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Can different adult attachment profiles be distinguished when categorical and dimensional approaches are combined? Evidence based on two questionnaires

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Abstract

The study of adult attachment styles has been approached either from a categorical or from a dimensional perspective, although some authors advocate a combination of both. In this last line, the present study assessed which attachment styles can be identified in two different questionnaires (CAA-r and ECR) using Factor Mixture Analysis (FMA), a technique that combines the categorical and dimensional approaches by allowing the hypothesis of different numbers of classes within a well-defined factorial structure to be rigorously tested. Furthermore, the appropriateness of different class-solutions can be assessed instead of imposing a fixed number a priori. These advantages are particularly relevant in attachment research overcoming the theoretical and methodological limitations of the previous approaches and contributing to both theoretical and practical advances in this domain. The sample consisted of 619 adults (60% female) and the FMA and validity analyses were performed with *MPlus*. In both measures, the FMA results suggest that there is a majority profile of individuals with neither high nor low means in any attachment factor, and a minority profile of insecure attachment, as had already been found previously with the CAA questionnaire. Furthermore, a different pattern of relationships between the attachment factor levels and other variables (perceived maternal care, perceived maternal overprotection and neuroticism) was found for each profile. Both the FMA and validity-analyses results point to the interest in differentiating between profiles, especially in the CAA-r. However, the results seem to be halfway between what is proposed from the dimensional and from the categorical perspectives.

Keywords Secure attachment · Insecure attachment · Factor mixture analysis · Maternal bonding · Neuroticism

The attachment theory has its roots in the studies and field work of John Bowlby and Mary Ainsworth over several decades of the 20th century. Bowly (1977) described attachment as a lasting and deep emotional bond between human beings, being the first attachment often established with the primary caregiver, usually the mother. This attachment figure would become a source of security and support, and so the separation, or threat of separation, from this figure would cause emotional distress (Bowlby, 1977). Ainsworth (1989) described the following kinds of attachment in the childhood: secure attachment, anxious/ambivalent attachment and avoidant attachment. Main and Solomon (1986) proposed a fourth category named disorganized/disoriented attachment, for children that display contradictory behaviors or affects, such as wishing to get closer to the attachment figure and, at the same time, moving away, freezing, showing fear, anger, seeking contact in an intense way, etc.

Although the attachment theory was originally focused on childhood, there has also been considerable interest in extending the theory to adults, giving rise to a substantial body of research in this population (e.g., Karantzas et al., 2023). So far, this research has been conducted using two main approaches (Martínez & Santelices, 2005). The first approach has focused on knowing which is the individual's mental state or representational system regarding the attachment experiences in childhood, which theorists refer to as

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states of mind, and which are derived from Internal Working Models. The Adult Attachment Interview (AAI, Main et al., 1985) is one of the main exponents of this approach. It is a lengthy interview in which the interviewer assesses the coherence of the individual while recounting relevant experiences from his/her childhood, as well as the structure of this narration and the ability to collaborate effectively with the interviewer, understanding that they involve unconscious aspects that are the result of his/her Internal Working Models. The second approach, which is the one we follow in the present research, focuses on the conscious self-reported content of attachment experiences. So, in this approach, self-report questionnaires are considered to be a useful way of objectively assess attachment styles (rather than states of mind) on the basis of the individual's perception of his or her relationships with others.

Regardless of the starting approach, there has been in the last decades a basic debate on whether the instruments that assess attachment should follow a categorical or a dimensional approach. Authors such as R. Chris Fraley have questioned the categorical approach, considering the dimensional approach to be more realistic (e.g., Fraley et al., 2015; Raby et al., 2021). These authors argue that the categorical approach assumes that variation within categories is less significant than variation between categories. However, if this assumption was not appropriate, the use of categories would lead to a loss of information, as the differences between individuals assigned to the same category would be ignored or minimized. Furthermore, they also point out that the results so far obtained by using factor analytic and taxometric methods are compatible with the dimensional approach (e.g., Fraley et al., 2015; Raby et al., 2021). In contrast, authors such as Steele and Steele (2021), even though recognising that the dimensional approach is also valuable, consider the categorical approach as preferable because it allows attachment to be assessed more comprehensively, because certain individual differences are a matter of *kind* rather than *degree*, and of *quality* rather than *quantity*. The categorical vs. dimensional controversy has also led to the coexistence of the two approaches, with some recent studies even using both at the same time (e.g., Masopustová et al., 2023).

Bartholomew and Horowitz (1991) proposed a four-category model that reconciles the dimensional and categorical approaches, since each category (secure, preoccupied, dismissing, and fearful) derives from the combination of the extreme positions in anxiety and avoidance dimensions. However, many questionnaires in the adult attachment field that follow both a dimensional and a categorical approach share the same limitation: As the authors focus on previous theories and models, they do not include an exploratory phase to determine which is the most plausible number of categories that the instrument is able to successfully identify. Rather, they tend to assess only one system, usually clustering individuals on four 'a priori' categories, without exploring other alternatives. This is the case, for example, of Brennan' et al. (1998) *Experiences in Close Relationships* (ECR) questionnaire. These authors first undertook a review of the previous self-report scales and factor analysed hundreds of items, essentially obtaining that two dimensions were underlying the item responses, avoidance and anxiety, which conceptually correspond to the two dimensions proposed by Bartholomew and Horowitz (1991). Next, they developed the ECR to assess these dimensions. Although this instrument was developed following a dimensional approach, the authors clustered the subjects into four groups based on their scores on the anxiety and avoidance factors, and the groups corresponded conceptually to Bartholomew's four attachment styles. The ECR has been adapted to many different cultures and languages, including Spanish (Alonso-Arbiol et al., 2007).

Another example is the 40-item Adult Attachment Questionnaire (CAA), developed by Melero and Cantero (2008), and the more recent Adult Attachment Questionnaire-Revised (CAA-r; Melero & Cantero, 2024), developed in Spain. In both cases, the authors first identified the number of factors or components underlying the data, and then carried out a k-means clustering with four specified clusters to find out whether the participants could be classified in the four groups proposed by Bartholomew and Horowitz (1991), taking the four components as a starting point. Therefore, they did not follow an exploratory approach to determine the most suitable number of profiles for differentiating among subjects. In the most recent version, the CAA-r, the exploratory Factor Analysis yielded the following factors: (1) Anxiety, (2) Socioemotional competence, (3) Avoidance, and (4) Anger. The k-means clustering with four specified clusters yielded four attachment categories, which, according to the authors, correspond to the Bartholomew and Horowitz (1991) categories.

Given the limitations above, in our view, there is a need for further research in this area that (a) takes a more exploratory approach, rather than assuming a priori that there are a certain pre-specified number of classes, and (b) uses more appropriate procedures that allow the categorical and the dimensional approaches to be combined. Compared to the previously used approaches, Factor Mixture Analysis (FMA; e.g., Lubke & Muthén, 2005) is a more suitable procedure for identifying different profiles or clusters of individuals within a established dimensional structure, by allowing an exploratory approach (as far as the most plausible number of classes is concerned) to be performed. Essentially, FMA

is a hybrid modeling that combines the common factor model with latent class analysis (LCA), and its main advantage is that the structure of the relations among the variables is allowed to be simultaneously dimensional and categorical. In more detail, in a purely dimensional approach such as factor analysis (FA), either exploratory or confirmatory, the population under study is assumed to be homogeneous, and all the observed individual differences are assumed to arise only from the different levels the individuals have on the factors. So, sub-populations or classes are neither allowed nor can be modelled. In contrast, in a pure categorical approach such as LCA all the observed variation is assumed to be due to the differences among the classes. So, strictly speaking, all the observed variability is between-class, and, within a given class, the variables cease to be related. Given the review above, both positions appear to be too extreme here. On the one hand, most of the FA-based research on attachment measures suggests clear factorial structures for the entire group. So, it is hard to believe that these structures arise solely because variation among different hypothetical classes. On the other hand, evidence of population heterogeneity (or existence of subpopulations, profiles or classes) seems also to exist. The use of FMA allows to reconcile these opposite results by relaxing the assumption of within-class conditional independence. In our case, FMA allows us to assume that, in each of the two instruments, there is a common factorial structure that influences the item responses of the entire population, and so, that allows for within-class variation. However, we also assume that there may be groups of individuals that behave differently (i.e. classes, profiles, or subpopulation) and that can be identified by allowing across-classes variations in the common factorially structure.

With regards to the previous dimensional-categorical combined studies revised above, we believe that the use of FMA has also advantages here. These previous studies used essentially a three-step sequence: (a) determining a (dimensional) factor structure; (b) obtain individual scores based on this structure, and (c) test an 'a priori' cluster solution based on these scores. While this approach is plausible it is only approximate because individual scores are at best approximations to the 'true' trait levels and the test of the imposed clustering structure is not rigorous either. In contrast, the use of FMA does not impose any a priori a class solution but allows hypotheses regarding different class solutions to be rigorously assessed at the structural level (not at the fallible score level) by using a sequence of nested tests (see Table 3 and 2 below).

Overall, FMA may be helpful for resolving the categorical vs. dimensional debate. More specifically, if it was not possible to differentiate between profiles, then, the dimensional perspective - based on subjects' scores on different questionnaire factors or subscales– would be fully appropriate for assessing adult attachment. However, if profiles could be differentiated by using the FMA, then, a purely dimensional approach will be insufficient because factors or subscales scores will not provide all the necessary information by not being able to capture qualitative differences between individuals. Therefore, the FMA may be pivotal in determining how adult attachment assessments should be conducted, influencing the development of future questionnaires. It may also affect the interventions designed in this field, which should address the needs of each identified attachment profile.

Regarding the CAA questionnaire mentioned above, the FMA-based results by Morales-Vives et al. (2021) showed that only two profiles could be univocally differentiated on the basis of the 'true' CAA scores: (1) A general profile, named by the authors as normal-range profile or secure attachment, that encompassed most of participants (77.48%), without high or low means in any factor, and (2) A profile that the authors named insecure attachment, especially characterized by very high levels of avoidance (described as emotional self-sufficiency and discomfort with intimacy), but also by high levels of anxiety (described as fear of rejection, need of approval and low self-esteem), high levels of anger (described as hostile resolution of conflicts, resentment and possessiveness), and low levels of socioemotional competence (defined as communication of feelings and comfort with relationships). Therefore, these results did not support the four-category system proposed by Bartholomew and Horowitz (1991). However, it should be considered that the sample was not heterogeneous, as this study was carried out with undergraduate and master's degree students, and that there was a high percentage of women (77%). So, it is possible that more profiles could be differentiated if more heterogeneous samples were used. Indeed, if a sample is so homogeneous that the less common profiles are underrepresented, it will not be possible to identify them. It is therefore important to use more diverse samples in such studies. Furthermore, the authors argued that other questionnaires could provide different results, allowing other profiles to be identified.

Determining which attachment profiles can be consistently identified and how they relate to other variables, especially in terms of psychological and emotional well-being and mental health, is important for designing realistic profile-tailored interventions. In fact, different patterns of attachment require distinct modes of therapeutic intervention. It is therefore important to know the attachment profiles that can be distinguished in the population so that they can be coherently assessed and incorporated into intervention programs. For this reason, and taking all of the previous results and limitations discussed above into account,

the main goal of the current study is to determine which profiles of individuals can be identified through both the ECR and CAA-r questionnaires, using again FMA but with a more heterogeneous sample than that in Morales-Vives et al. (2021). We focused on these two questionnaires because they have both been validated in Spain (the country in which the study was conducted) and because these validations have provided evidence of their factor structure, suggesting that they are suitable for use with the FMA. The fact that the ECR is one of the best known and most widely used questionnaires internationally also contributed to its selection for this study.

Overall, the present study extends the previous study above in two directions. First, we aim to assess whether previous results are consistently replicated (a) in a more heterogeneous sample, and (b) across two different instruments (i.e. psychometric sampling), one of them very well-known and widely used. Second, we aim to extend the "internal" FMA results to obtain external validity evidence, i.e. if different classes were consistently identified, we would further assess whether the factor scores of the individuals belonging to each class relate or not differentially to relevant external variables. On the basis of the results reported by Morales-Vives et al. (2021), if differential validity was obtained, we expect the pattern of relations within the insecure attachment profiles to be more complex, especially regarding perceived maternal care and overprotection. We also expect to find that insecure attachment would be related to neuroticism, considering the results of previous studies (e.g., Jackson et al., 2025). Differential validity evidence would greatly strengthen the interpretation that there are different classes or taxons within the basis dimensional structure (e.g. Carmines & Zeller, 1979).

Materials and methods

Participants

Participants were 619 individuals (60% women) between 18 and 76 years old (M=29.0, SD=12.7). Of them, 200 were students that completed the questionnaires during their class time. More specifically, 175 were undergraduate students from different degrees (Psychology, Engineering, Social education and Teaching) and 25 were master's degree students. The remaining 419 participants completed the questionnaires online, through the dissemination of the survey that we carried out in several ways, as explained in the Procedure section. Of these 419, 4.1% had finished primary education, 46.1% had finished secondary education, 32.0% had finished a degree, and 17.9% had finished postgraduate studies. Regarding their employment situation, 72.3% were workers, 11.5% combined work and studies, 5.2% were students, and 11.0% were unemployed. Furthermore, 43.9% were single, 21.7% were married, 27.0% lived with a couple but without being married, 6.7% were divorced, and 0.7% were widowed.

Measures

Adult attachment questionnaire-revised (CAA-r; Melero & Cantero, 2024) It has 35 items with a 6-point Likert response scale (1=Completely disagree, 6=Completely agree) and includes the following subscales: Anxiety (need for approval, negative self-esteem, fear for rejection/abandonment and relationship anxiety), socioemotional competence (emotional openness, sensitivity, and confidence), avoidance (Self-reliance and emotional discomfort with intimacy), and anger (resentment, anger and intransigence). The reliability estimates of the raw scores obtained in the current sample were α=0.87 for Anxiety, α=0.79 for socioemotional competence, α=0.77 for avoidance, and α=0.75 for anger.

Experiences in close relationships (ECR; Brennan et al., 1998) We used the Spanish adaptation developed by Alonso-Arbiol et al. (2007), which has 32 items on a 7-point response scale (1=strongly disagree, 7=Strongly agree) and assesses two dimensions, named avoidance and anxiety. Avoidance refers to the tendency to feel uncomfortable with closeness, being reluctant to be close to others. Anxiety refers to fear of abandonment, searching for signs of rejection, anger about separation, and hypervigilance of romantic partners. The raw-score reliability estimates obtained in the current sample were α=0.89 for avoidance, and α=0.89 for anxiety.

Parental bonding instrument (PBI; Parker et al., 1979) We used the adaptation by Ballús (1991) for the Spanish population. It is a retrospective self-report measure that assesses individuals' perceptions of parenting during their first 16 years of life. There are two versions of this questionnaire, one referring to the mother and one to the father. We used the mother's version, which has 25 items on a graded format (1=Very unlikely, 4=Very likely), and assesses two subscales: Care (12 items) and Overprotection (13 items). The subscale Care assesses perceived parental warmth and involvement contrasted with coldness and rejection. The subscale Overprotection assesses perceived parental overcontrol contrasted with encouragement to autonomy. The

reliability estimates obtained in the current sample were α = 0.86 for Care and α = 0.74 for overprotection.

Big five inventory (BFI) We used the adaptation of Benet-Martínez and John (1998), although we only administered the neuroticism subscale (8 items). Neuroticism is one of the Big Five personality traits, and it refers to the individual tendency toward negative affect (anxiety, sadness, etc.) and individual responses to threat, frustration, or loss. The reliability estimate for the subscale scores obtained in the current sample was α = 0.83. We did not include the remaining subscales because the survey was already quite long, with 100 items, and further lengthening the survey could have discouraged participation, particularly for the online version.

Procedure

The Ethical Committee of the X University (removed for peer review) approved this project (CEIPSA-2021-PR-0047). The informed consent was obtained from all participants. They did not receive any compensation for participating in the study.

There were two modalities of the survey:

1. Paper-and-pencil self-administered survey, which was used with the university undergraduates and master's degree students. They answered the survey during their class time. Participation was voluntary. They were informed that they could leave the study at any time.
2. Online survey. In order to recruit as heterogenous sample as possible, we disseminated the online version using two different procedures: (a) We shared the link of the survey with our own contacts of different social networks (Facebook, Twitter, WhatsApp, Instagram, etc.), asking them to share it with their own contacts; (b) we sent a message to different associations asking them to share the link of the online survey with their members; (c) we put up a poster in subway stations, train stations and bus stations in various locations, including cities and towns, asking people to take part in the study. This poster included a QR code that gave access to the online survey.

Once participants had completed the online questionnaire, the website allowed them to share it with their own contacts, resulting in an ever-increasing sample size, using the "snowball" non-probabilistic sampling procedure. Authors such as Parker et al. (2019) have warned that snowball sampling can lead to homogeneous and biased samples that are unrepresentative of the population being studied, especially if it is limited to distributing the questionnaire to one's own contacts, who in turn distribute it to their contacts. This can result in the questionnaire being disseminated only between people with certain socio-demographic and economic characteristics, similar to those of the researchers (for example, distribution mainly to men or to people from an ethnic background). For this reason, the questionnaire in this study was distributed in a variety of ways, increasing the likelihood of reaching people from different backgrounds.

Both the online and the paper-and-pencil versions included instructions for answering the questionnaires. Confidentiality and anonymity were guaranteed in both versions, as we did not request any information that allowed the participants being identified. All data collected was encrypted so that it cannot be read by unauthorized persons. The data was storage in the Linux server owned by the Department of Psychology of the X University (removed for peer review), which prevents third parties from accessing this data. The procedure was endorsed by the ethics committee mentioned above, which certified the correct treatment of the data.

Data analysis

For both measures, the analyses proceeded in four stages. First, exploratory and descriptive data analyses were carried out to decide which was the most appropriate modeling for the item scores (linear-continuous or non-linear ordered-categorical). Second, the basis factor-analytic structure was assessed in the general sample by using a restricted, Confirmatory factor analytic (CFA) solution, as implemented in MPlus 8.10. In the CAA-based previous study by Morales-Vives et al. (2021), eight items had to be removed from the CFA specification because it was previously found that they did not load on the expected factor or had a low loading on their own factor. So, for both questionnaires, in the present research we first conducted a pilot study with the 200 undergraduate students using the exploratory factor analysis (EFA) model. As for the CAA-R, EFA results showed that five items (4, 12, 14, 19 and 26) did not substantially load on any factor, whereas seven items (2, 6, 10, 11, 21, 25 and 31) were complex and loaded both on the main factor and on a secondary factor. As equivalent results were replicated again in the whole sample, we removed the items 4, 12, 14, 19 and 26, and fitted a CFA with the remaining 30 items, allowing items 2, 6, 10, 11, 21, 25 and 31 to load on a secondary factor. Regarding the ECR, in the pilot study item 19 did not load on any factor, and items 7, 23 and 31 loaded on both. So, we fitted the CFA in the whole sample without including item 19, and allowing the other three items to load on both factors. Overall, we want to stress that the items that were removed were so because they had no significant loadings on any factor, which means that they were construct-irrelevant or, in other words, that they did not provide any

construct-related information. In terms of construct validity, therefore, the removal of these items did not change in any way either the nature or the breadth of the construct that was assessed (see e.g. Clark & Watson, 1995).

Goodness-of-fit was assessed using the following fit indices: the standardized root-mean-square residual (SRMS) as an indicator of absolute fit, the root-mean-square error of approximation (RMSEA) as an indicator of relative fit per degree of freedom, and the comparative fit index (CFI) as a measure of comparative fit with respect to the null independence model. As for standard reference values, CFI values ≥ 0.95, SRMR values ≤ 0.06 and RMSEA values ≤ 0.06 are considered indicative of good fit (e.g., Schermelleh-Engel et al., 2003).

Provided that parsimonious, clear, and sound CFA solutions were obtained at the end of the second stage, FMAs, fitted again using Mplus, were carried out in the third stage. These analyses were extensions of the second-stage CFA solutions in which different numbers of possible classes were specified within the dimensional CFA structure. So, the most parsimonious possible FMA solution (i.e. a single class provides the best fit) would imply that the structure is fully dimensional and that no further classes (profiles, clusters or taxons) can be differentiated within it.

In theory, it is possible to specify FMA solutions in which the hypothetical classes differ in factor mean, factor variance, and item thresholds and/or loadings (Clark et al., 2013). Also, within these specifications, both the linear and the nonlinear FA modelling can be used. In practice, however, we have found that (a) the non-linear specification frequently leaded to convergence problems and/or implausible estimates; and (b) specifying very flexible (and so parameterized) solutions leaded to unstable results that could not be trusted. Clearly, a trade-off must be reached, and, in our view, the most trustable specification, that we used here, is two-fold. First, to use the simple linear model and treat the scores as continuous whenever is reasonable. Second is to specify a strongly invariant solution across classes in which the hypothetical classes differ only in means or locations (i.e. well-defined clusters, with clearly separated centroids, can be distinguished). With regards to the linear choice, if we take into account that: (a) the responses have 6 or 7 ordered categories, (b) the item distributions are non-extreme (see below), and (c) the number of items is relatively large, it seems to be quite reasonable and theoretically defensible (see Ferrando & Lorenzo-Seva, 2014 for a discussion). As for the second choice, trying to fit more flexible solutions, implies introducing a large number of class-specific parameters in the specified solution (Clark et al., 2013), which is expected to result in nonconvergent solutions, implausible estimates, or unstable estimates that vary when the starting values are changed.

The practical reasons above also guided the validity analyses at the fourth stage. In principle, the most complete approach would be to (a) define a multiple-group CFA solution in which the groups correspond to the identified classes, and (b) extend this model to include the relevant external variables. In practice, however, this full approach has potential stability problems, especially when there are classes defined by very few individuals. So, our choice has been a far more robust two-step score regression (or path analysis) approach (e.g., Devlieger & Rosseel, 2017). In the first step, the multiple-group CFA solution is estimated, and factor score estimates in each dimension are obtained. In the second step, the scores on the relevant external variables are regressed on the estimated factor scores, and validity coefficients are obtained. The external variables in the present study were the scores on Care, Overprotection and Emotional stability.

Results

Preliminary analyses

For both, the CAA-r and the ECR the distribution of the item scores were unimodal and not extreme. Furthermore, for the reasons discussed above, the use of FMA based on the nonlinear model proved to be infeasible: too many sparse contingency tables and, therefore, potential instability are only to be expected. So, given these reasons and the result above that the linear FA model is practically and theoretically defensible, the linear model was the choice for all the analyses that follow.

Confirmatory factor analyses

In both questionnaires, the CFA analyses were fitted using Robust Maximum Likelihood estimation with second-order (mean and variance) correction. The fit indices for the CAA-r were: SRMS = 0.053, RMSEA = 0.037, and CFI = 0.90. Those for the ECR were: SRMS = 0.056, RMSEA = 0.04, and CFI = 0.90. In both cases, the GOF outcomes when considered globally suggest an acceptable model-data fit. More specifically, however, the fit seems to be very good in absolute (SRMS) and relative (RMSEA) terms, but not so good in comparative terms (CFI). In our experience, this phenomenon is common in many non-cognitive measures, in which the item discriminating power is typically moderate (i.e. moderate loadings and inter-factor correlations), and so, the increase in fit with respect to the non-informative null model is not as strong as in other domains (see e.g. van Laar & Braeken, 2021 for a discussion of this this point).

Table 1 shows the loading estimates obtained in the CAA-r and the ECR. As can be seen, all the items loaded on the expected factor. Regarding the inter-factor correlations for the CAA-r questionnaire, as expected, the socioemotional competence factor, which refers to positive attachment, is negatively correlated with the Avoidance (r=−.31, p<.01), Anxiety (r=−.15, p<.01) and Anger (r=−.14, p<.01) factors. In contrast, Anxiety is positively correlated to Avoidance (r=.31, p<.01) and Anger (r=.53, p<.01), and Avoidance is positively correlated to Anger (r=.31, p<.01). Regarding the ECR, the correlation between the anxiety and avoidance factors was 0.27, positive as expected.

Factor mixture analyses

For both, the ECR and the CAA-r, Table 2 shows the goodness of fit (GOF) results of the FMA's for a number of classes ranging from 1 to 4 in the CAA-r and from 1 to 2 in ECR. In both cases, the single-class results are those of the CFAs above. So, what is tested here is (a) whether the specification of additional classes non-negligibly improves GOF, and, if so, (b) which is the number of classes that provides the best relative fit. As for model fitting details, estimation was based on the MLR criterion, and the relative fit was assessed by using three types of indicators (Clark et al., 2013). First was the BIC parsimony information

Table 2 GOF results for the factor mixture analyses

	Nº of classes	BIC	Δ	LMR test	*p*
CAA-r	1	64112.12	-	-	-
	2	63992.36	0.93	151.91	0.00
	3	63918.23	0.96	258.18	0.00
	4	63905.69	0.93	302.86	0.24
ECR	1	67639.11	-	-	-
	2	67595.08	0.71	63.30	0.08

Criteria: Bayesian Information Criterion (BIC), Entropy value (Δ), Lo-Mendel-Rubin (LMR) difference test with associated probability

Table 1 Pattern matrices obtained in the confirmatory factor analyses

CAA-r					ECR		
Item	F1 Anxiety	F2 Socioem.	F3 Avoid.	F4 Anger	Item	F1 Avoid.	F2 Anxiety
2.	**.52**	.30	.00	.00	1.	**.56**	.00
5.	**.65**	.00	.00	.00	3.	**-.55**	.00
9.	**.71**	.00	.00	.00	4.	**.71**	.00
13.	**.55**	.00	.00	.00	6.	**.59**	.00
17.	**.56**	.00	.00	.00	8.	**.71**	.00
21.	**.75**	.00	-.11	.00	10.	**.68**	.00
24.	**.68**	.00	.00	.00	11.	**.70**	.00
27.	**.62**	.00	.00	.00	13.	**-.63**	.00
31.	**.41**	.00	.25	.00	15.	**.50**	.00
33.	**.60**	.00	.00	.00	17.	**-.62**	.00
35.	**.66**	.00	.00	.00	21.	**.72**	.00
1.	.00	**.65**	.00	.00	23.	**-.61**	.17
6.	-.15	**.50**	.00	.00	24.	**-.50**	.00
10.	.22	**.48**	.00	.00	27.	**-.57**	.00
18.	.00	**.64**	.00	.00	29.	**-.49**	.00
20.	.00	**.59**	.00	.00	31.	**-.58**	.24
25.	.18	**.40**	.00	.00	2.	.00	**.62**
28.	.00	**.57**	.00	.00	5.	.00	**.65**
32.	.00	**.56**	.00	.00	7.	-.18	**.56**
8.	.00	.00	**.69**	.00	9.	.00	**.60**
16.	.00	.00	**.47**	.00	12.	.00	**.55**
23.	.00	.00	**.66**	.00	14.	.00	**.39**
30.	.00	.00	**.69**	.00	16.	.00	**.74**
34.	.00	.00	**.38**	.00	18.	.00	**.60**
3.	.00	.00	.58	**.60**	20.	.00	**-.48**
7.	.00	.00	.00	**.48**	22.	.00	**.70**
11.	.19	.00	.00	**.57**	25.	.00	**.50**
15.	.00	.00	.00	**.46**	26.	.00	**.75**
22.	.00	.00	.00	**.53**	28.	.00	**.55**
29.	.00	.00	.00	**.65**	30.	.00	**.50**
					32.	.00	**.52**

Socioem. socioemotional competence;*Avoid.* avoidance

criterion, a trade-off between simplicity and goodness-of-fit, that indicates the number of classes at which optimal fit is attained. Second was the normed entropy criterion, a 0–1 index that indicates the extent to which individuals can be differentiated in terms of the class they belong. Finally, we used the Lo-Mendel-Rubin (LMR) difference test, which assesses whether adding a new class to the previous number of classes, significantly improves model-data fit.

The results in Table 2 can be summarized as follows. As for the ECR, the "optimal" solution (in terms of minimal BIC) is achieved with two classes. However, the improvement in fit when going to the fully dimensional (one class) solution to the two-classes solution does not still reach statistical significance. So, from a strict statistical viewpoint, the solution adopted should be that of a single class. For the sake of completeness, however, and considering that the two-class solution was close to reach significance (p = .08), we decided to inspect also this solution. Table 3 shows the centroid estimates for each hypothetical class. In order to interpret this result, it must be considered that the means are scaled so that each overall factor mean across the two classes (i.e. the mean of the general group) is set to zero. So, the class means within each factor can be interpreted as deviates from the zero general mean. As can be seen, class 2 comprises a minority of participants (23.6%), with higher (relative) scores than those obtained by the participants of class 1 in both the avoidance (p < .01, Cohen's d = 2.94) and the anxiety factors (p < .05, Cohen's d = 0.35), but especially in the avoidance factor. Therefore, it seems that class 2 encompasses individuals with an insecure attachment, while the other class encompasses individuals with a secure attachment, as participants of class 1 did not score especially high or low in any factor. These results are similar to those obtained by Morales-Vives et al. (2021) with the CAA, although in that previous study the two-class solution (with a minority class especially characterized by high levels in the avoidance factor) was statistically significant. Because this replicated two-class solution still does not reach significance here, however, this classification should be treated with caution.

We turn now to the CAA-r results. Although all the BIC values for the solutions with 2 or more classes are better than that of the single class solution, the LMR test is only significant for the 2 and 3 classes solutions. The optimal solution is attained with three classes, and the improvements when going from the single class to the three-classes solutions are significant. Furthermore, the entropy values corresponding to the two and the three classes solutions are rather high, which means that individuals belonging to this hypothetical classes could be well differentiated. Inspection of the three-class centroid estimates and number of class members in Table 3, however, shows that the two classes with fewer number of people (17% in class 2 and 9% in class 3) follow a similar profile of means, in comparison with class 1 (74% of participants). More specifically, participants of class 1 did not score especially high or low in any factor, so this group could be defined again as secure attachment. In contrast, classes 2 and 3 have higher scores than class 1 in avoidance, anxiety and anger factors, and lower scores in socioemotional competence. The differences between classes 2 and 3 were only significant for the anxiety (p < .01) and avoidance factors (p < .01), being class 3 the group with more extreme scores in these factors. Therefore, it appears that both minority classes could be defined as insecure attachment, with a similar profile in shape terms, although not in quantitative (i.e. elevation) terms, as class 3 seems to be more extreme than class 2 in avoidance and anxiety. The meta-analysis carried out by Zhang et al. (2022) suggests that higher levels of avoidance and anxiety are related to negative affect (depression, loneliness, etc.) and low levels of positive affect (for example, poor self-esteem and low life satisfaction). Therefore, while both class 2 and class 3 involve insecure attachment, class 3 may be particularly vulnerable due to poorer mental health. This differentiation may therefore be relevant both in clinical settings and for identifying particularly vulnerable individuals in community settings. However, it should be noted that class 3 does not seem to be a fully different group in a qualitative sense (i.e. with a different configuration of their scores in the factors) but rather a subgroup of class 2, with more extreme scores in two factors. As the difference between class 2 and

Table 3 Two-classes mixture solution for the ECR and three-classes mixture solution for the CAA-r: mean factor levels in each class

	Latent classes	F1 Avoid.	F2 Anxiety		
ECR	Class 1 (N = 473)	−0.39	−0.10		
	Class 2 (N = 146)	1.26	0.31		
	Latent classes	F1 Anxiety	F2 Socioem.	F3 Avoid.	F4 Anger
CAA-r	Class 1 (N = 458)	−0.08	0.14	−0.74	−0.10
	Class 2 (N = 105)	0.04	−0.51	1.45	0.18
	Class 3 (N = 56)	0.55	−0.20	3.41	0.46

Socioem. socioemotional competence; *Avoid.* avoidance

Table 4 CAA-r questionnaire: mean factor levels in each class according to the mixture factor model for the two-class solution

Latent classes	F1	F2	F3	F4
Class 1 (N = 499)	−0.10** (d = 0.76)	0.11** (d = 0.61)	−0.50** (d = 4.51)	−0.08** (d = 0.48)
Class 2 (N = 120)	0.43	−0.50	2.12	0.36

Note. d = Cohen's effect size; F1: Anxiety; F2: Socioemotional competence; F3: Avoidance; F4: Anger

** p < .01

3 is a matter of extremeness, but not a qualitative difference, we decided to choose the two-class solution as the most parsimonious, with results shown in Table 4. As before, class 1 comprises most participants (80%), with means that are not especially high or low in any factor. In contrast, individuals of class 2 scored higher than individuals of class 1 in anxiety, avoidance and anger factors, and lower in socioemotional competence factor. As it occurred with the ECR, the between-class differences are more noticeable for the avoidance factor, which is also congruent with the results previously found by Morales-Vives et al. (2021) with the CAA.

Considering the results above (only a single class could be significantly distinguished in the ECR), validity analyses were undertaken only for the CAA-r, and aimed at obtaining more evidence regarding the plausibility of our tentative two-classes solution (Carmines & Zeller, 1979). The next section reports the results which were found for each profile in the CAA-r.

Validity analyses

The two-group (i.e. two-classes) two-step path analysis based on score regression achieved a good fit, $\chi^2(8)=8.97$, $p=.34$. Figure 1 shows the estimation results for the secure attachment class, and Fig. 2 shows the results for the insecure attachment class. In order to interpreted them, two caveats are in order. First, the path results that are shown in the figures are those that (a) reached statistical significance, and (b) were above a salience threshold of 0.20. These conditions were set in order to avoid interpreting spurious results due to capitalization on chance. Second, the weights attached to each path are structural coefficients (Carmines & Zeller, 1979) and so can be interpreted as standard validity coefficients. Furthermore, it should be considered that the latent CAAr attachment factors have been taken as dependent variables to be predicted (or explained) by perceived maternal care and overprotection, whereas, in the case of neuroticism, this indicator has been simply taken as a dependent external variable that can be predicted from the latent CAA factors. The reason is that care and overprotection refer to the mother's behavior towards the son or daughter, so they must be considered as precursors of the adult attachment styles.

Regarding the secure attachment class results in Fig. 1, perceived maternal care is unrelated to any of the four attachment factors, while perceived maternal overprotection is negatively related to socioemotional competence. Moreover, two attachment factors (anxiety and anger) are positively related to neuroticism. The avoidance attachment factor is neither related to neuroticism nor to perceptions of parenting. In contrast, a more complex pattern of relationships has been obtained for the insecure profile: perceived maternal care is positively related to socioemotional competence and negatively related to avoidance, and perceived maternal overprotection is negatively related to socioemotional competence and positively related to the other three attachment factors. Likewise, all the attachment factors are related to neuroticism, with a negative relationship for the socioemotional competence factor and a positive relationship in the other cases.

Discussion

Although the study of adult attachment has traditionally been approached from a qualitative perspective, by differentiating between different profiles of attachment, other authors have either argued that a dimensional approach would be more realistic (e.g., Fraley et al., 2015; Raby et al., 2021) or proposed to reconcile both approaches (Bartholomew & Horowitz, 1991). Given this state of affairs, Morales-Vives et al. (2021) carried out a FMA-based study with the CAA questionnaire in order to determine if different profiles of attachment could be identified within a dimensional structure, thus reconciling both the qualitative and the quantitative approaches. Their results suggested that, instead of the four profiles proposed by the authors of the CAA or by Main and Solomon (1986), only two profiles of attachment could be identified. One of them encompassed the majority of participants (77.48%), with no particularly high or low scores on any of the attachment factors, while the more minority profile was especially characterized by very high levels of avoidance, but also by high levels of anxiety and anger, and low levels of socioemotional competence. For this reason, the normal-range majority group was defined as secure attachment, and the other group was defined as insecure attachment. These results seemed to point out that most adults either have a style that does not quite fit into any of the prototypical categories or they have qualities in more than one prototype, as Stein et al. (2002) already pointed out based on her previous results.

Plausible as they are, it could be argued that the results found in Morales-Vives et al. (2021) were specific to the questionnaire they used. It could also be argued that all participants were undergraduate and master's degree students, with a 77% of women and that more profiles could have been possibly identified had a more heterogeneous sample been used. However, even though the present study has been based on two different questionnaires and used a far more heterogeneous sample, the results strongly agree with those previously reported by Morales-Vives et al. (2021). In fact, the results obtained with the new version of the CAA, the CAA-r, again suggest that most participants

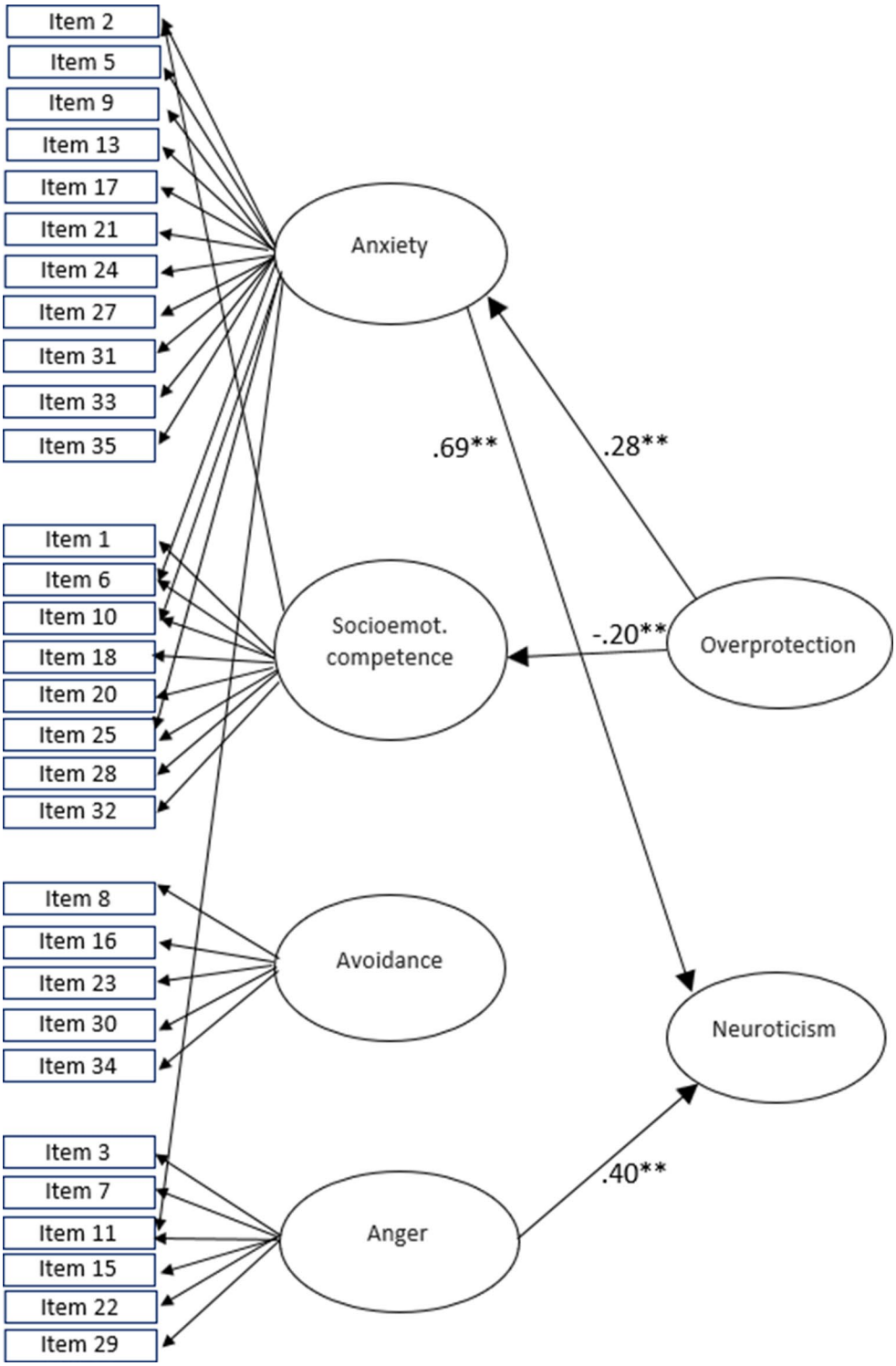

Fig. 1 Structural equation model for the secure attachment group

have an undifferentiated attachment profile not characterised by high or low means on any of the attachment factors. We use the term "undifferentiated" because this profile does not seem to correspond to any of the traditional attachment categories but, as discussed below, it could be also labelled as normal-range profile.

As Stein et al. (2002) suggested, over time there are more and more opportunities to relate to other people, generating different types of emotional bonds and attachments. In fact, children use to have few attachment figures (mainly the parents) whereas adults have generally had different attachment experiences with different people over time, which

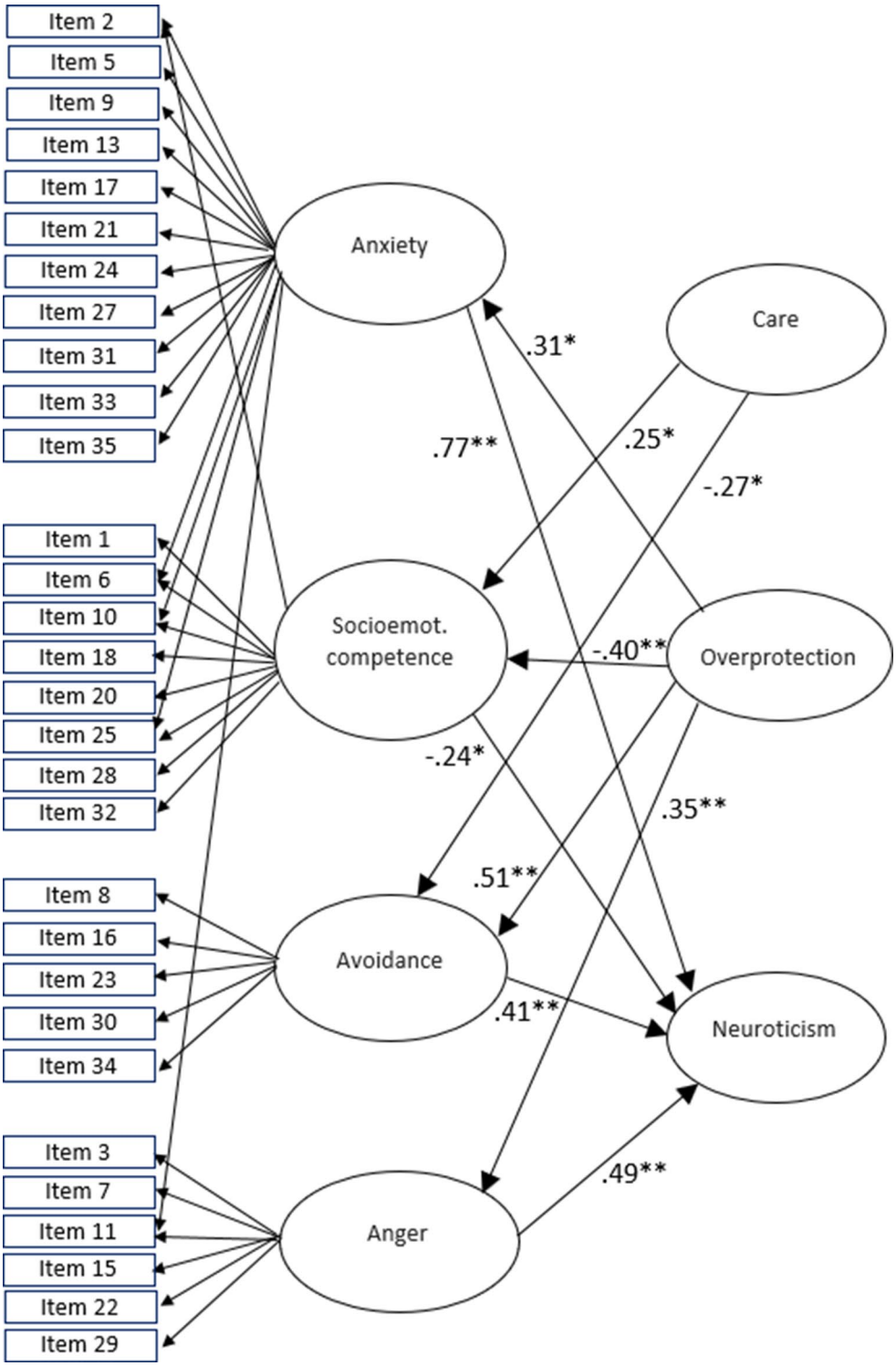

Fig. 2 Structural equation model for the insecure attachment group

may lead to a more undifferentiated attachment profile that does not have clearly defined attributes. So, it is reasonable to find that many adults do not have a differentiated attachment style. In fact, Stein et al. (2002) carried out a study with the Relationship Questionnaire and found that 70% of participants preferred to assign points to the four attachment styles, and 28% to three styles, instead of choosing a single one. More recent studies have also shown that some experiences may lead to enduring changes in attachment (e.g., Stanton et al., 2017). In the current study, the number of people in this normal-range profile is above 70% (74% when three profiles are differentiated, and 80% when

two profiles are differentiated), which is consistent with the study by Stein et al. (2002). And, although the results suggest that three different profiles can be statistically differentiated, the inspection of the three-class solution revealed that the mean profiles in the two minority classes followed a similar shape trend in comparison with the normal-range class, with higher scores in avoidance, anxiety and anger factors, and lower scores in socioemotional competence. So, the difference between the two minority groups was only in profile elevation since the group with the fewer number of cases (9% of participants) obtained significantly higher scores in avoidance and anxiety than the other minority profile (17% of participants). In other words, one of these minority groups (the one with 9% of participants) does not seem to be a fully different group in a qualitative sense, but just a more extreme subgroup of the other minority group. For these reasons, we decided to choose the two-class solution, with a majority normal-range profile, which we defined as secure attachment, and a minority profile characterized by very high scores in avoidance, high scores in anxiety and anger, and lower scores in socioemotional competence, as the most plausible and parsimonious.

Regarding the ECR, the two-class solution was only marginally significant. So, further studies based on large samples might achieve enough power to attain strict significance and so allow a second profile to be univocally identified. Significance aside, however, the congruence between the present two-classes solutions (both CAA-r and ECR based) and the two-class solution previously obtained with the CAA is striking. Thus, on the ECR, there is again a majority normal-range group than comprises more than 70% of the sample (76,4%), and a minority group especially characterized by a high mean in avoidance, and a high mean in anxiety, although not as high as in the case of avoidance. Overall, the consistent results so far summarized suggest that most adults have an undifferentiated profile, and so, cannot be categorized with the traditional attachment styles, **but** that there is also a distinguishable minority group with high anxiety and anger, low socioemotional competence, and especially very high avoidance.

Several authors, using a completely different kind of assessment as is the Adult Attachment Interview (AAI), have pointed out that in some individuals there is a breackdown in discourse strategy, so they cannot be classified in any of the traditional categories, which have led to the proposal of a "cannot classify" category (e.g., Main & Hesse, 1992). This category, however, is understood as a lack of narrative coherence that suggests the presence of a global alteration or impairment of a "coherent" state of mind with respect to attachment, which has been associated with mental disorders. Furthermore, only a small percentage of the population seems to be characterized by this global alteration (e.g., Bakermans-Kranenburg et al., 2025). Therefore, this "cannot classify" category does not seem to fit with the general profile found both in the current study and in the previous one byMorales-Vives et al. (2021). Firstly, this general profile encompasses the majority of individuals, unlike the 'cannot classify' category of the AAI. Secondly, it is difficult to argue that the majority of individuals in the sample have a highly disorganized and dysfunctional state of mind or are characterized by mental disorders, especially when they did not obtain extreme scores in any factor. On the contrary, it is more plausible to assume that this profile, shared by the majority of adults, is indicative of secure attachment, and that secure attachment in adults possibly does not correspond to the traditional perspective derived from childhood studies. However, further studies should be carried out on this issue, to further understand this general profile in adults.

Given the increasing concern about confusion arising from different ways of understanding the attachment construct and the different measures developed to assess it (e.g., Duschinsky, 2021), Strauss et al. (2022) compared different measures of attachment in clinical and non-clinical samples, and found a low convergence between the categorical measures assessed. In contrast, the categories found in the current study are considerably congruent across measures and are also congruent with the previous results by Morales-Vives et al. (2021). It should be acknowledged, however, that the study by Strauss et al. (2022) includes some categorical measures that are based on interviews, such as the Adult Attachment Interview, which makes the comparison with the current study difficult. But, in any case, the present results are a promising starting point for answering some questions in a topic that has raised justified concern in recent years.

The CAA-r based validity results provide further evidence on the interest in differentiating between different attachment profiles. Clearly, there is a different pattern of structural relations within each profile, being this pattern more complex for the insecure profile, which is again congruent with the results found by Morales-Vives et al. (2021). In the insecure profile, perceived maternal overprotection is related to all attachment factors, while in the secure profile is only related to anxiety and socioemotional competence. Likewise, in the insecure profile, perceived maternal care is related to socioemotional competence and avoidance, while the secure profile is not related to any attachment factor. Previous studies have already shown that maternal bonding during childhood has an effect on the development of adult attachment (Páez et al., 2006; Wilhelm et al., 2016), but the current study suggests that the influence of the maternal bonding on the different attachment-related dimensions is more evident for those individuals with an insecure attachment. Furthermore, as it was previously

found by Morales-Vives et al. (2021), neuroticism is related to anxiety and anger in both groups, being the relationship with anxiety particularly high. These relationships are not surprising, since this personality trait involves intense emotional responses (e.g., Serrano et al., 2020). However, in the insecure profile neuroticism was also related to avoidance and socioemotional competence, while in the study carried out by Morales-Vives et al. (2021) the same pattern of relationships between neuroticism and the attachment factors was found for both groups. These different results may be due to the use of different questionnaires, a more heterogeneous sample, or both.

Turning to limitations, it should be first considered that there is a certain gender imbalance in the sample (60% women), which, even if moderate, may limit to some extent the generalizability of the results. Previous studies assessing gender differences in attachment profiles (assuming that the same profiles exist in men and women, but at different levels) have not yielded consistent results, as noted by authors such as Scharfe (2016). Furthermore, there is no reason to believe that there are gender-specific profiles, although this question deserves future research, as do possible gender differences in common profiles. Therefore, future FMA-based with more gender balanced samples are warranted.

The age range of the sample used in this study is quite large, as it was intended to cover the entire adult life span. However, further large-sample, FMA-based studies should also be done separated for different life stages (for example, youth, middle age and elderly), to determine if the number and type of profiles vary according to the age stage. We would like to point out, however, that the present results are similar to those previously obtained by Morales-Vives et al. (2021) with a sample of university students, who mostly were young people, and so a more homogeneous age group than the present sample. So, we do not expect that different profiles would be found when differentiating among different adult age groups. Again, however, this issue requires further research.

The use of self-report questionnaires might limit the identification of some profiles of individuals in contrast with alternative procedures such as interviews. In fact, some profiles of individuals will remain unidentified in self-report questionnaires if there are no specific items referring to them. For this reason, we decided to compare two different questionnaires, which have provided similar results. However, further studies with other questionnaires should also be carried out, in order to determine if more profiles may be identified. Finally, the use of the "snowball" non-probabilistic sampling procedure may lead to homogeneous and biased samples (Parker et al., 2019), as explained above. But it should be considered that we used several procedures to collect the sample and to disseminate the questionnaire, in order to reduce this limitation and to achieve a more heterogenous sample.

Finally, it should also be considered that both the present study and the previous by Morales-Vives et al. (2021) have been conducted with Spanish citizens. As far as we know, there are no other studies that have used the FMA to assess attachment profiles. Therefore, future studies in other countries and cultures are warranted. Several studies, using other approaches, suggest that the distribution of attachment profiles may vary across cultures, because characteristics such as collectivism/individualism or ethnicity may make certain profiles more common in some cultures than in others (e.g., Agishtein & Brumbaugh, 2013). Moreover, according to the study carried out by Joo et al. (2023), comparing East Asian and Western individuals, the functioning of attachment may even vary across regions. Therefore, cross-cultural comparisons are crucial for a better understanding of the development of attachment and its manifestations in each context.

To sum up, the present results seem to be halfway between what is proposed from the categorical perspective and from the dimensional perspective. On the one hand, they partly support the dimensional perspective, because the use of this perspective in a community population will not be inappropriate for most of the people assessed, as they will be part of a common profile. In other words, as most adults do not seem to have a differentiated attachment profile, the use of a dimensional model, without making further class differentiations within it, would not probably have serious implications for the assessment of most people. On the other hand, however, the dimensional perspective will be certainly less appropriate for a minority of subjects who do not fit this profile. Moreover, in clinical settings, the categorical perspective will be particularly relevant, because identifying individuals with an insecure attachment profile may be key for developing interventions that meet the needs of these particularly vulnerable individuals. However, further validity studies focused on the small percentage of people who appear to have a differentiated profile are clearly needed, particularly with regards to the possible implications this type of profile might have at different levels (mental health, personal adjustment in different areas of life, etc.). Previous studies have already reported the relationship between the attachment styles and variables such as mental health (e.g., Hassan et al., 2023), spousal violence (e.g., Bougar et al., 2023), parental involvement (Li & Liu, 2023), etc. Validity studies are also needed to establish if the attachment profiles have different relationship patterns for certain types of variables, as this would provide a better understanding of the practical implications of differentiating among profiles.

The present results, however, suggest that the key point is to be able to differentiate between the general and the insecure profiles, rather than to differentiate among three or four

more specific attachment profiles, which the results of the current study do not appear to support. Therefore, if the present results were supported by further research: That there are, at most, two qualitatively distinguishable profiles, and that most people would tend to have an undifferentiated attachment profile, then, traditional assessment tools, therapies, protocols, etc. should be revised. Finally, in spite of the strong agreement in results between the two FMA-based studies so far carried out, more evidence should still be gathered using different samples (e.g. cross-cultural studies) and instruments for their generalizability to be firmly established. Therefore, we encourage researchers to conduct further studies on this field using Factor Mixture Analysis, because more evidence obtained in different cultures and with different instruments is still needed to better know which attachment profiles can be differentiated in adults, and because the results may have important implications for the assessment tools, therapies, protocols, etc. used in this field.

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Data availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical approval The Ethical Committee of the Universitat Rovira i Virgili CEIPSA (Comité Ético de Investigación en Personas, Sociedad y Medio Ambiente) approved this project (CEIPSA-2021-PR-0047).

Conflict of interest On behalf of all authors, the corresponding author states that there is no financial or non-financial conflict of interest.

Informed consent This research involved human participants, so informed consent was obtained from all participants.

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