 'Neglect' + 'Secure' styles ($P = 0.044$). Conversely, PH frequency is higher than expected in 'Affectionless Control' + 'Fearful-Avoidant' ($P = 0.011$), 'Neglect' + 'Fearful-Avoidant' ($P = 0.047$), and 'Optimal' + 'Dismissing' ($P = 0.048$) cases, when compared with C; its frequency is lower in 'Optimal' + 'Secure' ($P = 0.013$) instead. PH are more likely related to 'Affectionless Control' + 'Fearful-Avoidant' ($P = 0.029$) and less likely related to 'Optimal' + 'Secure' ($P = 0.024$), when compared with Non-PH.

In light of these results, a parallel mediation model was evaluated (Fig. 2c). The four different PB styles were proposed as multi-categorical predictor (X, with $X1$ = 'Optimal' *vs.* 'Affectionless Control', $X2$ = 'Optimal' *vs.* 'Affectionate Constraint', $X3$ = 'Optimal' *vs.* 'Neglect'); attachment-related 'Avoidance' (M_1) and 'Anxiety' (M_2) were proposed as parallel mediators; severity of hikikomori symptomatology, as tested at HQ-25M, was proposed as outcome variable (Y).

The above model (Fig. 2c) was tested for both maternal and paternal PBI. In the maternal model, the Omnibus total effect of X on Y was significant ($R^2 = 0.1235$, $F = 23.8213$, $P < 10^{-4}$). X showed significant influence on both M_1 (a_1: $R^2 = 0.3174$, $F = 78.5660$, $P < 10^{-4}$) and M_2 (a_2: $R^2 = 0.2280$, $F = 49.9146$, $P < 10^{-4}$). M_1 also had a significant effect on Y (b_1: $b = 6.6404$, $t(505) = 8.5588$, Lower Level Confidence Interval (LLCI) = 5.1161, Upper Level Confidence Interval (ULCI) = 8.1647, $P < 10^{-4}$). However, after 10,000 bootstrap repetitions, the Omnibus direct effect of X on Y (c') was no longer significant, whereas the indirect effects of X on Y through M_1 were highly significant

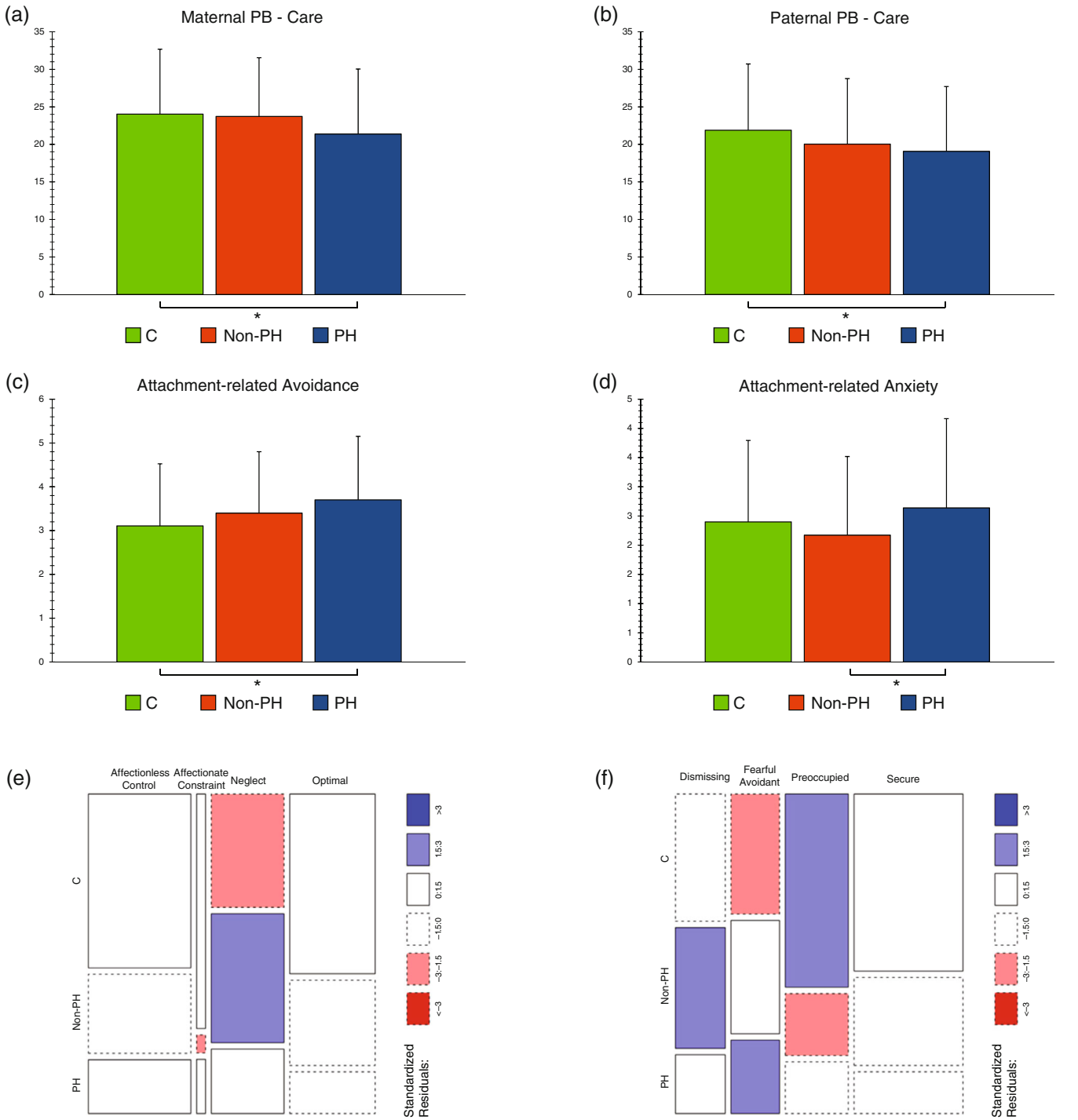

Fig. 1 First survey. (a–d) Bar plots depicting group differences among hikikomori conditions for Maternal PB 'Care' (a), Paternal PB 'Care' (b), attachment-related 'Avoidance' (c), and attachment-related 'Anxiety' (d). Statistically significant differences are represented with an asterisk (*). (e and f) Mosaic plots showing differences in frequency distribution of PB styles (e) and attachment styles (f) according to hikikomori condition. Blue boxes indicate overrepresented categories, in respect to expected frequencies with independent variables, whereas red boxes indicate underrepresented ones according to Chi-squared tests.

($a_1 + b_1$: $X1$: $b = 12.2374$, LLCI = 8.9496, ULCI = 15.6466; $X3$: $b = 8.9590$, LLCI = 6.3000, ULCI = 11.8958). The paternal model was analogous to the maternal one, with X having a significant influence on both M_1 (a_1: $R^2 = 0.3199$, $F = 79.5062$, $P < 10^{-4}$) and M_2 (a_2: $R^2 = 0.2590$, $F = 59.0671$, $P < 10^{-4}$) and M_1 exhibiting a strong effect on Y (b_1: $b = 6.9509$, $t(505) = 8.9517$, LLCI = 5.4254, ULCI = 8.4765, $P < 10^{-4}$). The bootstrapping also showed the nonsignificance of the direct effects of X on Y (c'), as well as a significant indirect effect through the mediation of M_1 ($a_1 + b_1$: $X1$: $b = 12.6970$, LLCI = 9.4878, ULCI = 16.2497; $X3$: $b = 10.3377$, LLCI = 7.6324, ULCI = 13.3486). Both models thus suggest that the relationship between PB and the severity of hikikomori symptomatology is completely mediated by attachment-related 'Avoidance' (Fig. 2d).

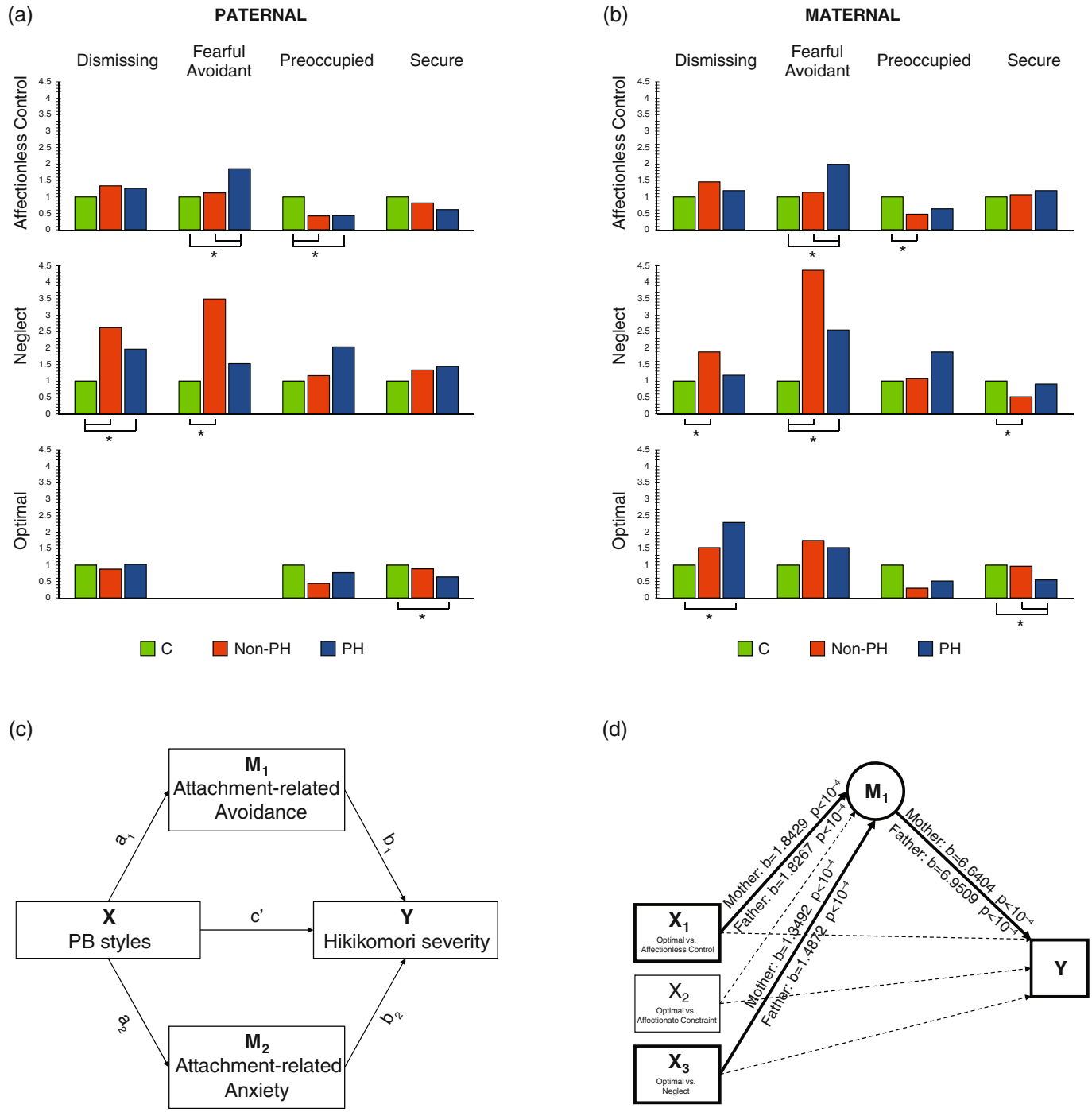

Fig. 2 Main outcomes of the first survey. (a and b) Bar plots illustrating differences of frequencies of hikikomori condition when taking into account combinations of PB and attachment styles simultaneously. The 'Affectionate Constraint' category of PB was omitted due to paucity or absence of samples reporting this characteristic. (a) Refers to paternal PB, whereas (b) refers to maternal PB. The frequencies are shown as normalized in respect to the control group. Statistically significant differences are represented with an asterisk (*). (c) Proposed parallel model for the Mediation role of attachment dimensions between PB styles and hikikomori condition. (d) Outcome of the Mediation Analysis, depicting the mediation role of attachment-related 'Avoidance' (*M*1) between multi-categorical PB styles (*X*1, *X*2, and *X*3) and hikikomori condition (*Y*). Significant mediation effects are evidenced with thicker lines, whereas nonsignificant mediations and direct effects are shown in dotted lines. Calculated effects and *P*-values for both maternal and paternal PB and attachment styles are reported adjacent to the respective lines.

Second survey

The sample of the second survey amounted to 281 subjects, as those whose offspring presented subthreshold symptoms of hikikomori were excluded according to the criteria mentioned in 'Methods'. The subjects were thus distributed in 186 C, 17 Non-PH, and 78 PH.

Table 2 shows variations of demographic variables, as well as scores at evaluated scales and subscales and significance of comparative tests among data from the second survey, evidencing interesting differences among the three groups from this sample as well. It is relevant to note how paucity of subjects in the Non-PH group might have impacted results relative to the second survey.

PCN Psychiatry and Clinical Neurosciences

Table 2. Descriptive analysis of data from the second survey.

Second survey ($n = 281$)

	Offspring's Hikikomori (HiDE-SF)	Control (C) ($n = 186$)		Non-pathological (non-PH) ($n = 17$)		Pathological (PH) ($n = 78$)		Test	
		mean	sd	mean	sd	mean	sd	ANOVA (F or K-W χ^2)	P-value
	Age	50.19	6.58	54.65	5.33	54.56	7.14	13.598	**$2.322*10^{-6}$**
	Offspring age	23.32	14.33	31.41	14.28	25.64	13.33	2.96	0.0534
PBI Mother	Overprotection	11.62	7.20	10.47	7.66	14.05	7.53	6.60	**0.0369**
	Care	24.48	8.06	25.59	9.13	21.15	8.14	11.10	**0.0039**
PBI Father	Overprotection	10.31	6.83	9.29	6.42	12.67	6.64	8.54	**0.014**
	Care	23.41	8.16	21.88	8.89	19.76	8.57	11.31	**0.0035**
ECR	Avoidance	2.89	1.43	2.91	1.49	3.51	1.45	5.18	**0.0062**
	Anxiety	2.17	1.29	2.25	1.40	2.64	1.53	6.27	**0.0435**
		Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	χ^2	*P-value*
Gender	F	100	35.59%	10	3.56%	43	15.30%	0.67	0.9554
	M	85	30.25%	7	2.49%	35	12.46%		
	Other	1	0.36%	0	0.00%	0	0.00%		
Offspring gender	F	90	32.03%	10	3.56%	36	12.81%	1.38	0.8478
	M	95	33.81%	7	2.49%	41	14.59%		
	Other	1	0.36%	0	0.00%	1	0.36%		
Marital state	Married	186	66.19%	17	6.05%	77	27.40%	2.61	0.2709
	Unmarried	0	0.00%	0	0.00%	1	0.36%		
Colive with parent	No	159	56.58%	17	6.05%	63	22.42%	4.14	0.1261
	Yes	27	9.61%	0	0.00%	15	5.34%		
Early loss of parent	No	174	61.92%	17	6.05%	76	27.05%	2.70	0.2588
	Yes	12	4.27%	0	0.00%	2	0.71%		
PBI mother	Affectionless control	62	22.06%	4	1.42%	33	11.74%	8.60	0.1971
	Affectionate constraint	4	1.42%	0	0.00%	2	0.71%		
	Neglect	56	19.93%	5	1.78%	28	9.96%		
	Optimal	64	22.78%	8	2.85%	15	5.34%		
PBI father	Affectionless control	54	19.22%	3	1.07%	37	13.17%	14.88	**0.0212**
	Affectionate constraint	10	3.56%	1	0.36%	3	1.07%		
	Neglect	35	12.46%	7	2.49%	14	4.98%		
	Optimal	87	30.96%	6	2.14%	24	8.54%		
ECR	Dismissing	28	9.96%	2	0.71%	15	5.34%	15.01	**0.0202**
	Fearful-avoidant	13	4.63%	3	1.07%	16	5.69%		
	Preoccupied	48	17.08%	3	1.07%	21	7.47%		
	Secure	97	34.52%	9	3.20%	26	9.25%		

Statistically significant results are represented in bold.

Analysis of variance showed statistically significant differences among the three groups at both PBI subscales (Table 2; maternal PBI 'Overprotection' $P = 0.0369$, maternal PBI 'Care' $P = 0.0039$, paternal PBI 'Overprotection' $P = 0.014$, paternal PBI 'Care' $P = 0.0035$). This effect seems to be driven by the parents of PH, with a trend showing lower 'Care' at maternal PBI (Fig. 3a; $P = 0.005$) and lower 'Care' and higher 'Protection' for paternal PBI (Fig. 3b,c; $P = 0.003$, $P = 0.016$).

Differences were also detected in ECR subscales (Table 2; ECR-Avoidance $P = 0.0062$, ECR-Anxiety $P = 0.0435$): Pairwise comparison evidenced higher 'Avoidant' (Fig. 3d; $P = 0.005$) and 'Anxious' (Fig. 3e; $P = 0.037$) attachment in the parents of PH, when compared to C.

Chi-squared tests showed an association between the subjects' recollection of PB with their father and the hikikomori condition of their offspring (Table 2; $P = 0.0212$): parents of PH overreported paternal 'Affectionless Control', whereas parents of Non-PH over-reported 'Neglectful' parenting (Fig. 3f); the latter result may be impacted by the low numerosity of the group in question. The relation between attachment style and offspring's hikikomori was also significant (Table 2; $P = 0.0202$), where parents of PH were more likely to report a personal 'Fearful-Avoidant' attachment style and less likely to report a 'Secure' attachment (Fig. 3g).

Further exploration of these data combining PBI and ECR outcomes confirmed that in both maternal ($P = 3.46*10^{-5}$) and paternal ($P = 1.06*10^{-6}$) PBI, PH appeared significantly more frequently in 'Affectionless Control' when combined to 'Fearful-Avoidant' attachment.

Discussion

The family structure of contemporary Japan has been described as characterized by a relative affective distance between parents, without

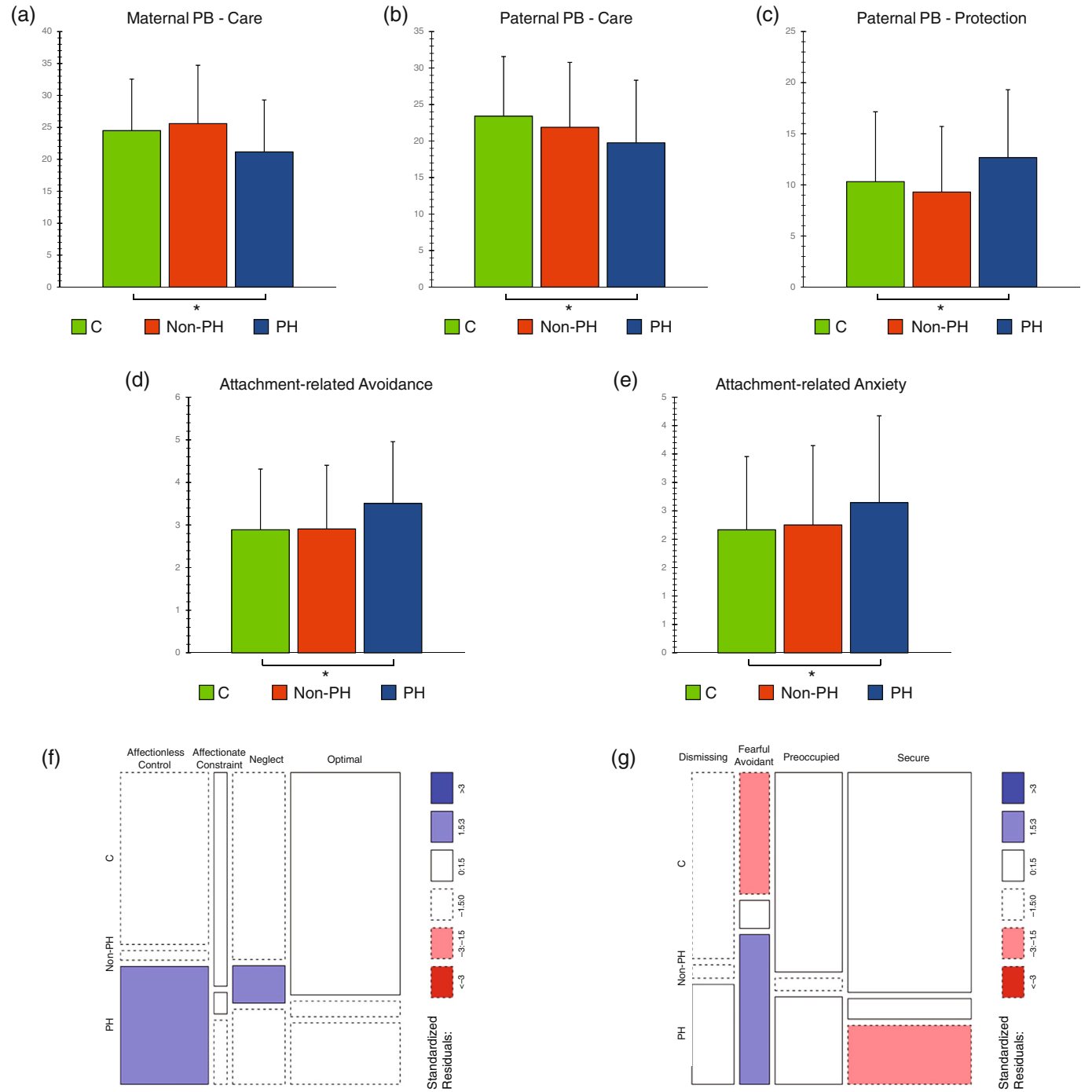

Fig. 3 Second survey. (a–e) Bar plots depicting group differences among hikikomori conditions of the offspring for maternal PB 'Care' (a), paternal PB 'Care' (b), paternal PB 'Protection' (c), attachment-related 'Avoidance' (d), and attachment-related 'Anxiety' (e) Statistically significant differences are represented with an asterisk (*). (f and g) Mosaic plots showing differences in frequency distribution of PB styles (f) and attachment styles (g) according to hikikomori condition of the offspring. Blue boxes indicate overrepresented categories, in respect to expected frequencies with independent variables, whereas red boxes indicate underrepresented ones according to Chi-squared tests.

expectations of romanticism and emotional involvement during child rearing.[45] This family configuration is commonly associated with greater interdependence in the child–parent relationship,[46] which translates into a tendency to anticipate the child's needs even before they are expressed. This form of overprotection has been proposed to hinder the development of independence and self-reliance for that child.[1,47] Conversely, parental indifference may be interpreted as a rejection of one's dependence and as a form of aggressiveness.[48] Such framework is suggested to facilitate the internalization of a persecutor-distancer model, which has been connected to avoidance of closeness in adulthood.[49]

This hypothesis is partially sustained by our data: Mediation analysis suggests that attachment-related 'Avoidance' mediates between PB and hikikomori symptoms—specifically, experiences of maternal or paternal 'Neglect' and/or 'Affectionless Control' may promote the development of 'Avoidant' attachment, which, in turn, may contribute to the appearance of hikikomori. Moreover, the consistency of results in both surveys supports the theory of an

intergenerational involvement of these 'early experiences of relationship' in later appearance of hikikomori.

Specifically, our data suggest that Non-PH may be linked to 'Neglectful' parenting, that could promote the integration of a negative models of others: Poor personal history of positive relationship could promote scarce interest in relationship, thus leading to abstention from relationship (attachment-related 'Avoidance'). This may facilitate the appearance of Non-PH, where interpersonal distance could act as somehow functional compensating mechanism.

PH appears to be connected to a family history of 'Affectionless Controlling' parenting; the combination of intrusiveness and lack of warmth may induce a view of others as unpredictable and unwilling to love, and the self as incapable to self-regulate and to be worthy of affection, with generally higher functioning impairment. Integration of these blueprints may be linked to 'Fearful-Avoidant' attachment, which we herein revealed in both parents of PH and in PH themselves: In this case, social withdrawal could be an adverse outcome, losing its compensating potential and thus leading to intense distress.

Interestingly, existing studies on the features of attachment and PB in different cultural models in a nonclinical population have suggested how some significant differences between Japan and other countries could be culturally bound, whereas other features appear worldwide independently from the cultural context.[49,50] Given the spread of hikikomori to different countries around the world, with very much different social structures,[51] it is likely that some of the features of early relationship patterns that can be evidenced in the Japanese hikikomori population may be relevant in international cases as well.

On the other hand, the complex etiopathology hypothesized for hikikomori calls for an interconnected understanding of all the different factors implied in its development. In this regard, family environment and 'early experiences of relationship' might acquire particular relevance as they have been implicated in later socioemotional functioning, potentially impacting the ability to stand in society during adulthood,[50] as they contribute to shaping future social life, adherence to social norms, and one's social role. Moreover, biological heritability and adverse childhood experiences have suggested to be linked to resilience and/or susceptibility to psychiatric fragility in adulthood.[15,52–55] Further investigations should be conducted to clarify these links.

Future Direction

Hikikomori cases have been observed in a variety of countries.[51] Interestingly, the relationship between attachment and hikikomori has been reported not only in Japan but also internationally.[1,21] Although a secure attachment relationship formed in early development is considered to reduce the risk of hikikomori, correcting parent–child relationships even after the onset of hikikomori may also be effective. Parental rejection has been suggested to contribute to the development of insecure attachment and peer rejection, which may lead to hikikomori.[56] Conversely, educational programs for parents may help modify attachment patterns and improve the parent–child relationship.

Attachment-based programs for improving PB have already been implemented to address various mental health challenges.[43] Programs already proposed for parents of children and youths, such as Connect and the Circle of Security, aim to enhance parenting skill development through the use of empathy, responding with warmth and sensitivity to support emotion regulation in the parent–child relationship.[57,58] These programs increase the caregiver's reflection about how his or her own developmental history affects current caregiving behavior. Such improvement could positively influence the interpersonal relationships of hikikomori individuals and potentially reduce the severity of hikikomori.

On the other hand, hikikomori-specific interventions aimed at enhancing parental sensitivity and mentalization, as well as targeted early or preventive attachment-based programs, could reduce the risk and severity of social withdrawal in offspring and shorten the duration of untreated illness in hikikomori individuals. The hikikomori guideline in 2010 proposed a family approach as the first step in treating hikikomori.[59] Thus, we, members of the Hikikomori Research Lab, have already developed a novel educational program for parents of individuals suffering from hikikomori,[32] combining key elements of Mental Health First Aid (MHFA)[60] and Community Reinforcement and Family Training (CRAFT).[61] MHFA is a program that helps participants obtain practical skills to provide help to persons with mental health problems, such as assessing and assisting with any crisis, listening nonjudgmentally, and giving support while encouraging professional help.[60] CRAFT, as employed in current hikikomori programs, involves positive communication skills and functional analysis of behavior therapy, which aims to clarify the chronological relationship between targeted behaviors, their corresponding antecedents, and subsequent outcomes.[35] Thus, these approaches for hikikomori that rely mainly on behavior management and problem solving could be integrated with the promotion of reflective capacity, emotion regulation, sensitive care, and building security within the parent–child relationship. Digital technology is beginning to revolutionize the fields of psychiatry and mental health. Virtual reality (VR) is characterized by immersion, interactivity, and responsiveness, enabling users to experience sensations and emotions in various situations.[62] We have recently launched a VR-assisted family education program for family members of individuals suffering from hikikomori, based on MHFA and CRAFT.[63]

Limitations

The present study employs a preliminary cross-sectional design and has some limitations. Firstly, employed scales were self-rated, which may have introduced recall and desirability biases. Secondly, the sample size of some groups (e.g. the Second Survey's Non-PH and 'Affectionate Constraint' PB) was significantly smaller than their counterparts.

Therefore, expanding the dataset and conducting subsequent analyses would enhance the statistical accuracy of the results and potentially yield further statistically significant outcomes; this study design did not pair data between the adults' and parents' groups.

This study was conducted on a Japanese population sample, and culturally and historically specific factors intrinsic to Japan may have influenced the presentation of hikikomori in the specific phenomenology observed in this study. Therefore, further cross-cultural studies with longitudinal designs are warranted to distinguish sociocultural factors from broader transcultural characteristics of the pathological trajectory of hikikomori, which could help describe the phenomenon in its current global emergence. Lastly, while this study acknowledges the complexity of hikikomori, characterized by the interplay of biological, psychological, social, and cultural factors, it focuses exclusively on early childhood parenting experiences and attachment styles. This study does not address the broader, multifactorial etiology of hikikomori. Future research could enhance the theoretical framework and contextual understanding of our findings by providing a more comprehensive discussion of these contributing factors.

Author contributions

T.A.K. initially designed the study. D.C. and T.A.K. revised the study design. D.C., T.K., R.K., T.M., T.N., L.O., U.V., and T.A.K. contributed to collecting data and data analysis. D.C. wrote the first draft of the manuscript. T.A.K. edited the draft manuscript, and all the other authors commented on the refined manuscript. All authors carefully read the manuscript and approved the final version for submission.

Acknowledgments

This work was partially supported by a Grant-in-Aid for Scientific Research from (1) the Japan Society for the Promotion of Science (KAKENHI; JP18H04042, JP19K21591, JP20H01773, JP22H00494, and JP23H01044 to T.A.K.), (2) the Japan Agency for Medical Research and Development (AMED; JP21wm0425010 and

JP25wm0625322 to T.A.K.), and (3) the Japan Science and Technology Agency CREST (JPMJCR22N5 to T.A.K.). The funders played no role in the study design, data collection and analysis, decision to publish, or manuscript preparation.

Disclosure statement

All the authors declare no conflicts of interest.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

1. Kato TA, Kanba S, Teo AR. Hikikomori: Multidimensional understanding, assessment, and future international perspectives. *Psychiatry Clin. Neurosci.* 2019; **73**: 427–440.
2. Kato TA, Sartorius N, Shinfuku N. Shifting the paradigm of social withdrawal: A new era of coexisting pathological and non-pathological hikikomori. *Curr. Opin. Psychiatry* 2024; **37**: 177–184.
3. Saito T. *Shakaiteki Hikikomori-Owaranai Shishunki [Social Withdrawal: A Neverending Adolescence]*. PHP kenkyujo, Tokyo, 1998.
4. Kato TA, Tateno M, Shinfuku N *et al*. Does the 'hikikomori' syndrome of social withdrawal exist outside Japan? A preliminary international investigation. *Soc. Psychiatry Psychiatr. Epidemiol.* 2012; **47**: 1061–1075.
5. Nakagami Y, Ii T, Russ TC *et al*. Taijin kyofusho: A culture-bound diagnosis discussed by Japanese and international early career psychiatrists. *Psychiatry Clin. Neurosci.* 2017; **71**: 146–149.
6. Martinotti G, Vannini C, Di Natale C *et al*. Hikikomori: Psychopathology and differential diagnosis of a condition with epidemic diffusion. *Int. J. Psychiatry Clin. Pract.* 2021; **25**: 187–194.
7. Ovejero S, Caro-Cañizares I, de León-Martínez V, Baca-Garcia E. Prolonged social withdrawal disorder: A hikikomori case in Spain. *Int. J. Social Psychiatry* 2014; **60**: 562–565.
8. Furuhashi T, Figueiredo C, Pionnié-Dax N, Fansten M, Vellut N, Castel P-H. Pathology seen in French "hikikomori". *Seishin Shinkeigaku Zasshi* 2012; **114**: 1173–1179.
9. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed., text rev. edn. American Psychiatric Publishing, Washington, DC, 2022.
10. Kato TA, Kanba S. Boundless syndromes in modern society: An interconnected world producing novel psychopathology in the 21st century. *Psychiatry Clin. Neurosci.* 2016; **70**: 1–2.
11. Koyama A, Miyake Y, Kawakami N *et al*. Lifetime prevalence, psychiatric comorbidity and demographic correlates of "hikikomori" in a community population in Japan. *Psychiatry Res.* 2010; **176**: 69–74.
12. Watanabe K. Anxiety disorders especially related to Futoko (school refusal) and hikikomori. *Jpn. J. Pediatr.* 2011; **64**: 871–879.
13. Wong PW, Li TM, Chan M *et al*. The prevalence and correlates of severe social withdrawal (hikikomori) in Hong Kong: A cross-sectional telephone-based survey study. *Int. J. Soc. Psychiatry* 2015; **61**: 330–342.
14. Neoh MJY, Carollo A, Lim M, Esposito G. Hikikomori: A Scientometric review of 20 years of research. *Int. J. Environ. Res. Public Health* 2023; **20**: 5657.
15. Masuda R, Katsuki R, Matsushima T, Kyuragi S, Nakao T, Kato TA. Does childhood maltreatment affect hikikomori via traits of modern-type depression? *J. Affect. Disord.* 2024; **360**: 50–54.
16. Kato T. *Nigeruga kachi no kokoroe: seishinkai ga susumeru "utsu sotsu" to shiawase na hikikomori raifu*. Kodachi no bunko, Tokyo, 2023.
17. Katsuki R, Inoue A, Indias S *et al*. Clarifying deeper psychological characteristics of hikikomori using the Rorschach comprehensive system: A pilot case-control study. *Front. Psychiatry* 2019; **10**: 412.
18. Orsolini L, Longo G, Bellagamba S, Kato TA, Volpe U. Hikikomori-like social withdrawal: An Italian case report. *Psychiatry Clin. Neurosci.* 2023; **77**: 510.
19. Hattori Y. Social withdrawal in Japanese youth. *J. Trauma Pract.* 2006; **4**: 181–201.
20. Muzi S, Rogier G, Pace CS. Peer power! Secure peer attachment mediates the effect of parental attachment on depressive withdrawal of teenagers. *Int. J. Environ. Res. Public Health* 2022; **19**: 4068.
21. Santona A, Lionetti F, Tognasso G *et al*. Sensitivity and attachment in an Italian sample of hikikomori adolescents and young adults. *Int. J. Environ. Res. Public Health* 2023; **20**: 6148.
22. Umemura T, Watanabe M, Tazuke K, Asada-Hirano S, Kudo S. Secure base script and psychological dysfunction in Japanese young adults in the 21st century: Using the attachment script assessment. *Dev. Psychol.* 2018; **54**: 989–998.
23. Crittenden PM, Landini A. *Assessing Adult Attachment: A Dynamic-Maturational Approach to Discourse Analysis. A Norton professional book*. W. W. Norton Professional, New York, 2011.
24. Lambruschi F. *Psicoterapia cognitiva: l'orientamento costruttivista ed evolutivo*. Carocci, Rome, 2024.
25. Bowlby J, Institute of P-a. *Attachment and Loss*. The Hogarth Press and the Institute of Psycho-Analysis, London, 1969.
26. Chen BB, Santo JB. The relationships between shyness and unsociability and peer difficulties: The moderating role of insecure attachment. *Int. J. Behav. Dev.* 2016; **40**: 346–358.
27. Nitta M, Narita T, Umeda K, Hattori M, Naitoh H, Iwata N. Influence of negative cognition on the parental bonding instrument (PBI) in patients with major depression. *J. Nerv. Ment. Dis.* 2008; **196**: 244–246.
28. Shah PE, Fonagy P, Strathearn L. Is attachment transmitted across generations? The plot thickens. *Clin. Child Psychol. Psychiatry* 2010; **15**: 329–345.
29. Verhage ML, Schuengel C, Madigan S *et al*. Narrowing the transmission gap: A synthesis of three decades of research on intergenerational transmission of attachment. *Psychol. Bull.* 2016; **142**: 337–366.
30. Zelekha Y, Yaakobi E. Intergenerational attachment orientations: Gender differences and environmental contribution. *PLoS One* 2020; **15**: e0233906.
31. Kubo H, Urata H, Sakai M *et al*. 3-day intervention program for family members of hikikomori sufferers: A pilot randomized controlled trial. *Front. Psychiatry* 2022; **13**: 1029653.
32. Kubo H, Urata H, Sakai M *et al*. Development of 5-day hikikomori intervention program for family members: A single-arm pilot trial. *Heliyon* 2020; **6**: e03011.
33. Kato TA. *Minna No Hikikomori Tsunagari Jidai No Shoseijutsu*. Kodashinobunko, Tokyo, 2020.
34. Meyers RJ, Mille WR, Hill DE, Tonigan JS. Community reinforcement and family training (CRAFT): Engaging unmotivated drug users in treatment. *J. Subst. Abuse* 1998; **10**: 291–308.
35. Sakai M, Nonaka S. *CRAFT Hikikomori no Kazoku-Shien Workbook [CRAFT Workbook for Supporting Family Members of Hikikomori]*. Kongoshuppan, Tokyo, 2013.
36. Parker G, Tupling H, L. B. Brown. A parental bonding instrument. *Br. J. Med. Psychol.* 1979; **52**: 1–10.
37. Bartholomew K, Horowitz LM. Attachment styles among young adults: A test of a four-category model. *J. Pers. Soc. Psychol.* 1991; **61**: 226–244.
38. Reina S, Kubo T, Orsolini L *et al*. Hikikomori diagnostic evaluation-screening form (HiDE-S): A validation study. *Psychiatry Clin. Neurosci.* 2025; **79**: 496–497.
39. Kato TA. The Hikikomori Diagnostic Evaluation - Screening for Family (HiDE-SF). In: Kato TA (ed.). *Research Tools*, Hikikomori Research lab @ Kyushu & Hokkaido, Fukuoka & Sapporo, 2024.
40. Kato TA, Suzuki Y, Horie K, Teo AR, Sakamoto S. One month version of hikikomori Questionnaire-25 (HQ-25M): Development and initial validation. *Psychiatry Clin. Neurosci.* 2023; **77**: 188–189.
41. Kitamura T, Psych FRC, Suzuki T. A validation-study of the parental bonding instrument in a Japanese population. *Jpn. J. Psychiatry Neurol.* 1993; **47**: 29–36.
42. Komura K, Tatsuya M, Toda K. Development of ECR-RS Japanese version: Examination of factor structure and reliability. *Jpn. J. Psychol.* 2016; **87**: 303–313.
43. Haynes W. Benjamini–hochberg method. In: *Encyclopedia of Systems Biology*. Springer, New York, 2013; 78.
44. Hayes AF. Introduction to Mediation, Moderation, and Conditional Process Analysis. In: *A Regression-Based Approach*. Methodology in the Social Sciences Ser, Second edn. Guilford Publications, New York, 2017.
45. Davies PT, Cummings EM. Marital conflict and child adjustment - an emotional security hypothesis. *Psychol. Bull.* 1994; **116**: 387–411.
46. Markus HR, Kitayama S. Culture and the self - implications for cognition, emotion, and motivation. *Psychol. Rev.* 1991; **98**: 224–253.
47. Kato TA, Kanba S. Modern-type depression as an "adjustment" disorder in Japan: The intersection of collectivistic society encountering an

individualistic performance-based system. *Am. J. Psychiatry* 2017; **174**: 1051–1053.
48. Uji M, Tanaka N, Shono M, Kitamura T. Factorial structure of the parental bonding instrument (PBI) in Japan: A study of cultural, developmental, and gender influences. *Child Psychiatry Hum. Dev.* 2006; **37**: 115–132.
49. Hoenicka MAK, Lopez-de-la-Nieta O, Martinez Rubio JL *et al*. Parental bonding in retrospect and adult attachment style: A comparative study between Spanish, Italian and Japanese cultures. *PLoS One* 2022; **17**: e0278185.
50. Rothbaum F, Weisz J, Pott M, Miyake K, Morelli G. Attachment and culture: Security in the United States and Japan. *Am. Psychol.* 2000; **55**: 1093–1104.
51. Tan MP, Hayakawa K, Nakagami Y *et al*. Global psychiatrists' opinions about hikikomori from biopsychosocial perspectives: International case vignette survey. *Psychiatry Clin. Neurosci. Rep.* 2025; **4**: e70120.
52. Matsuo K, Watanabe M, Inamine S *et al*. The flow cytometric analysis of depression focusing on modern-type depression and hikikomori: Exploring the link between subtypes of depression and immunological imbalances. *Dialogues Clin. Neurosci.* 2025; **27**: 13–25.
53. Kyuragi S, Matsushima T, Matsuo K, Nakao T, Kato TA. High-sensitivity C-reactive protein and bilirubin as possible biomarkers for hikikomori in depression: A case-control study. *Psychiatry Clin. Neurosci.* 2023; **77**: 458–460.
54. Setoyama D, Matsushima T, Hayakawa K *et al*. Blood metabolic signatures of hikikomori, pathological social withdrawal. *Dialogues Clin. Neurosci.* 2021; **23**: 14–28.
55. Hayakawa K, Kato TA, Watabe M *et al*. Blood biomarkers of hikikomori, a severe social withdrawal syndrome. *Sci. Rep.* 2018; **8**: 8.
56. Krieg A, Dickie JR. Attachment and hikikomori: A psychosocial developmental model. *Int. J. Soc. Psychiatry* 2013; **59**: 61–72.
57. Moretti MM, Dys SP, Craig SG *et al*. An attachment-based program for parents of youth with clinically significant mental health problems: Scaling up and drilling down to mechanisms of change. *JCPP Adv.* 2025; **5**: e12248.
58. Marvin R, Cooper G, Hoffman K, Powell B. The circle of security project: Attachment-based intervention with caregiver-pre-school child dyads. *Attach. Hum. Dev.* 2002; **4**: 107–124.
59. Saito K. Research into the actual state of psychiatric disorders that lead to adolescent social withdrawal and the construction of a psychiatric treatment and support system. Health, *Labor and Welfare Science Research Grants Disease and Disability Prevention Research Field Mental Health Science Research*. National Institute of Public Health, Japan. 2010.
60. Kitchener BA, Jorm AF. Mental health first aid training for the public: Evaluation of effects on knowledge, attitudes and helping behavior. *BMC Psychiatry* 2002; **2**: 10.
61. Smith JE, Meyers RJ. *Motivating Substance Abusers to Enter Treatment: Working with Family Members*. Guilford Press, New York, 2007.
62. Grigore C, Burdea PC. *Virtual Reality Technology*, John Wiley & Sons, New Jersey, 2003.
63. Kubo T, Kato TA. Virtual reality as a novel therapeutic tool in psychiatry: Will virtual reality intervention for families rescue hikikomori? *Curr. Opin. Psychiatry* 2025; **38**: 227–234.