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The possible influence of maternal insecure dismissive attachment on the onset of AD in the child

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For Myrthe

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List of abbreviations

AD	Atopic Dermatitis
MAPS	Munich Atopy Prediction Study
SSI	Semi Structured Interview
AAI	Adult Attachment Interview
ECR	Experiences in Close Relationship Scale
TEWL	Trans Epidermal Water Loss
SC	Stratum Corneum
FLG	Fillagrin
NMF	Natural Moisturizing Factor
DC	Dentritic Cells
TLR	Toll Like Receptors
TSLP	Thymic Stromal Lympho Poeitin
ILC	Innate Lyphoid Cells
HPA	Hypothalamic-Pituitary-Adrenal-Axis
PMBC	Mononuclear Cells from Peripheral Blood
NICS	Neuro-Immuno-Cutaneous-System
PSS	Perceived Stress Scale
ACE	Adverse Childhood Experiences

Summary

Background: Atopic Dermatitis (AD) is a recurring chronic skin inflammation with rising incidence worldwide. Both the affected child and the family suffer greatly from this disease. Within the Munich Atopy Prediction Study (MAPS), further research is being done into possible risk factors for the development of AD in the child. The underlying MAPS sub-study examines the extent to which a link exists between maternal insecure dismissive attachment and the development of AD in the child.

Methods: A mixed method of both qualitative and quantitative research was conducted to determine whether or not there is a possible association between maternal insecure dismissive attachment and AD onset. For the qualitative study, semi-structured interviews were conducted with both mothers of healthy children and mothers of AD-diagnosed children. These interviews were transcribed and analysed. For the quantitative part of the study, all participating mothers were questioned using the validated self-report, the Experience in Close Relationships Questionnaire (ECR), which was then statistically weighted.

Results: The qualitative study showed an association between the maternal insecure dismissive attachment pattern and the occurrence of AD in the child, whilst the mothers of the healthy children showed a secure attachment pattern. The time-intensive research is, however, difficult to use in daily medical practice. For the quantitative research all MAPS mothers received the self-report “Experience in Close Relationships Scale (ECR), to analyse their attachment pattern. The ECR did not confirm the results of the qualitative study. Both the mothers the mothers of healthy children as those of AD diagnosed children showed in this test a secure attachment profile.

Conclusion: The qualitative research suggests an association between maternal insecure dismissive attachment and AD onset in her child. The determination of risk factors for AD onset in a child should therefore also include the attachment profile of the mother. Furthermore, preventive measures should also contain support for insecurely attached mothers so that they can better perceive the child's signals. The self-report used in the dermatological clinical setting does not appear to be practicable for assessing the actual attachment profile of primary caretakers. Introspection, which

is necessary for filling in a self-report correctly, is an obstacle for people with an insecure dismissive attachment pattern, given the potential psychological distress involved This seems to lead to a biased assessment, where insecurely dismissively attached persons appear as securely attached persons. Further research is needed to determine when and in which accessible manner the attachment pattern can be properly determined in a clinical context.

1. Introduction

1.1 Atopic Dermatitis

1.1.1. Etymology & Pathology

Atopic Dermatitis (AD) is a common, chronic, relapsing and inflammatory skin disease, that is usually detected in early childhood (onset mostly between the 4th and 8th month *post-partum*). Typical symptoms, (infantile) eczema and lesions, are mostly distributed over the scalp, forehead, cheeks, trunk, folds and extensor extremities, whereas the diaper area is usually not affected [1, 2] A common symptom of AD is pruritus, which often leads to sleep disturbance. Subsequently, the quality of life of the children, their primary caretaker, and their whole families may be (massively) reduced due to AD [3-5], which finally even can lead to financial implications [6].

Over the last decades, the prevalence of AD in children has increased worldwide [7]. The reported prevalence ranges between 10 to 30% in infants and young children [7-9], with regional differences in clinical appearance as well as differences in seasonal appearance as it occurs more common in winter and spring. Moreover, AD is more prevalent among boys than girls [7, 10, 11]. Various studies showed the highest prevalence between 0-5 years of age [12]. In a study among UK children, a prevalence of 21,0% was observed in infants aged 0-6 months, 25,6% in infants aged 6-18 months, 23,2% in infants aged 18-30 months, and 19,9% in infants aged 30–42 months [8]. Children with a family history of AD were found to have a higher risk for developing AD: if one parent is affected the risk increases by around 37% and if both parents are affected the risk increases by 50% [13].
Studies including the 'International Study of Asthma and Allergies in Childhood (ISAAC)' showed that cutaneous lesions in most of the children disappeared spontaneously before adolescence [14]. However, about 30% of the children are also affected by AD as adults, resulting in a prevalence of AD in adults of 4% to 7%. In general, infants with AD have a 50% higher risk to develop asthma and even a 75% higher risk to develop allergic rhinitis and conjunctivitis later on in life [15], the so called 'Atopic March'.

1.1.2. History on AD research

Historical records on AD go back to as far as Emperor Augustus of the Roman Empire, suffering from an itching chronic skin disease, which was accompanied by asthma and rhinitis. Since the 17th century ongoing research has been made to understand the pathomechanisms that lead to AD. The name has changed over and over, from *"Lichen"* to *"Nverodermitis"* (neurodermitis), and in 1892 Besniers' definition "prurigo diathetique eczemato-lichenienne" [16]. Wise and Sulzberger introduced the term Atopic Dermatitis, referring to *atopy*, after having identified the association with rhinitis and asthma [17]. Sulzberger recognized that all atopy features of the above diseases were to be found in the cases presented of atopic dermatitis[16]. Moreover, he stated that "neurodermitis" was rather confusing, as the disease of a nervous origin, was to be understood as a psychiatric originated disease. In the 1950s "atopic dermatitis" was overall adopted.

With the discovery of the IgE molecule as the allergy reagin and the detection of high IgE levels in AD Patients, a shift took place towards immune response, with noticing IgE receptors on skin mast cells, Langerhans cells and eosinophils [18].

Another important milestone in research was the development of diagnostic criteria by Hanifin and Rajka, defining 5 major criteria:– (i) pruritus, (ii) a chronic, relapsing course, (iii) typical distribution, (iv) family or personal history on atopy, (v) onset before 2 years of age – For diagnosis, at least three criteria need to be met followed by associated minor criteria [19].

<u>Outside-Inside model & Inside-Outside-model</u>

In earlier research, the appearance of AD was mainly linked to an immune dysfunctionality with increasing levels of Th-2-cells. Subsequent IgE production [18], dendritic cell activation, and mast cell hyperactivation result in pruritus and skin inflammation [20]. This so called 'inside-outside-model' had a large influence on disease treatment, which primarily focused on skin inflammation and pruritus. Further research found lower expression or loss-of function mutations of filaggrin (FLG) and other skin barrier proteins in AD patients, which supported the theory of an additional 'outside-inside-model'. Additionally, other factors responsible for weakening the skin barrier and therefore promoting AD development have been observed, including hygiene measures [21], reduced environmental humidity [22], and psychological stress [23]. These observations led to the proposition of an 'outside-inside-outside-model'

[20], referring to (i) (epi)genetic dysfunction of the skin barrier (outside), (ii) immunological influences (inside), and (iii) environmental factors (outside) in the development and recurrence of AD in children

The above shows how complex the aetiology of AD is, and how many more influencing factors need to be considered in order to reach an overall understanding of the disease dynamics and related disease treatment.

(i) <u>(Epi)genetic dysfunction of the skin barrier ("Outside")</u>

The (epi)genetic dysfunction of the skin barrier ("Outside"), has been investigated in various studies [24, 25]. About the function and possible dysfunction of the skin barrier the following now is known.

Primary skin function exists in providing a barrier against internal water loss, and against intrusion of pathogens, immunogens, and irritants. The Stratum Corneum (SC) provides this function through different components, i.e. Keratinocytes, Ceramides, Cholesterol, free fatty acids, and several secreted enzymatic and structural proteins [24]. The disfunction of the skin barrier is usually assessed by the trans epidermal water loss (TEWL) and hydration of the skin surface. AD patients show significant lower skin hydration, even at the non-lesional sites, compared to healthy-skin volunteers[25].

The three most important factors for dysfunction of the skin barrier recognized to date are:

1. *<u>FLG Mutations</u>* - Filaggrin, produced by keratinocytes, is the main component of keratohyalin granules and contributes to the formation of the SC. During its lifecycle, filaggrin undergoes proteolytic processing, which is part of the squamation process. It terminates by releasing Natural Moisturizing Factor (NMF), which is important for water retention and skin hydration [26]. Decreased levels of filaggrin and loss-of-function-mutations in filaggrin-genes (at least 35 different mutations have been found), lead to alterations in the "brick and mortar" structure of the SC. This mutation-induced barrier dysfunction,

subsequently will allow penetration of exogenous pathogens and has been found in 30% of AD population in Europe [27]. Thus, FLG deficiency alone cannot be the sole factor for the onset of AD.

Decreased levels of filaggrin can also appear as secondary results of pro-inflammatory Th2 cells [28], explaining the appearance of AD when no FLG alterations were found. The impact of FLG on the SC date from recent studies and its functioning in relation to AD is not yet fully clear.

2. *Skin Ceramide* - The lipids in the SC, ceramides, cholesterol and free fatty acids, have an important function in maintaining the above-described skin barrier function. Especially ceramides are mainly associated with the constitution of this so called “brick & mortar” structure and thus the functional skin barrier [29, 30]. Studies in adult AD patients show a reduced ceramide level, both in lesioned and non-lesioned skin, which indicates rather a systemic defect. Children on the other hand, would only show defects in lesioned sites and different subtypes as adults. Moreover, ceramide deficiency would not be an inherent AD risk factor [31]. However, as the exact mechanism is not yet fully understood [29], further investigation is still needed.
3. *Epidermal Proteases* – Mutation in SPINK-5 and Kallikreins

   Proteases and their inhibitors need to be in balance to maintain skin barrier function. The overactivation of kallikrein-peptidases leads to hyper-desquamation of corneocytes, which can subsequently induce AD [27, 32]. Furthermore, mutations in the serine protease inhibitor SPINK-5, like those linked to Netherton syndrome, are suggested to have an association with AD [33].

1.2 Munich Atopy Prediction Study (MAPS)

1.2.1. Combining the multi-dimensional mechanics of a complex pathology.

Although much is now known about possible (epi)genetic dysfunction of the skin barrier, there is still a need to understand the immunological influence and environmental factors that can lead to the development of AD in the child. A precise understanding of the underlying interactions between the different elements that may cause AD to occur, is therefore also still unclear. For good patient- and disease

management, it is however crucial that those complex interactions become more transparent.

The Munich Atopy Prediction Study (MAPS) was designed by the Department of Dermatology and Allergy of the Technical University of Munich in a cooperation with the Helmholtz Zentrum Munich. It is a prospective four-year follow-up study in which infants are regularly seen by a dermatologist in a dermatological hospital. In 2016, the pilot phase of the study started with a few infants enrolled. After the successful test phase, the initial study commenced in 2017. Pregnant women and their unborn children were recruited shortly before birth in the delivery rooms of the Geisenhofer Clinic (since 2017), the University Hospital rechts der Isar (since 2017), and the Munich Clinic Schwabing (since 2019). For inclusion in the study, mothers needed to demonstrate German proficiency to answer questionnaires and to have plans to remain residents of the greater Munich area. In total, we recruited 392 new-borns.

MAPS investigates the influence of and the way in which the above described under (ii) immunological influences and (iii) environmental factors, play a role in the disease development. Due to the extensive research that has taken place on (i) (epi)genetic dysfunction of the skin barrier, this aspect will not be the focus of the MAPS study.

1.2.2. Immunological influences (“Inside”)

A dysfunctional skin barrier leads to an increased level of pre-inflammatory cytokines. Dendritic cells (DC) are activated by increased IgE levels and stimulate the recruitment of T-cells. The complex immune response consists of an innate and adaptive answer with a Th-2-skewed immune response. The immunological response is driven by:

(i) <u>Dendritic cells (DC)</u>

DC seem to have a central role in initiating the adaptive immune response, by up-taking and presentation of antigens to T-cells. DC, and the unique dermal subset Langerhans cell (LC), express Toll like receptors (TLR) and the high affinity receptor for IgE (FceRI). LC are to be found in both AD patients and healthy controls, but FceRI is supposed to be only elevated in AD affected patients. Moreover, another subset of dendritic cells, the inflammatory dendritic epidermal cells (IPEC), that are only present in AD patients, show the highest level of FceRI cells, and could thus be a relevant

indicator for upcoming AD infection. This is also an area of further investigation [34, 35].

(ii) T cells response

T-cell response in AD is a biphasic one. During the acute inflammation phase, Th-2 cells are predominantly present [34]. Th-2 cells are promoted by IL-25, IL33 and Thymic stromal lymphopoietin (TSLP). The possible importance of TSLP is also only a recent discovery and requires more research. Th-2 cells produce IL-4 and IL-13 - responsible for (a.o.) epidermal thickening, inflammation, IgE, and decreased FLG-, as well as IL-5 – resulting in eosinophilia- , all of which are found in the skin during the acute phase. IL-31 has recently been added as a cytokine produced by Th-2 and also by mast cells, and causes pruritus and inflammation. During the chronic phase mainly Th-1 cells are present [34].
A study has shown correlations between some Th-2 cytokines present in cord blood and the development of AD. However, this is still subject of ongoing research. In addition to Th-2 cell activity, involvement of Th-1, Th-17, and Th-22 cells has been observed for chronic AD. [36-38].

(iii) *Innate Lymphoid Cells (ILC)*

ILC are a recently discovered immune cell lineage (ILCs), representing 3 subgroups, ILC1, ILC2 and ILC3, corresponding analogue with Th-1, Th-2 and Th-17 [39]. Whereas ILC is broadly researched in other atopic diseases, for AD conclusions are mainly made upon murine disease models. ILC2 is supposed to be regulated by keratinocyte-derived cytokines IL-25, IL-33 and TLSP. This could explain the observed presence of ILC2 during acute inflammation in the AD patient [39]. However, the ILC2 role in AD is not well studied and needs further characterization.

(iv) Stress

Two biological systems are responsible for systemic stress response: (1) the hypothalamic-pituitary- adrenal axis (HPA), where neuroendocrine mediators, such as cortisol, are produced, and (2) the sympathoadrenal medullary system, responsible for releasing catecholamines. Systemic stress responses result in production of cortisol

and the release of catecholamines, leading to the differentiation of T-helper cells into Th-2 cells [40, 41].

Further research is needed to confirm the association between elevated stress responses in children and maternal stress in mother-child interactions [42-44]. McKenzie et al. have recently shown the existing association between postpartum- and maternal depression and the increase in onset and persistence of AD in children [45]. Thus, a systemic stress response can also be attributable to external factors, so that stress can be seen as an environmental risk factor.

It is to date not clear what role the attachment pattern of the primary caregiver has on the child. Earlier research has shown a link between insecure maternal (dismissive/avoidant) attachment pattern and diurnal cortisol slopes in youth with Asthma [46]. As Asthma is, like AD, an atopic disease with a similar Th2 pathomeganism, it is possible that insecure attachment patterns in the mother could be a risk factor for the development of AD in the child. This has not yet been investigated further and therefore requires further research.

The present manuscript presents the sub-study within MAPS into the possible link between insecure attachment in the mother and the occurrence of AD in the child.

1.2.3. Environmental aspects (“Outside”)

Environmental factors, like the microbiome, exposure to antibiotics, living conditions, hygiene, and skin care, play a prominent role in the multifactorial etiology of the AD. [47-49].

(i) Microbiome

The microbiome, as the representant of all living microbiota in a species, is relevant in the search for risk factors or AD.

Gut microbiome – Recent studies showed that reduced faecal microbiota diversity was found in children who developed AD. However, this inverse association could

not be confirmed with cross-check studies, i.e., this association appears to be missing once the disease is established [50].

Skin microbiome – The association between AD, *Staphylococcus aureus*, and the resulting skin inflammation has been investigated in various studies [32, 50-53]. It has been suggested that *S. aureus* colonization of the nares followed by transmission onto the skin may be an important source for the cutaneous presence of *S. aureus* [54]. Possible disruptions of the skin microbiome, such as hygiene practices, early exposure to antibiotics, and infant diet, should additionally be considered.

(ii) *Medication*

So far, few studies have investigated the association between the utilization of antibiotics during pregnancy or early childhood and the risk of AD development [55, 56].

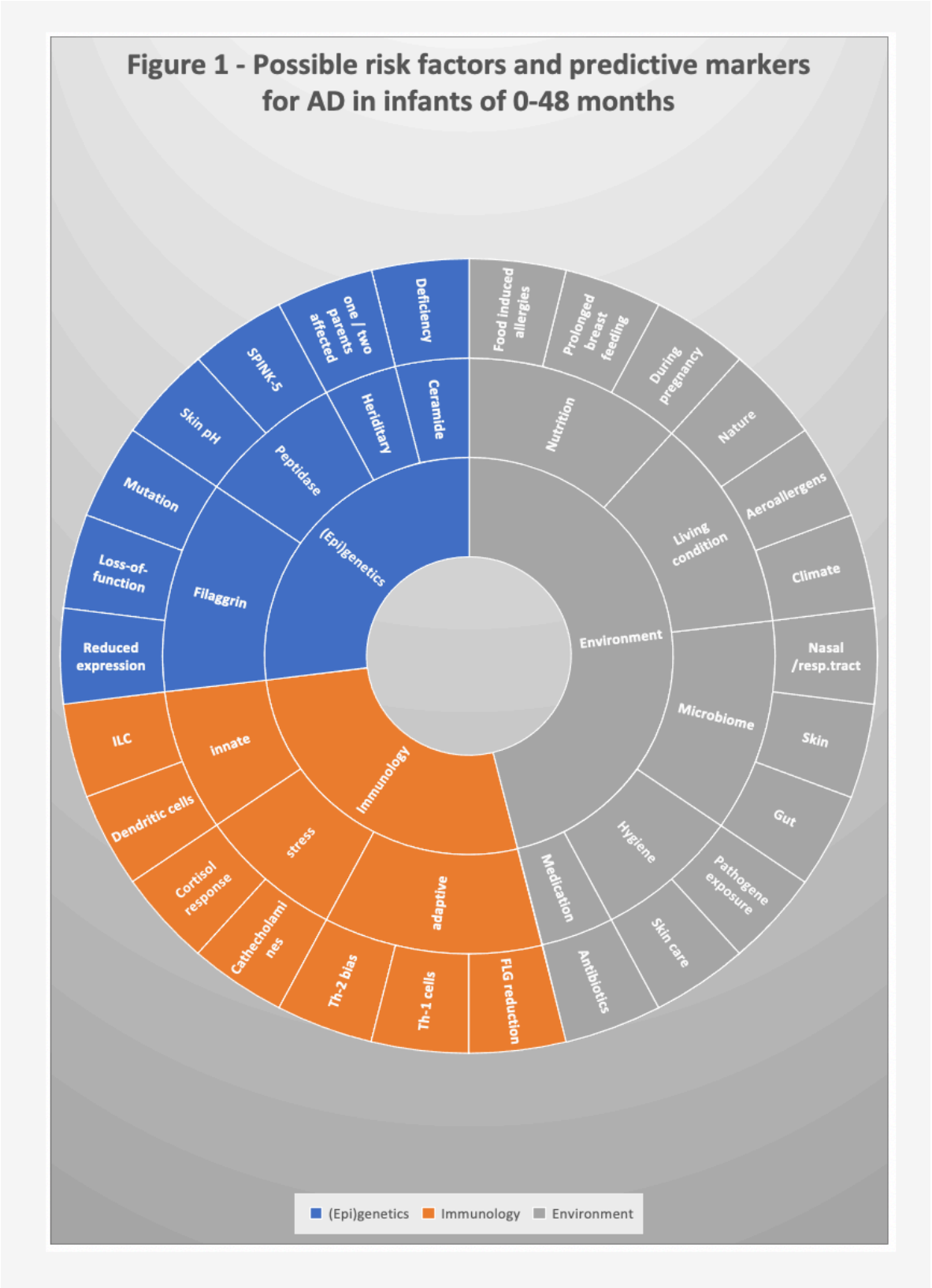
(iii) *Living condition*

Over time living conditions and working conditions have shifted from a rural and more outdoor (non-polluted air) life to a rather (sub)urban, with more air pollution, life, taking place mainly indoors. Studies have shown that both air pollutants as well as typical indoor pollutants, such as cigarette smoke, construction materials, etc., do have an impact on the onset of AD in infants and can aggravate AD inflammation [57]. Also the typical biological pollutants, including house dust mites, animal dander, bacteria, are found ubiquitously indoors [57]. The exact mechanisms are still unclear, but it has been suggested that multiple exposures to pollutants may play an influential role in allergic reactions [58].

(iv) Hygiene and Skin Care

The use of soap and other detergents increases skin pH levels and subsequently exacerbates the breakdown of the SC, leading to skin inflammation [59].

Figure 1 – Possible risk factors and predictive markers for AD in infants



1.3 Psychodermatology

As mentioned previously, a meanwhile well-understood risk factor for AD is stress [60-62]. Substantial psycho-neuro-immunological research confirms that stress leads to AD.
In this respect, Buske-Kirschbaum et. al. refer to a reduced release of free cortisol in response to being exposed to stressors. This would lead to a hypothalamic impairment compared to children without atopic diseases. This impairment would then lead to an impaired anti-inflammatory protective effect of endogenous cortisol [63].

In addition, Suárez, L. et al. describe how stress leads to an upregulation of neuropeptide mediators, endocrine hormones and peripheral nervous system, influencing immunological response in the skin. Apparently, in AD patients Th2 cells and Mast cells are found, as well as cell contacts between Mast cells and nerve cell fibres. In moments of stress, sensory nerves release neuromediators, which influence the skin barrier function and regulate the inflammation and immune response [64-66].This subsequently leads to the AD onset.

This "internal" immunological response is also determined by the "outside world", the so-called environmental risk factors, which set the stress cascade in motion. This principle is also known as "*nature versus nurture*", or "*nature and nurture*", where environmental triggers are assumed to lead to a disease onset, such as Asthma or Atopic Dermatitis [67, 68].

The above points to the interaction between psyche and skin, a distinctive medical field known as Psychodermatology. Whilst psychiatry focuses on the rather "internal" invisible diseases, dermatology deals with the diseases visible on the skin surface. The combination of these two fields leads us to psychomatic dermatology.

W. Harth, U. Gieler, D. Kusnir, and F. Tausk describe psychomatic dermatology in their book "Clinical Management in Psychodermatology" as follows [69]:

> *"Psychosomatic dermatology addresses skin diseases in which psychogenic causes, consequences, or concomitant circumstances have an essential and therapeutical important influence."*

And

> *"Psychosomatic dermatology in the narrower sense encompasses every aspect of intrapersonal and interpersonal problems triggered by (…) the psychosomatic mechanisms of eliciting of coping dermatoses. Emotional disorders are present in one-third of all patients in dermatology. (…) The stress factor plays an important role, especially in chronic dermatoses (Consoli 1996)."*

AD in particular is seen as a multifactorial cutaneous disease, which, in addition to a given polygenetic predisposition, is based on the assumption that the course is influenced among other things by emotions [69].

The phenomenon of stress as a possible cause of AD combines the neuroendocrinological and immunological systems, as also described as the Neuro-Immuno-Cutaneous-System (NICS).

L. Misery describes in his article on NICS:

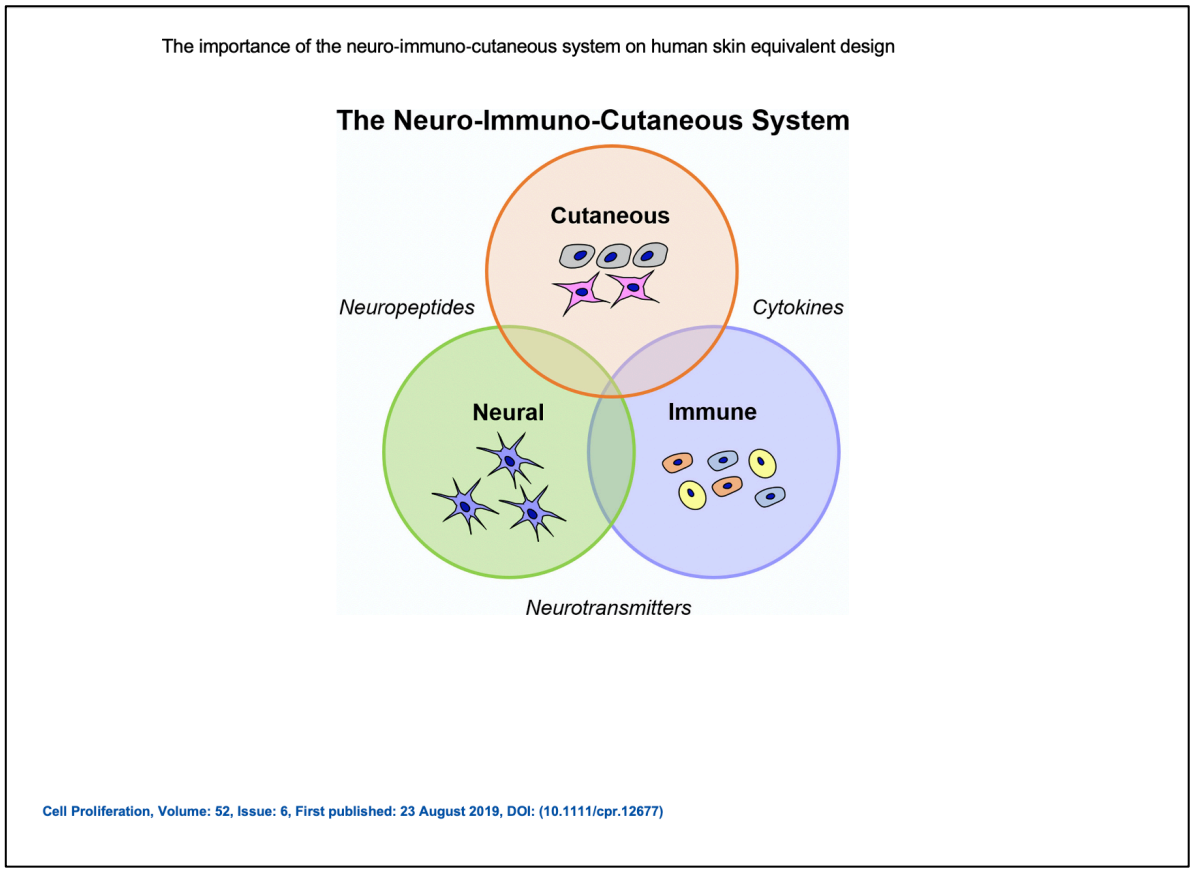
> *"Immune cells transiently present in the skin (macrophages, lymphocytes…) are modulated by neuromediators through receptors. In the course of skin diseases, especially inflammatory diseases, the NICS is destabilized. Psoriasis and atopic dermatitis are good examples. This phenomenon might be due to inflammation but is also responsible for induction and maintenance of the inflammation [70].*

Figure 2 shows the interaction between the different elements of the Neuro Immuno Cutaneous System. AD has been described as a psychodermatological disorder, in which the NICS is destabilized. Therefore, it is important to consider the psychological triggers and to understand the connections and interplay between the psyche and the skin [71, 72].

Meanwhile, some research has been done on the environmental origins of maternal psychological stress leading to AD in infants, as detailed hereafter. For instance, Wright et al. described that chronic stress in the caregiver was transferred to the child, which caused AD. In their study, chronic stress in the caregiver was measured with the

Perceived Stress Scale (PSS), without however addressing the specific causes [73, 74].

Figure 2 – the neuro Immuno-Cutaneous System (Printed with authorization)



Furthermore, Mc Kenzie et al. suggested a correlation between post-natal depression in the mother and the onset of AD in the child [45].
Another study from Harvey et al. showed the impact of dismissive/avoidant attachment through the hypothalamic-pituitary-adrenal (HPA) axis hyperactivation by flat diurnal cortisol slopes in youth with the AD-related disease Asthma [46].

1.4 Attachment theory impacting the Psychodermatology

1.4.1. Background of Attachment theory

1.4.1.1. Origin of Attachment Theory

In a Google search, the term Attachment theory yields 223 million results. Nonetheless, it is useful to briefly describe here attachment theory and its impact on the individual and the people around him, in the context of the medically-oriented study.

Bowlby was the founder of attachment theory. He viewed the attachment system as a set of instinctive, affective, behavioural, cognitive, and motivational mechanisms to encourage children to seek proximity with caregivers in stressful situations [75]. These caregivers are attachment persons which are there for the children's need. Because infants are not able to take care of themselves, they are completely dependent on the physical and psychological support of caregivers for co- and downregulation, especially in stressful situations [75-78].
Bowlby suggests that children naturally explore the environment; Bonding behaviour is particularly displayed in children at times when the child is experiencing danger or is feeling threatened, this being a subjective perception of the child [75, 78, 79]. Moreover, Bowlby sees an important role in this constellation for the primary caretaker, who is expected to sensitively perceive the needs of the child and to respond to them appropriately. Bowlby describes the latter as the "secure base" [80].

Bowlby developed the construct of "Internal Working Models", which reflect the child's internalised experiences with the attachment person during the first 12 months of life, and which are developed with regard to future expectations and forms of behaviour in attachment situations [75].

Ainsworth examined, in addition to Bowlby's work, how attachment might be perceived in a child, through its reaction *"strange situation test"* [76]. This test examines (i) how children explore the environment; (ii) followed by how the child then reacts when separated from the (primary) caretaker and left with a stranger; (iii) and finally how the child reacts when reunited with the caretaker. From the different reactions of children, four attachment patterns were defined, which reflected the type of attachment between child and caretaker:

(i) *Securely attached:* during the "strange situation" the child shows sadness at the parting of the attachment person, however, after comforting and reassuring him/her by the caretaker, the child starts to explore the environment again
(ii) *Insecure - dismissive attached:* The child is largely unresponsive to the farewell or reunion with the caretaker; although the child is very explorative, at a physiological level it has an increased release of cortisol, which reflects the inner stress situation [81].

(iii) *Insecure - ambivalent attached*: the child shows less exploration behaviour; in both separation and reunion, the child shows intense negative feelings. At the time of the reunion, conflicting behaviour arises between, on the one hand, the need for closeness to the caretaker and, on the other hand, distance due to anger towards the caretaker. This manifests itself in passive and helpless behaviour.

(iv) *Insecure disorganised attached:* This additional category is chosen if, in contrast to the previous categories, the child has no clear strategy, and sudden rigidity or confusion occurs.

1.4.1.2. Psychological Trauma and Attachment

Additionally, when exposed to Adverse Child Experiences (ACE), absence of the appropriate maternal sensitivity and care, can lead to frequent, strong, and prolonged activation of the HPA Axe in the child [82, 83]. With adequate co-regulation as present in secure attachment, emotional stress can be reduced in children. In contrast to that, when the child experiences repeated rejection or threat, it develops an insecure dismissive/avoidant, an insecure preoccupied/anxious, or a disorganized (both dismissive and preoccupied) attachment pattern [84].

Adverse Childhood Experiences occur because the child is exposed to: Emotional abuse, Physical abuse, Sexual assault, Emotional neglect, Physical neglect, Mother treated violently, Household substance abuse, Household mental illness, Parental separation or divorce, Incarcerated household member, Low socioeconomic status, Peer victimization, Peer isolation/rejection, or Exposure to community violence [85].

1.4.1.3. (un)Changeability and transferability of attachment pattern

Main, Kaplan and Cassidy described Bowlby's internal working model as a set of rules *"for the organization of information relevant to attachment and for obtaining or limiting access to that information"* [86](p. 67).

The hypothesis is that the internal working model, i.e. the current "state of mind" regarding attachment behaviour, determines parents' sensitivity to their infants' attachment patterns and, ultimately, shapes the infants' own internal working models of attachment [87]. It is assumed that the parent's own experiences of attachment relationships determine the extent to which he or she is able to process information regarding the child's attachment needs freely and without distortion.

Developed attachment profiles during childhood, as identified with the “strange situation test” from Ainsworth, generally remain unchanged and guide the person through life as "adult state of mind with respect to attachment" [86].

For example, the secure parent seems to have either processed negative attachment experiences in the past or made safe attachment experiences. As a result, the secure parent is able to give undivided attention to the attachment signals the child sends. In contrast, the insecure attached parent tends to distort or even block the child's signals of stress, fear, or anxiety, because freely admitting them threatens their own current state of mind in relation to attachment [86]. Thus, the adult with for instance a dismissive state of mind will tend not to recognize signals of stress in the child or not respond appropriately. Offered care is based on social desirability rather than on love and concern, while at the same time occurring from a safe emotional distance [88, 89].

In addition, Main described that attachment patters are considered intergenerational, where the adult provides care for the child in a way that preserves the own attachment pattern [78, 86, 90]. With the transfer of the adults own experiences into the child care, the child faces rejection and may be left in an un-regulated state of arousal, becoming dismissive attached himself/herself [91].

The above shows that the quality of maternal care as regulator of stress responses in the child seems to be important. Thus, this subproject of MAPS, aiming to investigate the maternal dismissive attachment as a risk factor for AD onset in the child, and what implications this has for daily clinical practice, seems to be relevant.

1.5 Research questions

1.5.1. The influence of attachment

Above, the current state of knowledge regarding the risk factors for the development of AD in children was described. In relation to this, it was indicated how MAPS, by means of a broadly based study approach, attempts to provide more insight into the possible risk factors as to when and how they interfere in the AD onset. From the aspect of Psychodermatology, it also became clear how the immunological &

environmental factor "stress" is of significance as a possible risk factor for the outbreak of AD in children. With the recent study of Harvey, showing the role attachment plays in the outbreak of Asthma in youngsters, it seems appropriate to take a closer look at the maternal attachment pattern as possible origin of stress in the child.

A better understanding of maternal (in)secure attachment as possible risk factor, helps to re-evaluate (i) preventive actions against the AD onset and (ii) the psychosocial support of the child and its parents once AD has occurred.

In order to explore the complexity of this attachment theme in depth, it makes sense to first conduct a qualitative study prior to standardised self-reports. Therefore, it seems relevant to gain insight into the current state of mind towards attachment among a smaller group of participating MAPS mothers. To this end, an explorative, open-ended approach seems the appropriate method. From the daily clinical context, such an exploration can then be followed by standardised questionnaires for all MAPS mothers.

Subsequently, the following research questions are explored in the present study:

(i) How is maternal insecure dismissive attachment relating to the onset of AD in the child?

(ii) How do the attachment patterns of mothers with healthy children differ from mothers of AD-diagnosed children?

Understandably, examining Attachment patterns with semi-structured interviews appear to be very time-consuming. Therefore, the second aim of this study was to investigate whether a self-report could confirm the results of the qualitative research. Thus, the additional research questions in this MAPS sub-study are:

(iii) Can a self-report reproduce the same results as a semi-structured interview, and thus be used in the daily clinical environment to determine the attachment pattern of the mother?

(iv) Are semi-structured interviews measuring the same construct as self-reports?

2. Material and Methods

2.1 MAPS Study Set-Up – Methods

The introduction referred to the need for further research and the initiative of the Munich Atopy Prediction Study, to better understand the outstanding unknowns.

For better patient and disease management, the above indicates that more in-depth research, examining the relationship between the multiple risk factors is still required. MAPS is based on a comprehensive study set-up to examine possible correlations of several risk factors for AD in a prospective birth cohort. Using this study design, MAPS aims to clarify how the underlying mechanisms of immunologic and environmental factors interact with the appearance of AD in infants.

2.1.1. Ethics committee vote

In 2017, the Munich Atopy Prediction Study was presented to the Ethics Committee at TU Munich.

The aim of the study was stated as follows:
"The aim of the present prospective study is a comprehensive evaluation of the human microbiome and individual immune responses in the context of environmental factors in the first four years of a child's life in relation to the risk of developing atopic eczema."

The comprehensive study proposal was accepted by the Ethics Committee of the TU Munich in 2017, after which the recruitment of children and mothers started in birth clinics in Munich, as well as the extensively described studies in the ethics proposal in the dermatology clinic “am Biederstein”.

On 21. July 2020, an amendment with number 334/16S to the original study proposal was approved. With this amendment, both the qualitative study, with the semi-structured interview, and the quantitative study, with the questionnaire for all study participants, were approved.
This approved amendment can be found in Attachment 1.

2.1.2. Timeline & Data collection in MAPS

Within the framework of the MAPS study, several studies are planned in the dermatology clinic over a period of four years. The planned examination time points and data collection in MAPS are shown in figure 3 and described as follows:

(i) Birth

Immediately after birth, cord blood is collected by the delivering obstetrician and then transported into the laboratory for (i) a full blood count, (ii) characterization of blood cell populations by flow cytometry, (iii) isolation of mononuclear cells from human peripheral blood (PBMC), (iv) and collection of plasma samples for further cytokine and chemokine measurements.

(ii) 2nd month visit

At the child's second month of life, a first clinical visit takes place at the dermatological clinic Am Biederstein. During this visit, the following information and samples are collected: (i) data from a questionnaire on pregnancy covering medication use, possible complications during pregnancy, living conditions, nutrition, and family history of AD; (ii) data from a questionnaire covering the birth process; (iii) data from a questionnaire assessing child development during the first two months; (iv) data from skin tests evaluating TEWL, corneometry, cutometry, and pH-levels; (v) data from visual and clinical full skin inspections; (vi) microbial DNA prepared from nose swabs taken from the child and antecubital crease skin swabs taken from mother and child; and (vii) stool samples from the mother and child.

(iii) 6^{th} to 48^{th} month visit

After the first clinical visit, mothers with their infants are scheduled to visit every 6 months starting at the age of 6 months. At the respective visits, the following information and samples are collected: (i) data from questionnaires on child development, living situation, and general well-being of the mother; (ii) data from skin tests, consisting of TEWL, corneometry, cutometry, and pH-levels; (iii) data from visual and clinical full skin inspections; (iv) microbial DNA prepared from nose swabs taken

from the child and antecubital crease skin swabs taken from mother and child; and (v) stool samples from the mother and child.

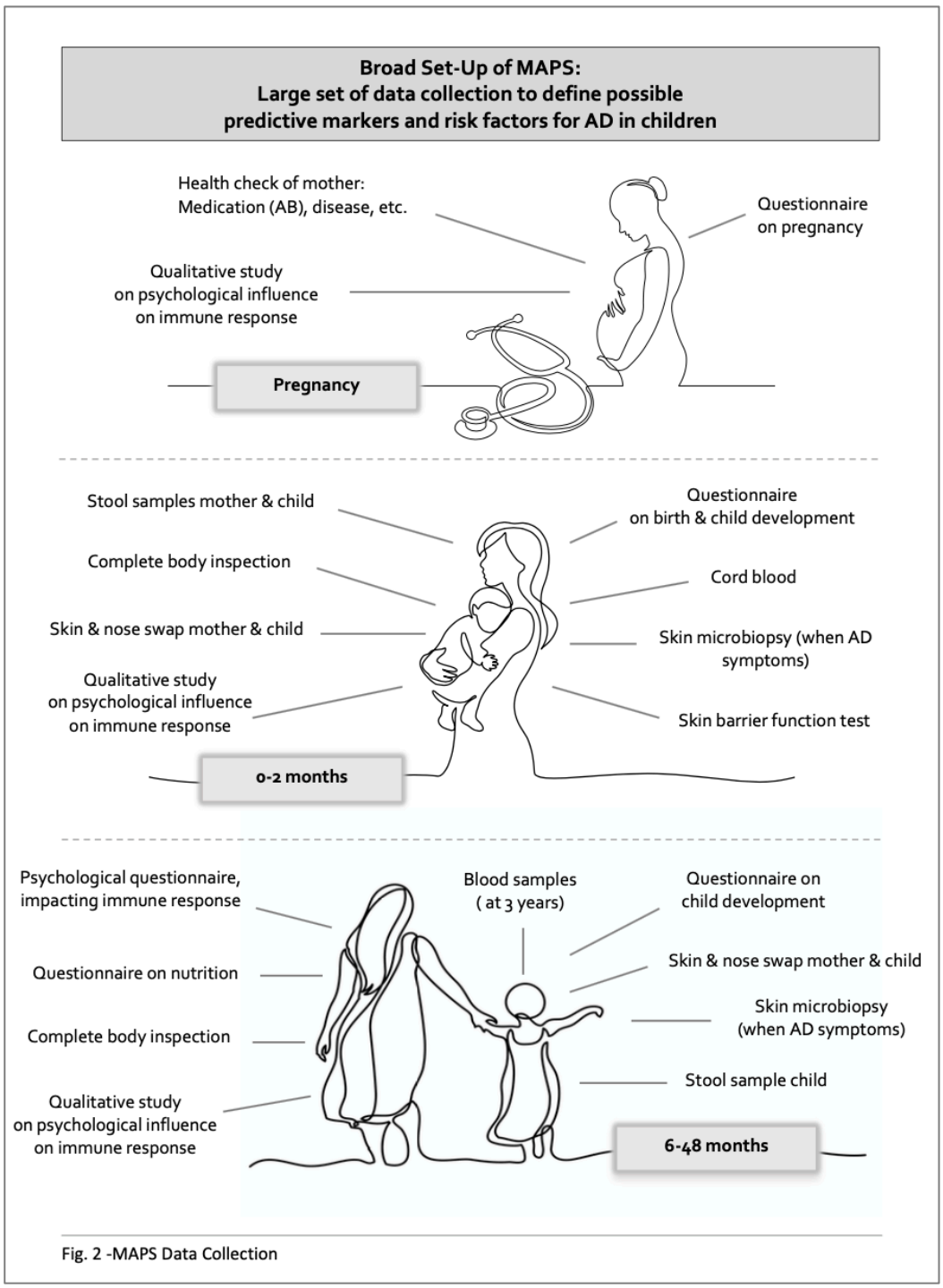


Figure 3 – MAPS data collection

(iv) <u>36th month visit only</u>

Serum samples are collected from the participating children and processed to measure AD-related cytokines and chemokines and to screen for allergen-specific IgEs using a

multiplex specific IgE test (ImmunoCAP ISAC Test). PBMCs are isolated from blood samples. Furthermore, characterization of blood cell populations is performed using flow cytometry for children with AD and their respective healthy controls.

(v) Visit during AD flare-ups:

If a child develops AD, the mother is asked to make an appointment at the dermatology hospital at any time for a study visit. At each visit, the following data and samples are collected: (i) data from skin-tests; (ii) data from visual and clinical full skin inspections; (iii) microbial swabs collected from AD lesional sites, perilesional sites, antecubital crease (if non-lesional), and nose of the affected child; and (vi) micro biopsy samples of AD-affected and nonaffected perilesional skin as well as micro biopsy samples from healthy participants.

(vi) Further one-time data collection

In addition to the regularly collected data, the following data are collected once for all participants: (i) data on nutrition with a questionnaire and (ii) data on current attachment pattern among the primary caretakers, using a self-report. (iii) Semi-structured interviews are conducted with 10 mothers of AD-diagnosed infants and with 10 mothers of healthy children.

(vii) Control group

For the assessment of differences between infants with AD and healthy infants, a control group with healthy babies, which are matched for age, sex, and living environment (urban, suburban, or rural) was established. Two healthy babies will be included for each newly diagnosed AD infant.

2.1.3. Data analysis in MAPS

The gathered data in MAPS is analysed as described below and shown in Figure 3.

(i) Laboratory analysis of collected samples

The following data will be analysed: immune cells and soluble factors in the cord blood of all babies; blood samples of all children at age 3; and transcriptome data. PBMC have been preserved and will be further used for stimulation and functional analysis. ISAC-Tests and flow cytometry analysis of immune cells and cytokines will be conducted on blood samples as performed with cord blood. Furthermore, a microbiome analysis is carried out on skin swabs, nose swabs, and stool samples.

(ii) Evaluation of environmental factors recorded in study questionnaires

The information obtained from the questionnaires filled in before each visit to the clinical trial is used for statistical analysis. This provides information about living conditions, family situation, medication used, etc.
Furthermore, the information from the one-time questionnaires on nutrition is analysed separately. Finally, based on the self-report, the existing attachment pattern of the mother is assessed.

(iii) *Evaluation of semi-structured interviews*

The semi-structured interviews are used to investigate whether the randomly selected mothers of healthy children and those of children with AD show a different attachment pattern.

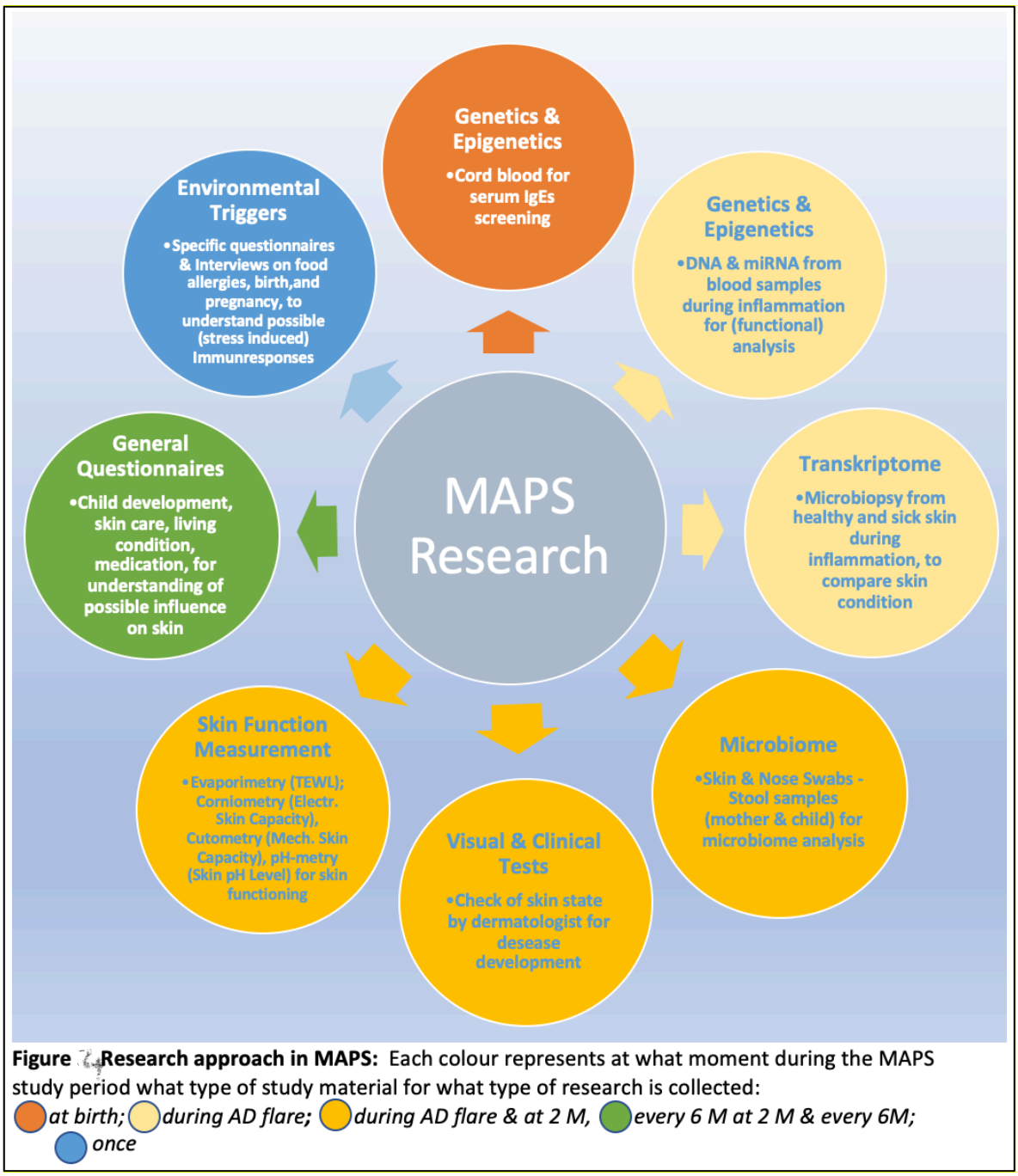


Figure 4 Research approach in MAPS: Each colour represents at what moment during the MAPS study period what type of study material for what type of research is collected:
at birth; during AD flare; during AD flare & at 2 M, every 6 M at 2 M & every 6M; once

Figure 4 – Research approach in MAPS

2.1.4. Study Rules & Regulation

Prior to study inclusion, a member of the study team presented the study in detail to the expecting mothers or parents. The participation criteria were also verified, which comprised being 18 years of age or older, understanding the German language, and having residency in Munich. After answering all possible questions, the participants gave written informed consent. The study was approved by the ethics committee of the

Medical Faculty of the Technical University in Munich and was in accordance with the Declaration of Helsinki.

2.2. Study Background of underlying MAPS-Sub study

Specifically, within this sub-study of MAPS, possible factors for the occurrence of AD in the child were sought outside the child itself. More specifically, the possible relationship between the leading attachment pattern in the mother and its influence on the child was investigated. To be able to answer that question, first of all the attachment pattern of the mother has to be examined.

2.2.1. General identification of one's attachment pattern

The identification of one's attachment pattern or profiles is generally performed with two different methodologies [92]:

(i) In developmental psychology, this assessment is based on the validated Adult Attachment Interview (AAI). George, Kaplan, and Main developed the AAI, which made it possible to verbalise the internal working models described previously (George 1996). The previously four defined attachment profiles were used to develop the AAI. As in the strange situation test of Ainsworth, the statements of the interviewee on the interview questions are assigned to one of the four categories (Beutel et al. 2013). This made it possible to use attachment theory with adults in order to make them reflect on their current state of mind regarding childhood experiences with caregivers (Main, Kaplan, and Cassidy 1985; Hesse 2008, Roisman et al. 2007).

(ii) Social and personality psychology researches Attachment pattern based on self-reports of attachment-related thoughts and feelings in adult relationships [93]. Hazan and Shaver developed the original self-report in 1987 [94]. In 1991 Bartholomew developed the Relationships Questionnaire, to assess attachment in the four categories. This model is not widely used anymore [95]. In 1998 Brennan at al developed the Experiences in Close Relationships Scale (ECR), a 36-item self-report, measuring adult romantic attachment, which has been revised in 2002 by Fraley, Waller and Brennan, called the ECR-R [96, 97]. In

those self-reports attachment is scored on dimensions, avoidance and anxiety, leading to four categories: secure attached, insecure avoidant (dismissive), insecure anxious, insecure preoccupied.

2.2.2. Use of mixed method approach for the underlying study

As indicated above in the introduction, we wanted to thoroughly address the complexity of the onset of AD. Given the complexity of the question and the fact that no studies could be found in the leading literature databases (status:2021), a qualitative study seemed appropriate. At the same time, we wished to respond to everyday clinical and practical reality in which larger-scale and less time-consuming studies have an important place.

Therefore, we choose to conduct both qualitative research by means of semi-structured interviews and quantitative research by means of a self-report in one study. This so-called mixed-methods approach is an emerging method that makes use of both the numerical data from quantitative research and the usual "non-numerical" data from qualitative research. As the value of qualitative research is increasingly appreciated, there is a growing interest in combining both approaches in one study [98]. The focus is on collecting information, analysing it, and mixing both quantitative and qualitative data in one study [99]. Another special feature of the underlying study is that the answers from the semi-structured interview are subjected to a numerical scoring system. This makes it even easier to compare the results from both the interview and the questionnaire.

These mixed methods approach thus allow us to compare the results of both research methods and to draw conclusions about a possible new risk factor for the development of AD in the child.

2.3. Qualitative Research

2.3.1. Setting and background of the study design

The aim of the phenomenological qualitative part of the study was to investigate and compare the current state of mind towards attachment of the participating MAPS mothers of both healthy and AD diagnosed children. This is in line with the description

given by Merriam, whereby a phenomenological study is well suited to the study of affective, emotional and often intense human experiences [100]. After all, these experiences in the child lead to the adoption of a certain attachment pattern [75, 80].

Hinz described qualitative research as tending towards *"explorative, theory-developing, inductive, intensive, holistic and subjective"* research [101]. The purpose of qualitative content analysis is to better understand human behaviour, without drawing generalizable conclusions from it. In qualitative research, small groups are often used, and in semi-structured interviews in particular, the focus is on understanding views on a particular theme [102].

Mayring has done a lot of work in the field of content analysis of qualitative research, and his method is generally used for qualitative research (Mayring 2010). This involves analysing the text after conducting interviews and then elaborating on it. Mayring's definition of Scaling Structuring *“aims to define characteristics for individual dimensions in the form of scale points and to assess the material on this basis” [103]*.

The underlying study also underlies this form of analysis, whereby the elementary scheme of structured content analysis is respected. The structural dimensions used in Mayring are also unchanged in the present study. The estimation dimensions, which are required precisely for scale estimation, are variables with at least one ordinate form (e.g. 'often' expressed in '1' or '9'; 'average', expressed in '5'; or 'little', expressed in '1' or '9') [103]. In contrast, summaries as proposed by Mayring for the text analysis are not part of the underlying research.

Instead of summarising key passages, each script was analysed three times, according to Main's method, each time focusing on a different perspective [87]. In doing so a classification system was used, allowing each transcript to be used ultimately, as if the information came from a standardised test.
This method of text evaluation therefore fits in perfectly with the "mixed methods" study method described under 2.2.2, which was used for our study.

2.3.2. Conception and preparation of data collection

2.3.2.1. Recruiting participants for semi structured interviews

The MAPS participant database was used to recruit participants. The participants in the database were divided into two groups: mothers of healthy children and mothers of children diagnosed with AD in MAPS. From both groups, mothers of healthy children and mothers of AD-diagnosed children were randomly selected.
Based on the pre-selected MAPS sample the additional inclusion criteria for this interview consisted of: (i) the mother's willingness to participate in an introspective interview, and (ii) being able to have at least one hour of undisturbed conversation with the interviewer
A written consent for this additional part in the MAPS study was sought prior to interview of all the participants.

2.3.2.2. Development of Semi-structured Interview

For the semi-structured interview 21 questions were chosen by the authors, based on (i) the validated AAI, supplemented by questions on (ii) work and (iii) pregnancy and (post) natal experiences.

As described in Chapter 1, the validated AAI is the preferred method for identifying the attachment pattern in the interviewee. The 20 questions from the AAI were all included in our interview. The questions on the current professional situation of the participating mothers, as well as the questions on the experiences with the pregnancy, birth and postpartum period, were developed specifically for this interview and added to the final semi-structured interview that was approved by the ethics committee. For scoring the questions concerning work and pregnancy/birth, the same scoring system was developed and used as for the items from the AAI. In this way, it was possible to aggregate and compare the results and to draw conclusions from the results.

The combination of those three areas of interest in the interview was chosen to ensure relevance to MAPS participants. This sub-study within MAPS required a high degree of self-reflection of the participants, which had previously not been so much the case within MAPS. Both the clinic visits and the general questionnaires at each visit focused mostly on the status of the child's skin and its development. With the semi structured

interview, the focus suddenly shifted to the mother and her memories of attachment to her own parents during her childhood. It seemed appropriate to us, that this shift in focus should be dealt with by creating relevance for the mother. Therefore, we decided to combine questioning of past experiences with experiences and beliefs in the here and now.

The interview therefore comprises (1) in-depth inquiries on the current work/life-situation and self-reflection of the mothers regarding their needs for a professional career, (2) the basic concepts of the Adult Attachment Interview (AAI) [93, 104, 105], (3) own perception and experience with their pregnancy and the experienced (post-) birth routine (table 1).

Table 1 - Main questions of semi-structured interview

First, an overview of the questionnaire is given. This is done by explaining how this questionnaire can be classified within MAPS. Then the interview procedure is explained to the interviewee.	
1. Let's start with some short questions about your professional situation. % of time currently working?	WRQ
2. Perhaps you can first give me a brief overview of your family situation at that time.	AAI
3. Can you now try to describe to me the relationship you had with your mother and father when you were a small child? It would be best if you started with the earliest memories.	AAI
4. Now try to find five characteristic words that describe the relationship with your mother in your childhood *(childhood to adolescence)* as accurately as possible. Take your time and think about it for a minute. Afterwards, I will ask you why you have chosen these words in particular.	AAI
5. So, now let's talk about your father. Now try to choose five characteristic words that reflect your relationship with your father in your childhood? Again, take your time. Afterwards, I will also ask you why you have chosen these adjectives.	AAI

6. Did you feel closer to your father or mother? What was the reason for that? (Why did you not have the feelings towards ...?)	AAI
7. If you didn't feel comfortable as a child, what did you do?	AAI
8. Can you remember the first time you were separated from your parents as a child? How did this separation come about? How old were you at that time?	AAI
9. Did you ever feel rejected as a small child?	AAI
10. Have you ever felt threatened by your parents, perhaps when your parents threatened you with something for fun or for disciplinary reasons?	AAI
11. In what ways do you think your experiences with your parents have influenced your personality as an adult?	AAI
12. Do you have an explanation for why your parents behaved the way they did towards you when you were a child? (generally)	AAI
13. Have you experienced the death of any close family member as a young child? Have you experienced the loss of children, including stillbirths, miscarriages, early pregnancy terminations, pregnancy interruptions?	AAI
14. Have there been many changes in your relationship with your parents since childhood? So, over the whole childhood until today?	AAI
15. What is your relationship with your parents like today?	AAI
16. With what feelings do you now react to separations from your child?	AAI
17. If you had three wishes for your son/daughter when he/she was about 20 years old, what would they be? One of the things I think about is what kind of future you want for your child. Take a minute to think about it.	AAI
18. Is there anything in particular that you think you have learned from your childhood experiences?	AAI
19. Can you tell me more about how the pregnancy went for you?	BBM

20.	Now let's continue talking about the birth of your child. How did the birth go? How did you feel supported throughout the birth process? How much stress did you feel? How was your relationship with your partner during the birth? Were there any particular moments of stress?	BBM
21.	Can you tell me what the first months of your child's life were like?	BBM

(WRQ= work related questions; AAI=questions of Adult Attachment Interview; BBM= Becoming and being mother).

The full interview can be found in Attachment 8.2

2.3.3. Setting of the semi structured interviews

The study was reviewed and approved by the Ethics Committee of the Medical Faculty of Technical University of Munich, Reference 334/16 S. The developed interview was held with a non-participating mother with a diagnosed AD child, to pre-test the duration, comprehensibility and feasibility of the interview with the MAPS-study participating mothers. After this, the selected potential participants were contacted to record the interview. Once data saturation had been reached one more interview was carried out for both groups, i.e. mothers with AD diagnosed children and mothers with healthy children, as before interviewees recruitment was stopped [106].

All interviews were conducted between April and October 2020 via videoconference due to the COVID19 pandemic. Interviews were held with “Red Connect Medical” (Red Medical Systems GmbH, Munich), where the participants were able to speak undisturbed in their familiar environment without the presence of third persons. Audio recordings and field notes were made of all interviews. The interviewer was herself during the interviews in the dermatological clinic or in home-office.

Each interview started with its framing within the MAPS study, and answering possible questions from participants. The participants then answered open-ended questions about their education, work and current living situation according to the above descried topic guide (table 1).

The interviews were performed by one interviewer (L.S.) that had substantial experiences with psychological trauma work (consisting of 400 hours of trauma education followed by practical application) and gave birth herself to four children.

2.3.4 Processing the qualitative data

2.3.4.1 Transcribing

After the interviews were held, their recordings were transcribed verbatim, showing not only the spoken text but also the non-verbal communication, such as pauses, longer silences, laughing, crying, stuttering, etc. Then each transcript was compared again with the interview notes to ensure the accuracy of the transcript. As the interviews were held in German, French, English and Dutch, verbatim transcription took place in all 4 languages.

2.3.4.2. Development of scoring method

For the underlying research, different dimensions (as described in detail hereafter) were determined, with corresponding scales (1-9), definitions and qualifiers for the individual categories. These were partly elaborated by Main and others in relation to the AAI (Main 1998; Hesse 2008). For the answers to the questions about work attitude as well as about experiences with pregnancy and (post) natal period, new dimensions were determined and the corresponding scales, definitions and qualifiers were determined to support the analysis of the verbatim transcripts.

(i) 29 different dimensions

In total, 29 different dimensions emerged, each of which was evaluated separately (Table 2). For each of the 29 dimensions, different qualifiers were established, on the basis of which the coding could take place.
In concrete terms, this meant that for each transcript, the evaluator compared the content of the defined qualifiers per dimension with what had been said, in order to arrive at a score per dimension.

All 29 dimensions with their qualifiers can be found in attachment 8.3.

Table 2 - Overview of evaluation and coding dimension, subdimensions, and merged dimensions

Dimensions*	Subdimension*	Merged dimensions
(i) Childhood experiences with parents	1. Loving mother	1. Loving parents
	2. Loving father	
	3. Rejecting mother	2. Rejecting parents
	4. Rejecting father	
	5. Role reversing mother	3. Role reversing parents
	6. Role reversing father	
	7. Pressure to achieve mother	4. Pressure to achieve parents
	8. Pressure to achieve father	5. Neglecting parents
	9. Neglecting mother	
	10. Neglecting father	
(ii) State of mind regarding to parents	11. Idealization mother	6. Idealization parents
	12. Idealization father	
	13. Involving anger mother	7. Involving anger parents
	14. Involving anger father	
	15. Derogation mother	8. Derogation parents
	16. Derogation father	
(iii) Overall state of mind	17. Overall derogation	
	18. Lack of recall	
	19. Passivity	
	20. Valuing independence	
	21. Fear of loss of child	
	22. Unresolved loss	
	23. Unresolved trauma	
	24. Coherence of script	
(iv) Pregnancy and (post)birth experiences	25. Experience with pregnancy	1. Becoming mother
	26. Experience with birth	
	27. Experience with period after birth (< 4 month)	

(v) Attitude towards career and work / life balance	28. % working (1=0% - 9= 100%) 29. Attitude towards need for own career

(Sub-)dimensions were developed based on literature of "adult attachment interview", adult attachment theory, "current relationship interview", trauma theory, and study setting.

Those 29 dimensions were regrouped in five main categories of findings to represent maternal attachment variations, namely: (i) experiences with parents representing dimension 1 to 10, (ii) state of minds related to parents representing dimensions 11 to 16, (iii) overall state of mind representing dimensions 17 to 24, (iv) pregnancy and (post) birth experiences representing dimension 25 to 27, (v) job perception and situation representing dimension 28-29. Category (i) to (iii) are aligned with the AAI, category (iv) and (v) are supplemented for this underlying study.

An in-depth analysis of each verbatim transcript took place by the first author, comparing each transcript with the different scaling possibilities for each dimension, on the previously described different (sub)scales.

(ii) Quantitative scoring system for each dimension

For this deductive research approach, each of the 29 dimensions (see table 2; subdimensions) had a nine-point continuous scale, where each odd number (i.e., 1,3,5,7, and 9) was well defined by a definite qualifier, as shown in table 3. This broad scaling between 1-9 made it possible to correctly assess the nuances and subtleties of the answers given by the participants. This ultimately allowed a score per dimension per transcript to be defined for the 20 different transcripts.

(iii) Calculation of means and standard deviation per dimension / study group

With the rating of each dimension in each transcript, a mean per dimension and its standard deviation (SD) was calculated for both the group of mothers with AD children and the group of mothers with healthy children. This scoring system was established for the purpose of this study in accordance with the AAI, 'Developmental Trauma

Theory', 'Adverse Childhood Experiences-Theory', CRI, and the 'Affect- regulation-model'[75, 93, 105, 107-110]

The different scores on experiences with mother and father for category (i) and (ii) were each combined into one average score for the parents together per participant (table 2; merged category). The individual scores for the category (iv) "experiences of pregnancy and (post)birth" were also combined into one mean score. Subsequently, mean values and standard deviations for all (sub-)categories / study group were calculated.

Table 3 - Example of coding in the different (sub)dimensions with ratings scales and qualifiers

Category	Subcategory	Ratings scales*	Qualifier
Childhood experiences with parents	Loving mother	1. Very lacking in love 2. – 3. Lacking in warmth 4. – 5. Neither loving nor actively loving 6. – 7. Loving 8. – 9. Very loving	Actively rejected love to the subject; There was no affection; there was a lot of anger towards the subject. The mother /father was cold, uninvolved; There was physical or emotional abuse towards the subject.

Rating scales were developed based on literature of "adult attachment interview", adult attachment theory, "current relationship interview", trauma theory, and study setting.

Finally an estimation of "the best-fitting organized state of mind" was made, using the scores for each transcript to determine which adult attachment classification - secure, dismissive, preoccupied, or unresolved - the transcript best fitted [104]. For secure

attachment, a high score was expected for the category "coherence of script". For dismissive attachment, high scores would be found for idealization of parents, derogation of parents, overall derogation, lack of recall, valuing independence, unresolved trauma, and attitude towards professional career (to express valuing independence) and a low score for coherence of script.

The analysis and scoring of the transcripts was partly caried out in MAXQDA2020, partly in Excel.

2.4. Quantitative study – Self reports

Simultaneously with the qualitative research, we started a quantitative study, reaching all participating mothers of MAPS. As indicated earlier, we wanted to see if self-reports could confirm the results of the qualitative study.

2.4.1. Setting and study background

2.4.1.1. Utilization of Self-reports in medical research

Self-reports reflect information from an individual's own interpretation, experiences, feelings, or beliefs. This data collection can be done by means of questionnaires and is an essential part of medical research. However, self-reports can be a source of distrust, particularly because of the conscious bias that can exist in the person filling in the data. Nevertheless, the use of self-reports is desirable in situations where obtaining information is too cumbersome or time-consuming (Stone et al. 1999). The method of semi-structured interviews described above is an example of this. In daily clinical practice it is unfeasible to conduct such an interview, transcribe it and analyse it in the required manner.

In order to overcome this very time-consuming research method, we decided to send a questionnaire to all participating MAPS mothers simultaneously with the qualitative study. To this end, we looked for a validated questionnaire, which is also used to determine Attachment Pattern.

Since the initial development of the attachment theory by Bowlby, a lot of value has been attached to come to a less time intensive method to determine attachment patterns, especially in relation to the development of attachment relationships in the individual [111]. It is therefore obvious, that several questionnaires have been developed over time, as previously mentioned under paragraph 1.4.2. under (ii).

In 1998, Condon and Crokindale had developed a questionnaire with 19 items, specifically aimed at measuring the mother - to - child attachment [112]. Condon et. al. assumed that the strength of attachment between parent and child could be measured by the parent's strength in (i) pleasure in proximity, (ii) tolerance (iii) need-gratification and protection and (iv) knowledge acquisition. These four indicators would not define attachment, but would serve as an indication of the possible presence of (secure) attachment. The authors of this test did not have the intention to continue using this instrument in this way, among other reasons, because its validity could not be clearly demonstrated. Therefore, for our research we continued to look for a validated test that would be more in line with the qualitative interview.

Also in 1998, another test instrument was developed for determining attachment patterns, the Experience in Close Relationship scale (ECR). This questionnaire assesses attachment orientations across relationships. In 1998 Brennan et al. combined from all known attachment self-report scales all the 323 used items and submitted those to more than 1000 students. Using a factor analysis, two factors - avoidance and anxiety - and their corresponding highest-scoring items were selected. These 36 items formed the basis for the Experience in Close Relationships scale (ECR) [113, 114].

We chose this questionnaire for the underlying study because of its bi-dimensional structure (avoidance / anxious) as well as its empirical background through the factor analysis carried out on all existing questionnaires at the time. Studies by Vogel & Wei (2005) and Waller Fraley (2004), among others, showed a high reliability of the ECR. The test-retest had a Cronbach alpha rating of .93 for the anxiety scale and .95 for the avoidance scale [115-117].

2.4.1.2. Experience in Close Relationships Scale (ECR)

As mentioned previously, the ECR is a validated questionnaire, developed by Brennan et al in 1998, consisting of 36 questions related to experiences in romantic relationships [113, 114]. This questionnaire is used to identify attachment related thoughts and feelings in adult relationships [93]. Of those 36 questions (i) 18 questions are regarding avoidant behaviour (e.g. "*I try to avoid getting too close to my partner*") and (ii) 18 questions are regarding anxious behaviour (e.g. "*I worry about being alone*") [114]. The full test can be found in attachment 8.3.

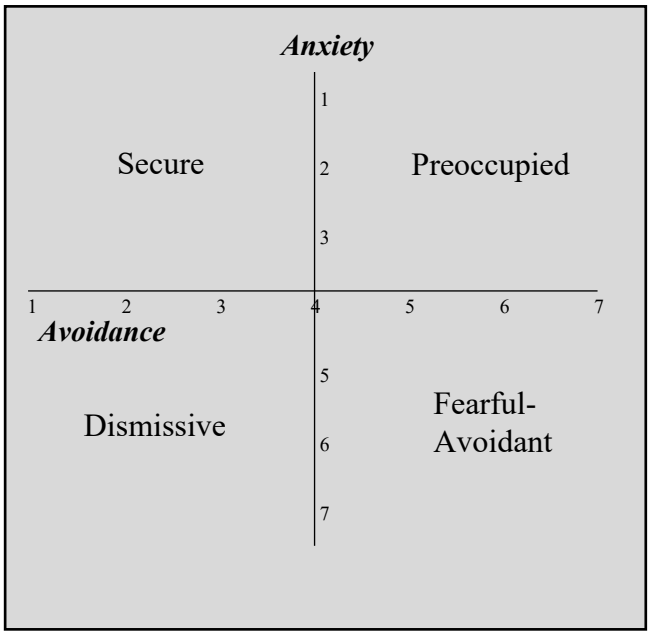


Figure 5 - Attachment Theory – adapted version of the "Two Dimension Model" [118] applied to scores of 1-7 from Experiences in Close Relationship-Scale

Answers are given on a 7-point Likert-scale indicating the respective agreement (1= strongly disagree, 7=strongly agree). The first sub-scale 'Dismissive/Avoidant' describes discomfort with closeness and the second sub-scale 'Preoccupied/Anxious' refers to fear of rejection or abandonment. Brennan et al. used the two dimensions to derive four type or style categories [114]. Values <4 for both categories indicate "secure attachment", values >4 for "avoidant" indicates "insecure avoidant", and values >4 for "anxious" indicates "insecure preoccupied". Values >4 for both categories indicate "insecure disorganized". Figure 5 shows the graphical illustration of the values described here.

As indicated in the qualitative study, mothers with AD were found to have an insecure dismissive attachment behaviour, while mothers of healthy children were found to have a secure attachment pattern.
Our main focus in the underlying part of the study is therefore on the categories "Dismissive" and "Secure" and how it possibly relates to the results from the qualitative research.

The results of the statistical analysis of the returned questionnaires would enable us to determine

(i) Which attachment profiles could be identified among the participating mothers;
(ii) Whether there was a significant difference in attachment patterns between mothers with AD-diagnosed children and mothers with healthy children.
(iii) Whether the results of the questionnaire matched the results of the qualitative research described above.

2.4.2. Conception and preparation of data collection

2.4.2.1. Study population

Similarly, to the qualitative part of this study, only the mothers were contacted. On the one hand, because they have been the ones to fill in all the other questionnaires within MAPS, as well as supervising the clinical examinations of the children. On the other hand, the results of the ECR were to be compared with the results of the semi structured interviews. Therefore, it was important that the participants in both parts of this study had the same gender so that the data would still be comparable.

2.4.2.2. Mailing (preparation) & data collection

Due to the COVID pandemic, all scheduled study examinations had to be cancelled. And it was precisely at the time of the complete lockdown that it was planned to start inviting mothers to fill out the ECR at their bi-annual visits.
This obstacle was circumvented by issuing a mailing to all participating mothers, asking them to return the response form to the study office in the envelope provided.

In March 2020, all participating mothers (n=284) were contacted by post and received the questionnaire, a pre-paid return envelope, and a patient information. In June, a second mailing went out to the remaining mothers of the MAPS database, that had so far not returned the ECR to the study office.

2.4.3. Statistical data analysis

The questionnaires were coded upon receipt and then digitalised in RedCaps (Research Electronic Data Capture, Nashville) [119]. T. This was done twice, in order to intercept and correct possible discrepancies from the data processing.
After correction of any inaccuracies, the raw data from RedCaps relating to the ECR questionnaire were transferred into SPSS Statistics to carry out a statistical data analysis.
For this purpose, two different groups were formed in SPSS (SPSS Statistics Version 25, IBM Corporation, Armonk, USA): mothers with healthy children (group 1) and mothers with children diagnosed with AD within MAPS (2). The values for questions 3, 15, 19, 22, 25, 27, 31, 33, and 35 were reversed, as these questions were entered as control questions in the test.
Then a group was created for the answers to the even questions: Answers on questions related to avoidant behaviour. The same was done for the odd-numbered questions: Answers on questions related to anxious behaviour. For each group, an average was calculated for each participant, which could lie between 1 and 7.

In this part of the study, only the above data were used for the statistical analysis. Other possible data such as age, education, etc. were still being collected at the time of this study and were not yet available for a qualitative analysis in relation to the results of the ECR.

The available data were checked for normality using the Kolmogorov-Smirnov test. Subsequently, the data with the results from both groups, i.e., the means for the answers to the questions relating to avoidant behaviour and anxious behaviour respectively, were compared with each other using an independent T-test. We wanted to find out whether there was a significant difference between the two participant groups in the avoidant and anxious categories. In other words: whether mothers with AD-diagnosed children would have (significantly) higher avoidant behaviour scores

compared to mothers with healthy children. In addition, we used the independent T-test to examine whether significant differences were found between the two groups of participants with regard to anxious behaviour.

3. Results

3.1 Results of qualitative research

3.1.1. Participating mothers in the semi structured interviews

10 mothers of each group agreed to participate in the study. Additionally, three mothers with AD diagnosed children were contacted but did not wish to participate and one mother with an AD diagnosed child agreed to participate, but did not appear at the interview. All participants had given their written informed consent prior to each interview.
The individual interviews were conducted from April 2, 2020 to October 27, 2020, and lasted between 53 and 87minutes.

The participating mothers were aged between 24 and 45 years, and came from Turkey (1), Malaysia (1), France (2), the Netherlands (1), Nigeria (1), Poland (1), former GDR (3) and former WDR (10). The distinction between GDR and WDR is made here because the study participants still actively or passively experienced the various regimes, which were also noticeable in their upbringing of small children.

Six of the healthy children had a parent who also suffered from atopic disease, and two children had both parents with atopic disease. In the AD-diagnosed children, four children had one parent affected by an atopic disease, and in one child both parents had an atopic disease (Table 4). Atopic diseases include Atopic Dermatitis, Asthma, Rhinokunjunktivitis, Hay fever and Dust mite allergy.

Table 4 – Affected parents with atopic disease

	Healthy children	*AD diagnosed children*
One parent with an atopic disease	*6*	*4*
Both parents with an atopic disease	*2*	*1*

The children of the mothers participating in the interview were at least 14 months old at the time of the interview, and had appeared at all previous scheduled examinations.

3.1.2. Results of the semi structured interviews

As described earlier, we did not completely apply Mayring's method for analysing the transcripts. The verbatim transcripts and the definitions of ranges, which can also be found in Mayring's work, were applied in underlying study. After these were determined, each transcript was further evaluated in the same way researchers would evaluate the AAI, by the utilization of the above-described scoring system.
(i) Firstly, the "experience dimensions" were evaluated and significant passages were marked. (ii) Then the so-called "state of mind" dimensions were evaluated. (iii) Finally, a "bottom down" analysis was carried out, in which the "coherence" in each transcript was examined. In this elaboration of the transcript, the Maxims of Grice [120] were used:
(i) Quality: frank answers that were supported by concrete examples;
(ii) Quantity: concise and at the same time complete answers
(iii) Relevance: meaningful answers without straying
(iv) Manner and Form: clarity and structured

Thus, based on the 29 (sub) categories developed, each with a rating scale and corresponding qualifiers, each transcript was analysed. This gave each participant a score per category, which was summarised in a table.
Table 4 is an exemplary representation of some categories with the corresponding scores and statements of the participants, corresponding to the qualifiers established.

Table 5 - Scoring guideline for the semi-structured interview: example of some relevant subcategories of category (iii) "Overall state of mind" with the sub-categories and the relevant findings and / or quotes

Subcategories	Rating scale	Interview abstracts
Overall derogation	1. No derogation of attachment 3. Mild derogation 5. Moderate derogation	**CG9** -**P**:" (…) *when we come home, we always go first for half an hour on the sofa and so to unwind, and then on to the playground or something (…)".* **I**: "*Is that cuddle time with mummy then?*". **P**:" Yes*, yes. We both need that".*

	7. Definite derogation 9. Strong derogation	**AD7**-**P**: "*But I was really completely alone in the whole family. And that's actually my character. I know that I can rely on myself (…) that was pretty intense, yes. But for me there was somehow absolutely no other way out and I'm not someone who likes to duck".*
Lack of recall	1. Clear recall 3. Definite recall of memory 5. Moderate recall of examples referring to statements about relationship with parents 7. Definite lack of memory referring to statements with parents 9. Insistence of lack of memory for childhood	**CG5 – P:**" Very *intimate, loving, so we were close to each other. Friendly, so yes-; and, and so cheerful".* **I:** "*Are there certain events that come to mind immediately?"* **P**: "*Yes, I can remember one situation (…). Well, that (example) just comes to mind."* **AD7 -P** "*No, I don't actually remember anything with my mother, except going grocery shopping".* **AD10 - I** "*How would you paraphrase your mum if you were allowed to use five words?*" **P:** "*Oh, I don't know (…*) **I**: "*Yes, and how could you* (…). **P**: *"I don't know".*
Valuing independence	1. No need for independence 3. Little valuing of independence 5. Moderate valuing of independence 7. Strong valuing of independence 9. Very strong valuing of independence	 **AD9 – P** "*I wanted her to get used to sleeping alone to that I could somehow, (...) say, do my own thing. That's why I got her used to her own bed quite early on (…). That was a struggle, of course, because she didn't like it either, but now she's so used to it that she doesn't fall asleep on my arm or anything like that."* **AD5** – **P**: *"Then I preferred to eat only crispbread and butter for weeks until my money came. It was just important for me to be so independent."*

Unresolved trauma	1. No traumatic events experienced during childhood 3. No disorganizing effects of trauma from childhood 5. Unsettled, but not cognitively disorganized due to traumatic events during childhood 7. Some negative effects of the experienced childhood trauma on the relationship with the own child 9. Distinct dysregulation and obvious trauma symptoms (reported). Severe effects of trauma experience on present relationship with child	**AD4 – P:** *"(…) I had panic attacks when I was young. That somehow – at 20 or so I felt that. (…) And when I was a baby, I was sick for six months (…) and somehow, I ended up in a children's hospital twice, (…) there everything was always very harsh, (…) they had wrapped me up the way they used to do it (…) where I was lying in a full nappy, so I was screaming and somehow tied up".* **AD5 – P**: *"And then my mum did this Vojta therapy with me. My father thought it was awful, because it is a terrible torture with a child that's only two or three weeks old. But my mother went through with it until I was a year old or something like that."*
CG= mother from control group, AD= mother from AD group; I= interviewer, P=participating mother. The categories "passivity", "fear of loss of child", "unresolved loss" and "coherence of script" are not shown here, because they showed no relevant differences or no quotes could be given (coherence of script.)		

From the individual scores per category, a mean and associated standard deviation were calculated for each group separately. The categories in which a distinction was made between "mother" and "father" were finally merged into the category "parents" in order to make the final result clearer.

This resulted in the following scores:

(i) Category 'Childhood experiences with parents'

This category indicated that mothers of AD diagnosed children had to deal with an indifferent attitude of the parents with little affection through "(very) lacking in love" (mean 2.7 ± standard deviation (SD) 1.3). In addition, a constant rejection of support or spending time together was also visible with "rejection of attachment" (6.9 ± SD 1.0). AD mothers also experienced "very neglecting behaviour", with parents being rather reluctant/unwilling in their role of caregiver towards the child (mean value 2.3 ± 0.6). Among mothers with healthy children, the results for these categories were quite the opposite.
Experiences of role-reversal, which is typical of "insecure preoccupied adult attachment", were not observed in one of the groups.

> *Example of "Loving parents" - AD1- P: "Yes, we also got beatings back then.(...) It was just the times when you got one with your belt (...)And at some point, of course, I knew when they said, "But if you do, they'll do it again with a belt," and I already knew what a belt felt like, so unfortunately the threat already existed, yes, yes."*

(ii) Category 'State of mind relating to parents'

Category (ii) shows a typical attitude among AD mothers that corresponds to "dismissive adult attachment": "Idealization of parents" (mean value 6.5 ± 1.3) and "Derogation of parents" (mean value 6.5 ± 1.2). These values indicate on the one hand the discrepancy between how participants continuously describe their parents in a positive way, while suppressing existing negative feelings about the relationship with parents, and on the other hand the time they reject the need or importance of attachment with parents, as if it were unnecessary and undesirable.

> *Example of "Involving anger father" - AD6-P: "Because I'm never going to apologize for that and he is too stubborn to ever believe that he's ever in the wrong so we shouldn't ever really- if we want to have any kind of a relationship, not to brush things under the carpet (…) Because he thinks, he*

sends us to counselling and that counsellor will tell us that we are wrong and he's right".

(iii) Category 'Overall state of mind'

AD mothers showed a higher rejection of attachment (mean value 6.5 ± 1.2). The high values for "Lack of recall" (mean value 6.7 ± 1.4) and "Unresolved trauma" (mean value 8.2 ± 1.3) mean that participants still carry the effects of the ACE with them, which are repressed from their awareness due to lack of recollection. The strong desire for independence (mean value 7.3 ± 1.3) is also associated with this. Furthermore, the value for "Coherence of script" was nearly three times higher among mother of healthy children (mean value 7.6 ± 1.6) than among mothers of children with AD (mean value 2.8 ± 1.9), which indicates secure attachment. In contrast, the AD mothers' transcripts showed inconsistencies about attachment experiences: feelings were vaguely described and the transcript was at times excessively detailed without being substantial.

*(iv) Category '*Pregnancy and (post)birth experiences'

This category did not show a meaningful influence on the current pattern of adult attachment for one of the groups (AD: mean value 3 ± 1.7 vs. CG mean value 2 ± 1.3).

(v) Category 'Attitude towards career and work / life balance'

Category (v) showed how AD mothers' valuing of independence was reflected in their need for professional career and desire to work, as opposed to the CG group (AD: mean value 6.8 ± 1.3 vs. CG: mean value 3.6 ± 1.3). For the category "% working" de AD mothers and CG mothers showed no relevant different scores (AD: mean value 5.6 ± 2.4 vs. CG: mean value 5.2 ± 2.9)

AD5 – P: *"With the little one, he was eight weeks old, (...) I was away for ten days. The children accepted this as perfectly normal from an early age. (...) they (...) didn't care who was there. (...) We never had that, it was always very, that is, the children always didn't care at all."*

The analysis of the transcripts with the established rating system, provided a score per category for each study group. Figure 6 shows the pertinent differences between the two study groups, as described hereafter. All mean values and associated standard deviations are available as supplement.

Table 6 shows the estimation of “the best-fitting Organised State of Mind” for the two study groups, based on the ratings of the relevant categories. The mothers with healthy children show secure autonomous attachment. The mothers with AD-diagnosed children show an insecure dismissive attachment pattern. Preoccupied and unresolved/disorganized attachment scores proved to be irrelevant in the study.

Figure 6 - Summarized scores for each (merged) category for both atopic dermatitis and control group mothers *CG=control group, AD=Atopic dermatitis group

Table 6 - Estimation of the "Best-Fitting Organised State of Mind"

Category	**Mean**	**SD***	Defined Attachment Category
Coherence of script			
- *AD*	2.6	1.4	Insecure attachment
- *CG*	7.6	1.6	Secure autonomous
Idealisation parents			
- *AD*	6.5	1.3	Insecure dismissive
- *CG*	1.2	0,4	Secure autonomous
Derogation parents			
- *AD*	6.5	1.2	Insecure dismissive
- *CG*	1.4	0.5	Secure autonomous
Overall derogation			
- *AD*	6.5	1.2	Insecure dismissive
- *CG*	1.0	0.0	Secure autonomous
Lack of recall			
- *AD*	6.7	1.4	Insecure dismissive
- *CG*	1.6	1.0	Secure autonomous
Valuing independence			
- *AD*	7.3	1.3	Insecure dismissive
- *CG*	1.8	1.4	Secure autonomous
Unresolved trauma			
- *AD*	8.2	1.3	Insecure dismissive
- *CG*	4.0	2.4	Secure autonomous
Attitude toward professional career			
- *AD*	6.8	1.3	Insecure dismissive
- *CG*	3.6	1.3	Secure autonomous

**SD = standard deviation, AD = Atopic dermatitis; CG = control group*

3.2 Results ECR

Of the 284 contacted mothers, 168 mothers returned the questionnaire (response rate 59.0%). Overall, 32 mothers of the 40 mothers having a child diagnosed with AD during the study participation replied (80.0%) and 136 mothers of the 244 mothers having a healthy child replied (56%).
Both groups represented a similar diversity in education and work.

The Kolmogorov-Smirnov test showed that the data presented, i.e., the values for both avoidance and anxiety for group 1, mothers with healthy children and group 2, mothers of children with diagnosed AD, respectively, represented a normal distribution.

The T-test yielded the following results:

(i) Avoidance

No significant difference for the mean value of dismissive/avoidant behaviour was found between mothers of AD children and mothers of healthy children (2.26 ± 1.0 vs. 2.28 ± 0.8, p=.651). The mean scores of the avoidance questions indicated that both groups of participants presented a secure attachment pattern.

(ii) Anxiety

No significant difference was found for the mean value of preoccupied/anxious behaviour between the mothers with AD children and the mother of healthy children (2.53 ± 0.7 vs. 2.68 ± 0.8, p=0.366).
The mean scores of the anxious questions indicated that both groups of participants presented a secure attachment pattern.

Table 7 shows a comparison between the results of the qualitative study within MAPS and the ECR. In the semi-structured interviews, mothers with AD children are classified as "insecure dismissive" with a score for the "Dismissive" category of 6.9 and a score of 3.2 for "coherence of script". The scores of 2.1 for the "dismissive" category and 7.1 for "coherence of script" among mothers with healthy children indicates "secure autonomous". According to the results of the ECR, both the mothers of AD children

and those of healthy children are "securely attached" with a mean score in both groups that is <4.

Table 7 – Comparison of relevant results from "semi-structured interview"-research with results of "Experience in Close Relationship Scale-Questionnaire", showing opposite results in anticipated attachment pattern for mothers of AD diagnosed children: insecure dismissive attachment I qualitative study versus secure attachment in quantitative study

	Mean values score of mothers with AD diagnosed children	Mean values of mothers with non-AD children
Combined "Dismissive" categories in SSI (n=20)	6.9 ±0.6	2.1 ±0.5
"Coherence of script"-category in SSI (n=20)	2.8 ±1.9	7.6 ±1.6
ECR – "Dismissive/Avoidance" (n=168)	2.3 ±1.0	2.3 ±0.8
ECR – "Preoccupied/Anxious"	2.5 ± 0.7	2.7 ± 0.8

Scores from semi-structured interview (SSI) are retrieved from the qualitative research, described previously. Score-scale in SSI 1-9; scores-scale in Experience in Close Relationships-questionnaire (ECR) 1-7. Combined "Dismissive" categories in SSI included 'idealization of parents', 'derogation parents', 'Overall derogation', Lack of recall', Valuing Independence', 'unresolved trauma', and "perception on work'. Secure attachment in SSI is expected to be present with scores for "coherence in script" > 5; "insecure dismissive attachment" is expected to be present with scores for "dismissive categories" > 5. Scores in ECR <4 are anticipated to be "secure attachment", scores > 4 in ECR are anticipated to be "dismissive/avoidance" resp. "preoccupied / anxious"

Table 8 shows the individual results of the AD mothers who participated in both the SSI and the ECR. In the semi-structured interviews, AD2, AD5, AD10 have a low score for "coherence of script" and a (very) high score for "dismissive categories", indicating an "insecure dismissive" form of attachment. In the ECR, the same mothers have a

score (far) below the mean value of mothers with healthy children, which indicates "securely attached". Participant AD7 gave birth to her child at the age of 47 years and did not appear to be "socially desirable" in the semi-structured interviews. This means that she is the only participant for whom both the SSI and ECR indicate "insecure dismissive / avoidant" as an attachment pattern. The individual results of the mothers of healthy children, who participated in both studies, demonstrated secure attachment for each participant in each study.

TABLE 8 - COMPARISON OF RELEVANT SCORES FROM MOTHER WITH AD CHILDREN, PARTICIPATING IN BOTH SSI AND SELF-REPORT ECR, INDICATING THE DIFFERENT OUTCOMES IN ATTACHMENT PATTERN FOR 8 OUT OF 10 PARTICIPANTS BETWEEN THE QUALITATIVE STUDY AND THE ECR.

	Results from SSI		**Results from ECR**	
Part. Nr	Coherence of script (scale: 1-9) **Score >5 support "Insecure dismissive attachment"**	Combined "Dismissive" Categories (scale: 1-9) **Score > 5 indicates "Insecure dismissive attachment"**	"Avoidance" in ECR (scale: 1-7) – **Score > 4 indicates "Insecure dismissive /avoidant attachment"**	"Anxious" in ECR (Scale: 1-7) **Score > 4 Indicates "Insecure preoccupied /anxious attachment"**
AD1	3	6.6	1.78	1.89
AD2	2	7.2	1.94	2.72
AD3	2	6.1	2.28	2.56
AD4	1	6.4	3	2.72
AD5	3	7.6	1.56	2.11
AD6	5	6.6	1.94	2.61
AD7	7	7.6	4.61	2.83
AD8	2	6.1	Not participated	
AD9	2	6.8	3.94	3.11
AD10	1	8.0	1.33	2.56

4. Discussion

4.1 Discussion of methods

4.1.1. Composition and recruitment of interview partners

The mothers surveyed in the semi-structured interviews are those participating in the MAPS study, aged between 24 and 45, with different educational backgrounds and nationalities, as well as private backgrounds. The participants all live in or around Munich, have given birth to one child in the last four years at least, and have given birth in a hospital on the right bank of the Isar (Munich), or in a hospital in Schwabing (Munich).

This is a large variety of criteria regarding the backgrounds of the participants. The participants offer a wide range of insights, experiences and opinions about (i) the experienced bond with the parents, (ii) as well as the pregnancy, birth and postnatal period of their child participating in MAPS, and (iii) their views on work and family life. This allows for a high content validity and a high level of information regarding the research topic (i.e., the mother's bonding behaviour as a possible risk factor for the occurrence of AD in her child) [121].

The number of 20 participants in the study meets the principle of saturation in qualitative research (Saunders et al. 2018). Of course, the results from these interviews cannot be applied to every situation. Therefore, it is important to investigate on a larger scale whether the results are replicable there as well.

The entry criteria for MAPS consisted of (i) having reached the age of 18, (ii) being able to understand the German language to be able to answer the questionnaires and (iii) that the participants voluntarily chose whether or not to participate.
The participants were recruited in the birthing clinics Right Isar and Munich Schwabing, where they had the first opportunity to volunteer for the study. In addition, the interview participants had had at least four examinations in the Dermatological Clinic am Biederstein and had already completed five different questionnaires at the time they were invited to take part in the semi-structured interview. Thus, the participants already had extensive experience with MAPS and knew whether their child had AD or not even before participating in the interview.

The invitation to participate in the semi-structured interview was made by telephone and subsequently confirmed by e-mail. The background of the interview, i.e., to investigate a possible correlation between attachment pattern in the mother and AD in the child, was communicated to the participants. In addition, mothers were asked to plan at least one hour of uninterrupted time to talk to the interviewer.

At the beginning of the interview, the purpose of the interview was again explained. And that, in contrast to clinical studies in the dermatological clinic am Biederstein (Munich), the interview would have an introspective character, with regard to the mother's own experiences of childhood and adolescence, of pregnancy and birth, as well as her professional career. It was noticeable that the mothers of the healthy children could often recall without difficulty both good and more difficult periods in their lives. Some mothers of AD-diagnosed children were clearly more agitated at the beginning of the interview and found it difficult to engage in the form of introspection that the semi-structured interview entailed.

4.1.2. Composition and recruitment of ECR participants

For the ECR questionnaires, we had written to all active MAPS mothers (N=284), of whom 168 responded after an initial and a reminder mailing, thus achieving a response rate of 59%.
In recruiting participants to the MAPS study, the possible high loss-to-follow-up rate known from cohort studies was taken into account (Sindhu et al. 2019). The objective for the recruitment of participants was to have an active group of approximately 300 participants. The number of questionnaires sent out (N=284) is close to that target.

With the final response rate of 59%, we felt that the size of the study population was sufficient to conduct analyses on the data obtained.

It was striking that the response rate of 53% was lower among the 123 participants recruited from November 2020 onwards in comparison to the study population as a whole, where the first participants had been recruited in 2017. This seemed surprising at first, as these mothers had only confirmed their participation a few months before receiving the ECR-mailing. In birth cohorts, it is known that retaining participants in such a study over a longer period of time can often be a problem (Sindhu et al. 2019).

However, this was not the case for the participants who had been recruited just before the pandemic broke out.

The Corona pandemic may have played a significant role here: Between the time they joined the MAPS study and the time they received their questionnaires; these mothers only had one or no contact at all with a doctor at the Dermatologische Kinik am Biederstein. From March 2021 onwards, all elective appointments with patients had to be cancelled, which meant that clinical examinations within the framework of MAPS could no longer take place.

The participating mothers all lived in or directly around Munich, and all spoke and understood German. The mothers were between 18 years old and below menopausal age. The exact ages of the participating mothers were not yet known at the time of the data analysis.

4.1.3. Semi-structured interview and qualitative analysis

Qualitative studies have now become an established part of all medical research (Collingridge and Gantt 2008). This is because qualitative research can provide insights, clarifications and interpretations that quantitative research cannot. Especially for subjects that have been little researched, qualitative research is very useful and the interviewees have the opportunity to express their own opinions, experiences and feelings [102, 122]. And it is precisely this that can help to arrive at a more differentiated picture. A semi-structured interview, as used in the underlying study, helps to describe correlations, interpret them and then understand them. Based on this, broader hypotheses can be generated, which can then be used in larger quantitative studies. In other words, qualitative research is used to gain insight into complex themes, often with a smaller study population. A consequence of this is that the results of the research cannot immediately be used as representative for every situation.

The present research question is, as a result of the above, therefore particularly suited to being investigated with an in-depth qualitative study [123].

4.1.3.1 Quality of the research itself

Despite this increasing popularity, the quality of the research itself should not be lost sight of. Qualitative research also assumes that certain basic rules are met, such as reliability, validity, sampling and generalizability [103, 124].

(i) Reliability

In contrast to quantitative research, the way reliability is established in qualitative research is often different. Collingridge and Gannt describe it as follows in the American Journal of Medical Quality:

> *"Reliability in qualitative research typically refers to adopting research methods that are accepted by the research community as legitimate ways of collecting and analysing data. Specifically, reliable qualitative methods consistently produce rich and meaningful descriptions of phenomena. Thus qualitative researchers who adopt reliable, qualitative methods and conduct their analyses in a competent manner (see validity) are expected to produce results that enrich our understanding of the meanings that people attach to social phenomena [124]".*

(ii) Validity

In qualitative research, validity refers to the selection of an appropriate method to be used for a defined research question. This method is then applied in a coherent, rigorous and justifiable manner. Through a combination of careful use of the established method and attention to detail, it is possible to arrive at legitimate results. Just as in quantitative research, qualitative research also involves construct validity (the accurate description of the construct), content validity (an adequate assessment of the constructs by means of thorough interviews and observations), and criterion validity (obtaining results that correspond to similar phenomena). [124, 125].

(iii) Sampling

In qualitative research, sampling indicates purposing: participants are selected in line with a certain purpose which is clearly in line with the main objective of the study.

(iv) Generalizability

It should be obvious that the ultimate goal of research in a medical context is to be able to apply the results to a larger group of people. Qualitative research, however, cannot achieve this in the same way as quantitative research. Daly et al. indicate that the results of qualitative research, which are based on existing theoretical concepts, which use theory-based sampling procedures, which use clearly defined analysis procedures, which clearly indicate in which way results are transferable, and which integrate results into existing studies in a coherent manner, can be used for generalisation with a greater degree of confidence [126].

4.1.3.2. Semi Structured Interview aligned with the AAI

For this study, the AAI was used, which was supplemented with questions that would lead to more relevance for our participants: questions about personal experiences with the pregnancy, birth and postnatal period of the own child, as well as questions about the importance and role of career for the participant.

Several studies have shown that the predictive validity of the AAI is proven. These studies focused on the parent-child attachment classification and in 70-80% of the cases a correspondence between the attachment pattern of the parent and that of the child was found [127]. Secure autonomous parents appear to have secure autonomous children. Insecure dismissive parents appear to have insecure dismissive children. This fact in itself is relevant to the present study, because we can assume that insecure dismissive mothers also have insecure dismissive children.

Furthermore, studies were carried out that examined the methodological aspect of the AAI [127]. The qualitative semi-structured instrument used in the present study should be regarded as unique in the context of quantitative studies. On the one hand, this type of semi-structured interview is capable of reflecting the nuances that emerge in such an autobiographical conversation. On the other hand, the coding system, as developed by Main et al. and which was also used in the underlying study, is capable of arriving at measurable classifications that can be used even in a quantitative study [87]. The results from the interview can be interpreted and used, as they appear to derive from

a standardised test. This is in contrast to the previously described method of qualitative analysis as used by Mayring [103, 125].

The reliability of the semi-structured AAI was also investigated. This showed that the reliability of the AAI over time was 78%, which is considerably high [127].

The above is a confirmation that the methodology chosen for this study meets the quality requirements for both reliability and validity.

4.1.4. Self-reports and statistical analysis

4.1.4.1. Analysis carried out

The completed questionnaires were entered into Red Caps twice, and possible incorrect data entries were made visible and corrected. This ensured the correctness of the data processing.

Finally, the answers from the questionnaires were transferred into the .
Two groups of participants were formed: group 1 - mothers of healthy children; group 2 - mothers of AD-diagnosed children. In addition, the questions were divided into one group with questions on "avoidant behaviour" and one group with questions on "anxious behaviour": Other data about the mothers, such as age, education level, etc., were not yet included for the analysis of the study data in the present study.

Using The Kolmogorov-Smirnov-Test, the normality of the data was examined and no extraordinary results emerged. This meant that the analysis could proceed further. The following t-test compared the two participant groups for each question cluster. Here too, no statistical inconsistencies emerged. The way in which this statistical analysis was carried out then made it possible to further examine the results in the light of the defined hypothesis.

4.1.4.2. Possible future data analysis

When processing the survey data, this study did not take into account other details of the study participants, such as age, number of children, level of education, etc.

Therefore, it could be argued that possible confounders were not yet made transparent.

The size of the study population, and in particular the group of mothers of AD-diagnosed children at the time of data analysis, was small (N=40, of which 32 had participated in the quantitative study). Moreover, the results of both participant groups did not reveal any extremely large outliers (Avoidance: 2.26 ± 1.0 vs. 2.28 ± 0.8, Anxiety: 2.53 ± 0.7 vs. 2.68 ± 0.8). Therefore, we decided that, at the time of the data analysis, no further data beyond the responses from the ECR would be included in the analysis, potentially leading to even smaller groups and making it potentially more difficult to draw conclusions. With a future, larger study population, it is advisable to include additional data in the analysis, such as for example age, or level of education, living situation, etc. Before doing this, it is advisable to take a closer look at the type of self-report that is used. For this purpose, we refer to the discussion points as described under 5.2.2 in this study.

4.2 Discussion of content

4.2.1 Content of the Qualitative Study

The current qualitative study evaluated if the attachment pattern of the mother may be a risk factor for AD onset in the child. Detailed analysis of semi-structured interviews with the MAPS participants revealed that the mothers with AD diagnosed infant showed a (strong) insecure dismissive attachment pattern, whereas the mother of healthy children, showed secure attachment pattern. Consequently, insecure dismissive attachment pattern reflects an avoidant dismissive attitude towards interpersonal relating [128]. As a result, this form of attachment is associated with insensitive maternal care, and with less attunement to the child‘s needs, leading to deficient maternal stress regulation in the child [129]. However, need expression in children is associated with stressful somatic states, which, when not attuned to, leave the child in a toxic, stressful, unregulated state that he/she cannot handle on its own [109]. This enhances the immunological stress response, that favours the onset for AD [41, 65]. Such a possible association between the attachment pattern of the mother and AD onset in her child, has by our knowledge not been subject of previous research. The study by Harvey et al. found a link between maternal dismissive/avoidant attachment and diurnal cortisol slopes in youth with asthma, like AD an atopic disease

[46]. Conclusively, it suggested itself to research the possible influence of insecure attachment in the mother as a risk factor for the onset of AD in the child. After all, a possible association affects both a possible prediction for the occurrence of AD and prevention against it.

4.2.1.1. Values for secure versus insecure forms of attachment

Leading literature on attachment interviews describe various categories that can be used to recognise whether or not the interviewee has a secure attachment or an insecure attachment [104]. Hess characterizes autonomous secure attachment by a high value (i.e., >5 on a scale from 1-9) in the category that is described as "coherence of script". This means that the interviewee speaks coherently throughout the interview, verbally, non-verbally, as well as by means of quoted examples or explanations. Furthermore, Hess and Main describe that high interview scores (>5 on a scale from 1-9) for the interview categories “idealization parents”, “overall derogation”, “lack of recall”, “valuing independence”, “unresolved loss”, and “unresolved trauma”, are associated with insecure dismissive attachment [86, 104, 105, 130, 131].

4.2.1.2. Key category for secure attachment: Coherence of script

Our study showed that mothers with healthy children scored high in the category "coherence of script", confirming their autonomous secure attachment. The interviews showed that the mothers with healthy children could talk about negative events in the past in a mature way. When asked about difficult situations, they were able to articulate this well and also to describe the emotions that existed at the time. From the way they spoke, it was clear that these mothers had access to the memories, and unpleasant situations had been processed and had not led to unprocessed suffering or psychological trauma.

4.2.1.3. Key categories for insecure dismissive attachment

In contrast, mothers with AD-diagnosed children scored high (>5) for the categories “idealization parents”, “overall derogation”, “lack of recall”, “valuing independence”, “unresolved loss”, and “unresolved trauma”. Thus, these results correspond to the "dismissive / avoidant attachment" category, as mentioned previously by Hess and Main. The category "Job Attitude", which measured the mother's current attitude

towards work, once again supported the category " Valuing Independence" and thus the previously described interview results. As anticipated, this study indicates that AD mothers were classified as having an insecure dismissive/avoidant pattern.

4.2.1.4. Different attachment patterns in the two study groups

One of the postulated research questions concerned the possible difference in attachment pattern, between mothers of healthy children versus mothers with AD-diagnosed children. Within the framework of the present study, this difference was indeed found. However, it is not clear what concrete conclusions can be drawn from this.

In any case, this observation does not have to mean that all mothers with an insecure dismissive attachment pattern (automatically) have children with AD. Insecure dismissive attachment can be regarded more as a favourable risk factor that can lead to the onset of AD in the child.

The complexity of the occurrence of AD was mentioned earlier in this manuscript. An (epi)genetic predisposition does not automatically lead to the onset of AD in the child. For example, the randomised composition of the two groups with MAPS mothers showed that the healthy children had more parents affected by atopic diseases than the children with AD.:

The above information about the genetic predisposition of the study participants underlines the idea that (epi)genetic predisposition does not automatically lead to AD onset. It rather means that in an (epi)genetic AD beneficiary skin, risk factors can lead to the actual onset of AD or can exacerbate it. Insecure dismissive attachment can then be regarded as a possible favourable risk factor.

In addition, the reverse also seems untenable: Children of mothers with a secure attachment pattern cannot develop AD.
The present study makes no statement about other possible favourable factors that can lead to an AD onset. The complexity of AD appears to be a combination of favourable and risk factors!

4.2.1.5. External (environmental) causes of stress

Risk factors for AD, such as stress, are often considered and evaluated from a somatic perspective [64-66]. The identification of insecure dismissive attachment as a possible risk factor leads to an expansion of the perspective of the origin of AD: from mostly neurophysiological causes, to the inclusion of social interaction and interactional sensitivity.

This finding obviously has consequences for the way in which risk factors are determined in the future: it is then (no longer) enough to limit oneself to clinical examinations, such as checking the skin barrier, taking stool samples, investigating the microbiome, etc.

The possible association between the mother's maternal attachment pattern and AD onset in her child, as the present study demonstrates, makes it necessary to take this possible risk factor into account when examining possible risk factors in a small child in clinical practice. This acknowledgement also has an impact on the possible prevention of AD onset in the infant.

4.2.1.6. Prevention

The impact of attachment pattern, particularly dismissive attachment on the course of illness or coping with it, is currently not addressed. Therefore, future research seems necessary to find out if current treatment methods and parent education should take into account this defined potential risk factor for AD onset in children, namely parent-child co-regulation (operationalized as attachment) through the primary, mostly maternal, caregiver. Current prevention programmes as realized by Brisch point in one possible, promising direction [132].

The present study examined the structure of Parent Education, as it takes place in the Dermatologic Clinic Am Biederstein (TU Munich) and meets the quality criteria set by " Centre for Patient Education".

To illustrate, Figure 7 (a) and (b) show what kind of stress is currently being addressed in such a parent education programme where, for example, Mindfulness may be recommended as a possible aid. The stress in the child, which leads to AD onset, such as described in this study, is not currently part of an education programme. Future research is important to determine how this method of prevention can be shaped.

Figure 7a – Increased parental stress, as a result of AD onset in child – currently addressed in AD education & prevention program.

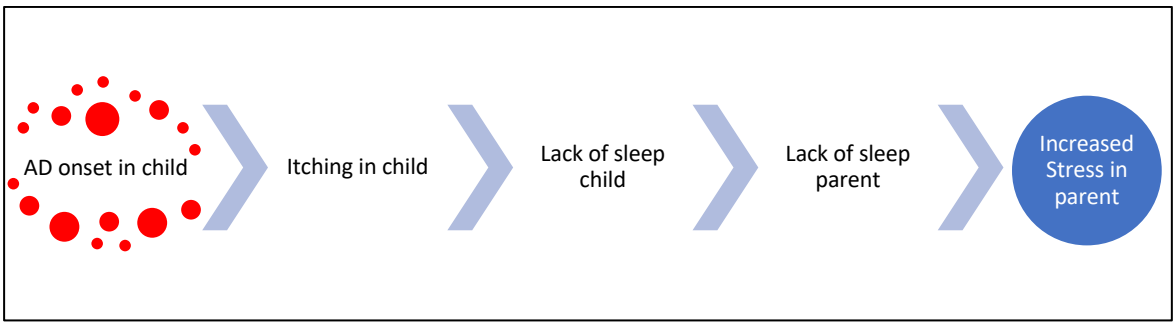
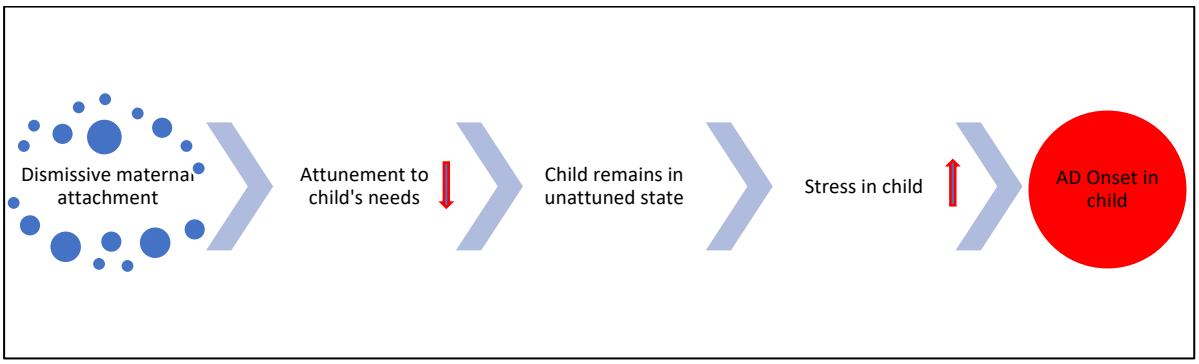


Figure 7b – AD onset in child, due to increased stress in child – currently not addressed in AD education & prevention program.



4.2.1.7. Changeability of attachment patterns

In this prevention-perspective, a closer look at the risk factor attachment itself is needed to determine how static or dynamic attachment patterns are. Above, we referred to the stable nature of attachment patterns, which could imply that the specification of the attachment profile ultimately makes no difference for the treatment of AD given their solid, unchangeable nature [88, 110]. In this context, our study revealed that the AD mothers scored high on unresolved trauma. Unresolved trauma arises from ACEs, which have their origin in: unstable and unsafe environments; separation from a parent; serious illness; intrusive medical procedures; sexual-, physical-, or verbal abuse; domestic violence; or neglect [82, 83, 133, 134]. All the foregoing is not just related to an unsafe environment but also characterized by a lack

of co-regulation in critical life situations. Trauma cannot just be seen as exposure to overwhelming life-events but likewise as a chronical lack of (social) resources, and thus co-regulation through sensitive attachment behaviour by a caregiver, in straining life-situations. Recent research confirms the role of unresolved trauma in the intergenerational transmission of insecure attachment [128, 135, 136]. It needs to be assessed if unchangeability of attachment pattern may be linked to underlying trauma dysregulation in the mother which is conveyed to the infant by the particular care-giving and attachment pattern.

4.2.1.8. Timing of maternal attachment assessment

Given the forgoing perspective, it needs to be determined when the mother's attachment profile should be best assessed and how the result is best communicated to her, without stigmatizing her. Various studies described the psychological strain on primary caretakers caused by AD symptoms in the child [137, 138]. Since our research on association between attachment style of the mother and the AD onset in the child appears to be the first of this kind, it is so far not clear if the mother should be addressed only after the child has been diagnosed with AD.

4.2.1.9. Practical application in clinical context

Finally, a critical concern for all further proceedings is the evaluation method used to identify the attachment pattern in daily clinical practice. Conducting the applied semi-structured interview, and its evaluation is time consuming and requires experience and competence. This does not make its application an easy-to-use facility. Further research for other, simply to apply measurement methods to determine attachment profiles, are needed.

4.2.1.10. Limitations of qualitative study

Although the study presents a data saturation, there may still be open points that have not been considered by the study. Our study had an exploratory character, through which first a comprehensive insight into the attachment patterns of mothers with AD children and mothers with healthy children should be gained. Thus, the sample size was adequate with respect to our study objective [106]. Further quantitative large(er) scale research to confirm the present results appears to be important.

In addition, conducting this interview presupposes sound experience in conducting in-depth-inquiring conversations. The qualification of the interviewer may have influenced the outcome of the interviews. The first author had demonstrable experience in trauma therapy and interviewing techniques. This background increases the likelihood of necessary attunement between interviewer and participants, so that the likelihood to generate substantial and relevant data could be increased.

Any selection bias in this study is generated by the fact only females (pregnant women/mothers) who lived in the greater Munich area were selected for the study. The participants were contacted at random and invited to participate.

However, participants from both groups had very diverse educational backgrounds, consisted of 7 different nationalities, and had diverse social and cultural backgrounds. One mother in the AD group chose ultimately not to participate, despite earlier commitment, two other mothers were unable to participate due to the Covid19-home-situation.

4.2.2. Utilisation of the ECR

4.2.2.1. Aim of utilization of ECR

The aim of the utilization of the ECR was to find an applicable attachment measurement-tool that could reproduce the results of performed time-consuming semi-structured interviews within MAPS among a larger number of study participants [139]. The results indicated that when using the ECR, no differences in attachment pattern between the groups of mothers with healthy children and mothers with children having AD could be found. Instead, the results suggested that both groups scored themselves to be “securely attached”. Thus, the study results were unable to confirm the results of the semi-structured, qualitative interviews, which were also performed within MAPS.

4.2.2.2. (im)Possibility to explore inner experiences

One explanation that suggests itself is that insecurely dismissive/avoidant attached mothers tend to ignore their inner experiences, and thus the painful introspection and insight linked to it. Insecure dismissive adults tend not to want to see the importance of attachment relationships for their own lives ([127]. In addition, they may idealise their parents (or romantic relationships), without being able to substantiate this with

concrete examples. As a result, the ECR is completed by the person in idealizing ways, leading to the self-classification "securely attached". The ECR by itself does not reveal this methodological drawback.
Another reason for these different findings could be that the studies did measure various constructs.

4.2.2.3. Constructs that are being measured

Both the Adult Attachment Interview (AAI), on which the semi-structured interview was based, and the ECR have their origin in Bowlby's attachment theory, observing internal working models and cognitive systems [75, 79, 97, 108, 140]. However, they differ regarding the relationships that are assessed. The semi-structured interviews aligned with the AAI examine adult attachment relationships with their parents [104, 105, 131]. In the ECR, attachment in adult romantic relations is measured, which addresses the experiences in the present and the prediction of features of those romantic relationships [141, 142]. However, some of the components that are being measured, such as the ability to depend on attachment figures, should be related as they both are referring to a person's attachment history [111]. According to Mikulincer and Shaver, further research regarding measuring attachment needs to be performed, because one reason for the existence of self-reports was convenience [143]. In other words, as the two studies investigate different constructs, it is likely that two different mind- and behaviour sets are being explored in these two approaches. Various research was not able to sufficiently answer this question on the interchangeability of the two measurements [141, 144].

4.2.2.4. Impact of absence of the interviewer

Another important explanation for the difference in results between the qualitative and quantitative research tool could be the presence/absence of the interviewer. In the qualitative part of MAPS, the interviewer particularly assessed the way the interviewee answered [104]. Aspects such as "unresolved trauma" and "coherence of script" could therefore be identified. In a self-reported questionnaire, this possibility is not available. Crowell and Treboux described this phenomenon, when they stated that researchers that rely on self-report measures of attachment seem to fail to consider the inaccessibility of certain aspects of attachment patterns to conscious awareness. And

therefore, they believe that self-report methods cannot be used to access each aspect of attachment [145]. Thus, a self-reported questionnaire possibly cannot reflect the way people talk about attachment. In the AAI, this is precisely a crucial aspect on the basis of which someone's attachment pattern is determined. Precisely the impossibility to measure unconscious processes by means of someone's conscious self-report is seen as a problem to use the ECR for measuring the "Current State of Mind in regards to Attachment" [146].

This gap is also identified by a study measuring adult attachment by Jacobvitz et al. [147]. This study specifically looked at comparing outcomes of the qualitative AAI on the one hand and self-reports on the other. Adults who are classified as dismissing in the AAI minimize the importance of negative experiences with their parents. This coping strategy is used to avoid the pain associated with unprocessed trauma. One way of doing this is to idealize one or both parents, or insisting that they have no memories of early childhood events. In AAI this "incoherence of script" (avoidance) becomes clear. In self-reported questionnaire, however, this is not recorded. Therefore, the avoidant behaviour is not registered when filling in the ECR and not recognized by an observing researcher.

4.2.2.5. Setting of the study in the context of MAPS

The communicated context of the study may also play a role in how the questionnaire was completed. In the context of MAPS, the mothers regularly fill in questionnaires, which largely focus on the development of their children, but it is the child who is clinically examined by a dermatologist. In contrast to that, the ECR requires the mother to be introspective. However, participant may not be prepared, willing, or able to fill in such a questionnaire. This may explain why participants had to be encouraged to complete the ECR.

4.2.2.6. Limitations of the study utilizing self-reports

There are some study limitations regarding the ECR. The possible moderating or aggravating influence of the fathers is omitted here. Furthermore, the reliability of the ECR is enhanced if parents answer the questionnaire before knowing their child’s diagnosis and thus are spared possible shame and avoidance issues. When filling in

the questionnaire, the mothers already knew whether their child had AD or not. It is therefore likely that this may have created a certain social desirability bias in the completion of the ECR [148-150].

4.3 Overall conclusion and future recommendations

In conclusion, the current state of mind of the mother in regards to attachment seems to have an impact on the child. In our study the mothers with AD diagnosed children showed an insecure dismissive attachment pattern, whereas mothers with healthy children showed a secure attachment style. Thus, it seems that the understanding about AD risk-factors needs to go beyond the neurophysiological and somatic and include social interaction and sensitivity in a child's environment. This broadening of our scope leads to diversification of treatment methods, including our attention to the quality of attunement and interactional sensitivity by the primary caregiver. The implications of this result consider for further research regarding risk factors for AD onset in children. This study focuses on the attachment pattern of the primary caretaker, namely the mother. Identifying further possible modifying resources to co-regulate the mother-child dyad are still to be investigated.

Furthermore, this study indicated that in contrast to the performed semi-structured interviews, the self-reported questionnaire failed to identify the concomitant attachment pattern. Accordingly, the ECR seemed not to be suitable for every day practice to assess the influence of attachment pattern on the occurrence of AD and thus, more research should be conducted to examine which tools can be used to measure effectively and reliably attachment patterns of individuals in clinical environments.

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6. Table & Figures Index

7. Publications

The contents of the qualitative study were presented to an international audience at a dermatological congress in London. In addition, the contents of the qualitative as well as the quantitative part of this study were described in two papers, which have not been published yet.

7.1. Participation at European Society for Dermatology and Psychiatry – 19th Congress - 2021

On June 11ht 2021 the results of the qualitative Study have been presented at the international Congress of the European Society for Dermatology and Psychiatry in London.

7.2 Congress Paper

The following congress paper has been published in the British Journal for Dermatology), Volume185, Issue3 September 2021 Pages e70-e108, Abstract B09, **https://doi.org/10.1111/bjd.20518**

B07

A qualitative study on maternal attachment behaviour as a risk factor for the onset of atopic dermatitis in the infant

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Atopic dermatitis (AD) is a recurring chronic skin inflammation with rising incidence worldwide. Further research still needs to specify risk factors for AD. Since 2017 a prospective birth cohort study has assessed risk factors in AD development within the first years of life. This includes regular examinations, including cord blood analysis, overall assessment of health status, signs of AD and environmental risk factors, as well as laboratory and microbiome analyses. One segment of this study focuses on the possible correlation between maternal attunement and onset of AD in the child. Stress experiences increase stress hormone levels and can trigger the onset of AD. As infants cannot cope with stressful situations on their own, they need the presence of responsive, attuned caregivers, helping them to regulate. We therefore analysed maternal caregiving behaviour. We conducted 20 semi-structured interviews, with 10 mothers of children diagnosed with AD and 10 mothers of healthy children. Interviews were transcribed verbatim and assessed along 26 different items: we reviewed how mothers perceived (i) the home situation during their childhood; (ii) their work situation; and (iii) the pregnancy and (post-) birth situation. Both (i) *what* mothers said, as well as (ii) *how they said it* was scored on a Likert scale. The mean per item was calculated for each group. Those means per item revealed relevant differences between the two groups. Mothers with children diagnosed with AD scored high(er) on 'unresolved trauma', 'rejecting parents', 'idealization', 'derogation' and 'valuing independence'. They scored low on 'loving parents', 'coherence of script' and 'neglect'. The control group shows the opposite results. 'Atopic predisposition' and '% working' were similar in both groups. With reference to 'nature' vs. 'nurture', we observed comparable parental atopic predispositions, yet substantial differences in the mothers' behavioural patterns. Studies have revealed that dismissively attached parents fail to provide the required care, notably when children are most in need of parental attunement (Schaver MMPR. *Attachment in Adulthood: Structure, Dynamics, and Change*. New York: Guilford Press, 2007). High scores on 'lack of memory', 'unresolved trauma', 'idealization' and 'derogation', and low scores on 'coherence of script' and 'neglect', as shown here with mothers of atopic infants, are associated with insecure dismissive attachment. Unintentionally failing to provide required maternal care leaves the infant in distress. This suggests that maternal attunement is a relevant risk factor in the development of AD. As time-consuming interviews are unfeasible in clinical situations, a practical measurement tool is needed to identify this AD risk factor.

7.3 Presentation Slides

Does maternal attachment behavior influence the onset of AD in her child?

Lea E. Schmidt – Technical University Munich
Department of Dermatology

Conflict of interest

- None

Research on Atopic Dermatitis

- Munich Atopy Prediction Study – MAPS (2017- ongoing)
- Birth cohorte with 257 active participants
- Wide-ranging research on possible risk factors for AD onset in children

How MAPS is carried out

- Regular examinations (2 per year) including
  - overall assessment of health status
  - signs of AD
  - blood, lab and microbiome analyses
  - study questionaires on child development, psychological well being of mother, living conditions

Qualitative research on environmental risk factors

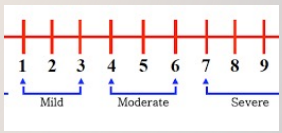
- Questionaires do not reveal differences in psychological well-being between mothers of AD children or healthy children
- Review of possible influence of mothers‘ attachment pattern on AD onset in child
- Deductive research with semi structured interviews

Semi structured interviews

- 20 interviews carried out with 10 mothers of AD diagnosed children and 10 mothers of healthy children
- Verbatim transcription of all interviews

Evaluation of each transcript

- Development of a scoring system
- Scoring of each interview transcript along 29 items
- Items based on
  - The adult attachment interview (Category I-III)
  - Mothers‘ experience on pregnancy, birth and post natal situation (Cat. IV)
  - Attitude towards professional career (Category V)
- Each item was rated on a scale of 1 - 9



Overview of coding (sub)categories

Category	Subcategory	Merged category
(i) Childhood experiences with parents	1. Loving mother	- Loving parents
	2. Loving father	
	3. Rejecting mother	- Rejecting parents
	4. Rejecting father	
	5. Role reversing mother	- Role reversing parents
	6. Role reversing father	
	7. Pressure to achieve mother	- Pressure to achieve parents
	8. Pressure to achieve father	
	9. Neglecting mother	- Neglecting parents
	10. Neglecting father	
(ii) State of mind regarding to parents	11. Idealization mother	- Idealization parents
	12. Idealization father	
	13. Involving anger mother	- Involving anger parents
	14. Involving anger father	
	15. Derogation mother	- Derogation parents
	16. Derogation father	
(iii) Overall state of mind	17. Overall derogation	
	18. Lack of recall	
	19. Passivity	
	20. Valuing Independence	
	21. Fear of loss of child	
	22. Unresolved loss	
	23. Unresolved trauma	
	24. Coherence of script	
(iv) Pregnancy & (post)birth experiences	25. Experience with pregnancy	- Becoming mother
	26. Experience with birth	
	27. Experience with period after birth (< 4 month)	
(v) Attitude towards work / life balance	28. % working (1=0% - 9= 100%)	
	29. Attitude towards work	

Example from category (iii) ‘State of mind relating to parents’ – *Unresolved trauma*

Subcategories	Rating scale	Interview abstracts
Unresolved trauma	1. No accounted trauma experiences 3. Dysregulation experience but person composed and coherent 5. Restless but beginning incoherence 7. Discernable dysregulation 9. Distinct dysregulation and obvious trauma symptoms (reported)	AD4 – P: “(…) I had panic attacks when I was young. That somehow – at 20 or so I felt that. (…) And when I was a baby, I was sick for six months (…) and somehow, I ended up in a children’s hospital twice, (…) there everything was always very harsh, (…) they had wrapped me up the way they used to do it (…) where I was lying in a full nappy, so I was screaming and somehow tied up”. Conversational style: aroused, agitated, emotional AD5 – P: “And then my mum did this Vojta therapy with me. My father thought it was awful, because it is a terrible torture with a child that’s only two or three weeks old. But my mother went through with it until I was a year old or something like that.” Conversational style: detached, distant, unaffected

Colour-coded Results

- The figure presents the mean score for each item in each group

– Green line: mothers of healthy children – Mean Control Group

– Red line: mothers of AD diagnosed children – Mean AD

Results: items that scored highly are:

- ➢Coherence of script
- ➢Idealisation of parents
- ➢Derogation of parents
- ➢Overall derogation
- ➢Lack of recall
- ➢Valuing independence
- ➢Unresolved trauma

} high score indicates *„secure attachment“*

high scores indicate ***„insecure dismissive/avoidant*** *attachment“*

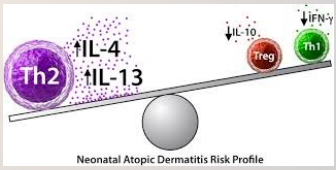
Conclusion

- Mothers with AD diagnosed children showed an insecure dissmissive attachment pattern
- This form of attachment is associated with insensitive maternal care, leading to deficient maternal stress regulation in the child.
- The child remains unregulated in its distress, and has no means to handle this state on its own

→ contributes to AD onset

Consequences for AD research

- Most research on risk factors for AD focus on neurophysiological aspects alone
- The identification of dismissive attachment as a risk factor leads to an expansion in the diagnostic perspective for the AD onset.
- Dependency on co-regulation of caretakers, presumes inclusion of the childs' socio-emotional environment in research focus



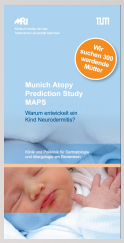
Possible consequences for AD treatment in infants

- Stress reduction in infants is an essential role of primary caretaking.
- Insecure dismissive attachment does not proivde the co-regulating, attuned sensitive child care that reduces stress in the child.
- Association between dismissive attachment and AD onset implies an alterend attachment pattern in the mother

Possible consequences for AD treatment in infants (cont.)

- Current AD treatment consists mainly of basic physiological care, little on the role of the caretaker for stress reduction
- Consequently, for AD treatment it needs to be considered how caregivers can be included in forms of attunement programs **to ensure functional interpersonal co-regulation.**

Limitations of current study



- The small number of participants (n=20) fits the qualitative setting of this study.
- Additional larger scale quantitative research is needed to confirm the findings.
- The type of semi structured interviews requires time and experience.
- Amore accessible method for determining attachment profiles in everyday clinical settings is desirable.

Ultimate conclusion

On behalf of all children:
Thank you for your attention

&

Stay attuned to your loved ones

Virtual

European Society for Dermatology & Psychiatry 19th Congress

ESDaP

BrainSkin

Virtual 19th ESDaP Congress & 2nd Brain:Skin Colloquium

This is to confirm that

Lea E.M. Schmidt

gave the following Oral presentation

A qualitative study on maternal attachment behavior as a risk factor for the onset of AD in the infant

within the **Brain:Skin Colloquium Stream**

of the

Virtual 19th ESDaP Congress & 2nd Brain:Skin Colloquium

held over

11th – 12th June 2021

[redacted]

Prof Anthony Bewley
President – European Society for Dermatology & Psychiatry

[redacted]

Dr Elise Kleyn
Chair & Co-Founder – Brain:Skin Colloquium

8. Attachments

8.1. Ethics Committee vote

Unser Zeichen: **334/16 S**

Technische Universität München

Ethikkommission

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Cc. Herrn Dr. Zink per E-Mail

München, 19.08.2020/SR

Unser Zeichen: **334/16 S** (bitte bei Schriftwechsel angeben)

Nachträgliche Änderungen; Amendment vom 21.07.2020

Studientitel: Munich Atopy Prediction Study (MAPS)
Antragsteller: Prof. Dr. med. Tilo Biedermann

Sehr geehrter Herr Prof. Biedermann,

die Ethikkommission hat Ihren Antrag vom 21.07.2020 auf der Basis der vorgelegten Unterlagen und Informationen geprüft.

Es bestehen keine Bedenken gegen die geplanten Änderungen.

Datenschutzrechtliche Aspekte von Forschungsvorhaben werden durch die Ethikkommission grundsätzlich nur kursorisch geprüft. Dieses Votum / diese Bewertung ersetzt mithin nicht die Konsultation des zuständigen betrieblichen oder behördlichen Datenschutzbeauftragten.

Mit freundlichen Grüßen

[redacted]

Prof. Dr. Georg Schmidt
Vorsitzender der Ethikkommission

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Unser Zeichen: **334/16 S**

Anhang 1
Antrag vom 21.07.2020
Anschreiben Amendment 3 MAPS
2020.07.21_ Amendment 3 Studienprotokoll Geburtskohorte MAPS_mit sichtbaren Aenderungen
2020.07.21_Bindungsfragebogen BoBi final
2020.07.21_Dokumentationsbogen_Atopiekriterien
2020.07.21_Ernährungsfragebogen Final gekürzt
2020.07.21_Leitfaden Qualitative Befragung MAPS

nachgereichte Unterlagen; Eingang 12.08.2020
Begleitschreiben Nachforderungen Amendment Augi 2020 Ethikkommission_MAPS
2020.08.12_ Amendment 3 Studienprotokoll Geburtskohorte MAPS_mit sichtbaren Änderungen
20200810 Probandeninformation MAPS_mit sichtbaren Änderungen
20200810 Probandeninformation MAPS_ohne sichtbaren Änderungen

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8.2. Semi-structured interview

Semi Structured Interview

Introduction to the questionnaire

First, an overview of the questionnaire is given. This is done by explaining how this questionnaire fits within MAPS. Then the interview procedure will be explained to the interviewee.

1. let's start with some short questions about your professional situation. Can you tell me what you do / have done professionally? And if you are currently working, what % of the usual working hours do you currently work?

2. Maybe you can start by giving me a brief overview of your family situation at the time. Just tell me where you were born, where you lived with your parents, whether you moved frequently and what your parents did for a living.

Did you spend much time with your grandparents as a child?

Possibly:

Did your paternal/maternal grandmother/father die before you were born? How old was your mother/father at that time? Did she/he often talk about her/him? Do you have any siblings? Did you grow up with your parents together with your siblings? Did other people besides your siblings and your parents live with you at home?

3. Can you now try to describe to me the relationship you had with your mother and father as a small child? It would be best if you started with the earliest memories.

If the respondent has difficulty answering this question, specific questions should be asked to help:

- What did your mother/father do with you? Did they play with you?

- When was your mother/father at home?

- What did the weekends look like ..., did you do something together?

- Can you remember a particular event with your mother/father?

4 Now try to find five characteristic words that describe the relationship with your mother in your childhood (childhood to adolescence) as accurately as possible. Take your time and think about it for a minute. Afterwards, I will ask you why you have chosen these words in particular.

... Well, let me ask you a few more questions about your description. You have described your relationship with your mother as _____. Are there any particular memories associated with it, is there a particular event that comes to mind? 5.

5. Now let's talk about your father. Now try to choose five characteristic words that reflect your relationship with your father in your childhood? Again, take your time. Afterwards, I will also ask you why you have chosen these adjectives.

Ask as you did for question 3.

6) Did you feel closer to your father or mother? What was the reason for that? (Why did you not have the feelings towards ...?)

If you compare your childhood relationship with your mother on the one hand and your relationship with your father on the other hand, how do you differ? 7.

7. if you did not feel well as a child, what did you do?

(The person should be encouraged to give his/her own interpretation of "not feeling well", only then proceed with further questions).

- When you felt sad or distressed as a child, what did you do? Can you think of a particular event?

- Can you remember what happened when you hurt yourself as a child, when you were injured? Is there a particular situation that comes to mind?

- What was it like when you were sick as a child? Are there any particular memories associated with that? If it is reported that you went to your parents, ask for details that spontaneously come to the patient's mind. Then ask directly whether the person was taken in your arms by your parents and whether you wished for physical contact. If the person only refers to one parent in their answers, the other parent should be asked about. 8.

8 Can you remember the first time you were separated from your parents as a child? How did this separation occur? How old were you at that time?

How did you experience this separation?

How did your parents react to this separation?

Can you remember any other separation experiences?

9. did you ever feel rejected as a small child?

Here it is important that you felt this rejection as a child, even if you would perhaps judge this quite differently today as an adult.

(Possibly give your own example or an example that has already been given, but leave enough time for your own interpretation).

How old were you when you first felt this way?

How did you react to it?

Why do you think your parents behaved like this? Do you think your parents were aware of this rejecting attitude?

10. have you ever felt threatened by your parents, perhaps when your parents threatened you with something for fun or for disciplinary reasons?

Some people we interviewed told us that you were threatened to be abandoned by your parents or sent away from home. Have you ever experienced your parents threatening to leave you or send you away?

- Some people have told us that they have been mistreated or abused. Have you also experienced something similar? Was there anything like this in your family?

- How old were you at the time? Did it happen more often?

- Do you feel that this experience(s) still affects you today as an adult?

Do you think it has had an impact on you as a person?

Has it affected the way you relate to your own children?

(If the person answers in the negative, you can ask whether and how the parents punished the child).

11. in what way do you think the experiences with your parents have influenced your personality as an adult?

Are there any particular events (aspects) that you think have hindered your development?

12. do you have an explanation for why your parents behaved the way they did towards you as a child? (in general)

- Besides your parents, were there other adults who were very close to you, who were particularly important to you?

- Was the ... a kind of parental figure?

(Did you have a parental-like relationship towards them?) (importance/type of relationship)

13. as a young child, did you experience the death of any close family member? Have you experienced the loss of children, including stillbirths, miscarriages, early pregnancy terminations, pregnancy interruptions?

- Could you describe the circumstances in more detail?

How old were you at the time?

How did you react to the death at that time?

- Were you prepared for the death or did it come as a surprise?

Can you remember how you felt at the time?

- Have your feelings about this loss changed over time?

Were you allowed to attend the funeral and what was its significance for you?

(If parents/siblings died)

- What impact did the death of your mother/father/brother/sister have on other family members and on their living together (on the other parent, household, living arrangements)?

- Has this situation changed over the years?

- Do you think this loss has affected your personality?

- Has your relationship with your children been affected?

a) Did you lose another important person in your childhood? - same questions as above

b) Were there any close people you lost as an adult?

- same questions as above

14) Have there been many changes in your relationship with your parents since childhood? That is, throughout childhood up to the present day?

(Puberty/rebellion; reconciliations)

15. how is the relationship, your relationship with your parents today?

- (How much contact; cause of satisfaction/dissatisfaction.)

16. with what feelings do you now react to separations from your child?

Do you ever worry about your child?

17. if you had three wishes for your son/daughter when he/she was about 20 years old, what would they be? One of the things I think about is what kind of future you want for your child. Take a minute to think about it. 18.

18. is there anything in particular that you think you have learned from your childhood experiences?

What do you hope your son/daughter will one day learn from his/her experiences with his/her parents?

19 Can you tell me more about how the pregnancy went for you? The following questions will be used as a guide:

- How did you feel physically?

- How did you experience the support within your relationship? Which people were particularly important to you?

- Were there moments when you did not feel supported, even though practical support may have been needed?

- What moments of tension were there during the pregnancy?

- What in particular worried you?

20 Let's now move on to talk about the birth of your child. How did the birth go? How did you feel supported throughout the birth process? How much stress did you feel? How was your relationship with your partner during the birth? Were there any particular moments of stress?

21 Can you tell me what the first months of your child's life were like?

The following questions are used as a guide:

- How did you feel supported at home?

- How well were you able to recover from the birth/possible lack of sleep?

- Which people did you need the most? Was the necessary practical as well as emotional support available to you? What else did you need?

- How did you experience the connection with your child? How were you able to build a relationship?

- What were some stressful moments for you during the first months of your child's life? How much do you think this affected your relationship with your child?

8.3. Scoring scales

Scoring Scales for Interviews

1. Attitude towards combining work and care for small(er) children

1.	The subject finds the care for the child more important than a job. She will not work as long as her child is small and finds it more important to be at home and be present for the child. She will rely on the partner for financial support and is completely at ease in her role as full time dedicated mother. She gladly takes up her responsibilities of motherhood to nurture and care for her child
2.	
3.	The subject works as little as possible. The reduced working to the minimum acceptable level, in order to keep the job security and financial support, that she needs. She will pick up working when her child is in kindergarten, or before when really (financially needed)
4.	
5.	The subject is comfortable to attune to both work and child. She divides the time over work and child and does wish to combine the responsibilities of being a mother equally with the job-responsibilities, For her own well-being, she needs to divide her time equally over her partner, child as well as job and other private activities. Subject also finds it important to make sure that she maintains some level of financial independency.
6.	
7.	The participating mother has started to work again as soon as possible. She indicates that her job is important to her, as well as her independency and own development as a person, rather than being “downgraded” to a mother. A (7) is scored, when the participant is still indicating that the child may need one of the parents, and that her role as a mother may be important to the child, but that she can just not do it differently in order not to feel depressed or devaluated.
8.	
9.	The participant cannot put down the job. The most important is her own independency, before anything else. She does not stay at home longer then needed, and makes sure that other people are there to take care of the child, regardless the age /possible needs of the child. The participating mother values her own needs to stay independent or to develop her working position more important that possible needs of the infant. The participating mother measures her self-esteem solely to her (success in her) job and devaluates the typical mother-roles and responsibilities. She indicates that she is not made to be a “typical” mother and / or values that the child’s father or any other care taker, can take as well care of the infant, as herself.

2. How much do I work?

1.	I do not work
2.	
3.	I work 30 %
4.	
5.	I work 50 %
6.	
7.	I work 65%
8.	
9.	I work full time

<u>Questions to Pregnancy, Birth and the period after birth</u>

Attachment theory predicts, that the internal working models of caregivers are generalized to other people in their social environment. Furthermore, attachment styles seem to relatively enduring throughout the course of life, even though there may be alterations over time by new input.

3. Pregnancy – How does participant evaluate her pregnancy from a subjective felt point of view

1.	*No complications* The mother indicates that the pregnancy was a period she rejoiced. The thought of becoming a mother did fill her with joy and she did never feel any anxiety for becoming a mother, nor did she fear for the health of her child or herself. She did not have physical problems during the pregnancy that made it less agreeable to be pregnant.
2.	
3.	*Some sort of worries* The subject had some physiological problems during the pregnancy, but they were all bearable. She had some questions about birth, and the time after, but they either did not stay long, or she got support to deal with the questions and emotions to her satisfaction
4.	
5.	*Moderate anxiety about the pregnancy and* The subject was worrying about her health, and the health of the baby at more instances. She did worry about the birth process and was distressed about her future role as a mother. She did have some depressive moments, yet could also at moments enjoy the pregnancy. She was insecure about how she would recover afterwards.

6.	
7.	The participating mother could not really rejoice the pregnancy. She was severely suffering from pregnancy- sicknesses and negative thoughts over motherhood and / or the health of the baby or herself. She could not attune to the baby, growing in her.
8.	
9.	The subject was very afraid because of previous experiences of miscarriage. And did not dare to connect to the child growing in her. The participating mother had due to medical indications, to lay down most of the pregnancy and was afraid that the baby would not be healthy or would not be born alive or would have massive health problems. OR the subject suffered from depression and the entire pregnancy felt as a burden, all happening to her. She felt very alone and insecure during her pregnancy and did not want to see herself as a mother to be.

4. Birth – how does the participant evaluate the birth of her child from a subjective felt point of view, the perception about the birth process

1.	The birth of my child all went fine. I had no fear, nor was I facing difficulties during birth
2.	
3.	I had quit some pain during birth but it all went fast enough I did have little fear in the beginning, yet it did not overwhelm me, I could bare the pain and did manage to overcome it
4.	
5.	I had hoped for a better birth process It took very long and it was all very painful I felt quite lost and was worried that I could not manage to give birth
6.	
7.	I was having a lot of pain, I could not manage without additional medication This was a terrible process; it was an extreme difficult birth
8.	
9.	The birth did not go at all as planned, The doctors had to have an emergency c-section and I thought the baby and I were not going to make it It was extremely difficult birth, very painful and I believe that normally it does not go as bad as I had to experience It was very risky and the baby almost did not make it

5. The first 3 months after birth – how does the participant evaluate the first 3 months after birth of her child, from a subjective felt point of view

1.	I felt at ease with the situation We could enjoy the time as a family and get used to the little child Everything was all fine
2.	
3.	The little lack of sleep was bearable.
4.	
5.	The first month were pretty stressful. It was more complicated than expected I was often alone with everything and had to face most of the worries and difficulties alone
6.	
7.	The first month were very difficult for me I suffered from depression most of the time I was alone and there was little support for me I could difficultly enjoy my child due to all the difficult circumstances
8.	
9.	The first three months were extremely difficult I faced extreme difficulties with the child and therefore could not enjoy one single moment I could not connect to my child at all I was depressed all the time There was no support at all and with all the difficulties I felt again left alone in everything I had to be extremely strong to face the reality with my child, there was no time to think, reflect or enjoy

AAI Scales related to parents

Subjective experiences related to parents

6. Loving

1.	*Very lacking in love* Actively rejected love towards the subject There was no affection There was a lot of anger towards the subject The mother / father was cold, uninvolved There was physical or emotional abuse towards the subject
2.	
3.	*Lacking in warmth* There was inconsistency in the support towards the subject Support was mildly but inadequate Mother / father were mostly indifferent towards the subject Some sort of disrespect and a general lack of support
4.	
5.	*Neither loving nor actively loving* Participant may say that parents were "good" or "loving" towards him/her, but details to confirm or challenge this perception are missing from the transcript If more detail is given, parents do come across as ones who usually provide adequate emotional support to the subject. They are not particularly well attuned to the needs of the subject, but they have tried to be helpful in most issues. This rating should be assigned as an average if in the past the caregiver(s) has acted in clearly unloving ways, but has made up for these negative periods by believable affectionate acts of dedication to the subject.
6.	
7.	*Loving* Though there may have been problems, the caregiver was accepting and loving towards the subject. There is a definite sense of trustworthiness and supportiveness. When consistently speaking about warmly and loving relationship between caregiver and subject, but subject provides few specific details to substantiate this, a rating of (7) is inappropriate.
8.	
9.	*Very loving* The caregiver(s) was actively loving and affectionate towards the subject, and clearly enjoyed her/his company. There is anecdotal evidence that the subject was supported by the parent(s). The parent(s) has provided companionship and comfort to the subject.

	The relationship does not need to be perfect in any way to get this rating, but there is strong evidence that the parent loves, respects and supports the subject.

7. Rejection

1.	*Not at all rejecting of attachment* The parent/caretaker does not turn away bids for closeness. It may be that the parent is extremely loving. It may be that the parent seeks more intimacy. There is not attempt to actively push away the child.
2.	
3.	*Mild rejection of attachment*. There is either a slight sense of rejection that characterizes the caretake-child-relationship in general, or there may have been a short period of rejection which has since been convincingly resolved. The parent occasionally fails to meet the child attachment needs, but of most the time deals with them willingly, so that the reader has the sense that this parent is probably acting out of an occasional lack of awareness or consideration than out of any desire to have the child to be more independent.
4.	
5.	*Moderate rejection of attachment* The parent is not particularly affectionate or supportive of the child when he/she seeks closeness or help. The parent seems to want the child to be more independent, though this is not explicit. If attachments bids are initiated by the child, they are met only minimally. This rating may also be assigned as an average if the caretaker is rejecting in some areas or at some times, pushing the other towards greater independence, or being unavailable in certain situations, but not rejecting in other areas or at other times. It is possible for a parent who is responsive in emergencies, or who gives instrumental help such as getting cold remedies when the child is ill, to be scored as high as (56-6) on this scale. NOTE: A person who scores high on this level, cannot score above mid-range on the loving scale.
6.	
7.	*Rejection of attachment* This rating is given to a parent, who rejects attachment behaviours in a manner which cannot be ignored, with no reports of counterbalancing attempts to bring the other person closer. Although not the only way a parent may be scores as rejecting at this level, the parent may manifest rejection by insisting upon being independent and may refuse requests by the child to spend more time together or that the parent be more supportive. Or the parent may have criticized the child for being too dependent, though the reader does not get the impression that the child has asked for anything more than expectable levels of support or affection.

	This rating differs from a (9) rating in that this parent seems primarily intent on assuring his or her independence rather than rejecting the child.
8.	
9.	*Extreme rejection of attachment* The parent is so consistently rejecting of attachment that the reader feels that he or she is becoming cruel to the child. There may have been derogation of the child's attachment-seeking behaviours, or reports of disapproving statements that the child is too "clingy" or "babyish", The parent appears to dislike the child (Again, it is important to remember that not all cruel behaviour has the goal of decreasing attachment behaviour, and if the behaviour does not appear to have that as its purpose, it should not be scored here)

8. **Role-reversing**

1.	*No inversing behaviour* No inversing behaviour is described in the coder's opinion
2.	
3.	*Mild reversing behaviour*. The subject has some concerns reg. time spent with the parent, but these appear to be realistic. The parent emphasizes a need for closeness, and some mild anxiety when the child is upset. A parent who desires more communication with the subject is scored here. Teasing effort at making the child jealous are scored at (4)
4.	
5.	*Moderate reversing behaviour* Low level fear or guilt induction is used in an attempt to influence the child, including strong expression of helplessness, and desire for other relationships and activities to be curtailed. The parent may push the child away at times, then use a "hook" to pull him/her in, or vice versa, seeks help strongly then is dissatisfied. The parent's distress or illness is a cause for moderate anxiety and overreaction, but overall, the child is concerned for the parent, as much as for him/herself. Threats to abandon the child during arguments may be scored here if they appear to have the function of getting the child more in a reversed role. NOTE: a person who scores at this level, cannot score above the mid-range on the loving scale.
6.	
7.	*Reversing behaviour* The parent is very involved in the child's relationships with friends or other family members, activities etc., as if the parent feels he/she must have close contact for the well-being of the self and the parent-child relationship. The parent tries to get the other to increase closeness. The parent may be described as checking up on the child or repeatedly bringing up ways in which they feel the child should have acted or using strong guilt induction. The child is highly anxious about any distress or problems of the parent, and he/she can be of little help / support. The parent is difficult to soothe, the balance of the parent's concern has shifted to his/her own feelings and needs, with little concern for the child actual interest or well-being

8.	
9.	*Very reversing behaviour* The parent is manipulative I attempts to ensure closeness and involvement. Even short separations are distressing for the parent. The parent is extremely demanding of the child's attention and assurance. The efforts of the child to respond are rarely, if ever, satisfactory to the parent. The subject is highly anxious about any distress or problems with its parent, and the subject / child can't seek help from them because of this. The parent is very difficult to soothe.

9. Pressure to achieve

1.	Does not show any pressure to achieve
2.	
3.	Infrequent pressure to achieve
4.	
5.	Moderate pressure to achieve
6.	
7.	Pressure to achieve
8.	
9.	Excessive pressure to achieve

10. Neglecting

1.	*Does not provide caregiving – very neglecting behaviour* The parent appears to be unable to adopt the role of helper or caregiver. He / She may be unwilling to take care the child, being unresponsive or rejecting, or is extremely anxious or childlike and therefore is unable to comfort or nurture the child when it is called for. Other parents appear to be unaware of the caregiving role, and view staying away from the child as desirable and kind
2.	
3.	*Infrequent or inadequate caregiving – neglecting behaviour* This parent rarely assumes the role of helper or comforter, (though he/she may occasionally do so when there is a crisis, such as serious illness). This may be because the caretaker misses signal from his/her child that caregiving would be welcomed / is needed. In other cases, the needs of the child may be seen as undesirable; the parent responds with reluctance or resentment when it occurs, but does deal with it. Parents who provide care when they view the stressor as important, but ignore or reject the child when they feel the child's distress is due to something trivial, receive this score. A parent who becomes very distressed by the partner's problems and has trouble being responsive receives this score. If the child

	is very difficult to soothe, the caregiver should be scored here, if he/ she expresses frustration, and that he/she (caregiver) has given up. Others who earn this rating are described by the subject, as a friend who enjoys good times together, but with no element of caretaking.
4.	
5.	*Moderate able to provide caregiving – moderately neglecting behaviour* The child provides at least one specific description of an attempt of the parent to be nurturing, usually in response to a crisis. Though this may result in excellent caretaking during the crisis, the parent is only moderately caring and reassuring on a day-to-day basis with fairly routine matters. (When I was upset, she would be like "just calm down don't worry about it") this caregiving behaviour may take the form of advice to the individual, e.g., "you should just do …" or "why don't you just ..", which is action oriented and aims to fix the problem. The parent who responds with instrumental assistance only may be scored here (e.g., getting cold tablets at the pharmacy). A parent who is very distressed by the child's problems, but can provide some help and support, should be here and not higher. A rating of (5) should be given when the subject uses general terms ("she would take care of me") ,which seems credible but are not substantiated with detail even after prompting, ("when I was sick, she was great, she did everything for me, you know). A rating of (5) may also be appropriate when the parent does not act as a caregiver, but the reader feels this is mostly due to the child's disinclination to adopt the complementary care seeking role, rather than any inability to be caring if called upon. The child may also be very difficult to soothe, and the parent should be scored here if they express frustration, but keep trying in instrumental ways to help.
6.	
7.	*Skilled at serving in caregiver role – absence of neglect* The parent is clearly comfortable taking care of the child. He or she appears sensitive and responsive to the child's needs and emotional state. For this rating to be given, the subject must at least provide one clear example of the parent appropriately taking on the role of caregiver with respect to a relatively routine source of distress. However, if contradictory episodes are also related, the rating must be lower. If the subject as a child was very difficult to soothe, and the parent should be scored here, it would be when expressing frustration, but being aware of the child's difficulty and being flexible in their responses.
8.	
9.	*Consistently serves as a secure base/ safe haven – total absence of any form of neglect* This rating is given when the parent provides more than one specific example of care and support, stated in the narrative, so that the reader is convinced that this parent is adept at comforting reassuring, and encouraging his / her child in routine matters as well as during crisis, regardless of the care seeking and care accepting characteristics of the child.

States of Mind related to parents

11. Idealizing

1.	*No idealization* The description of the parent, self or relationship supported by convincing and consistent evidence. The subject who receives this score in relation to the parent at stake, may describe a satisfying relationship, but can support it or is open about the quirks or ups and downs of the relationship, and presents these matter-of-factly without needing to deny them as slight problems
2.	
3.	*Slight idealization* There is a minor discrepancy between the positive image of the parent, or relationship to the parent and specific examples or anecdotes, but this is within normal range for child – parent relationship who have a "Loving-relationship". Some participants begin the interview with a favourable generalized picture of the parent, and later, as they begin to be more comfortable with the interviewer, admit to some small problems. There is a sentimental or normalized appraisal with no fear confirming anecdotes but no contradictory evidence either.
4.	
5.	*Moderate idealization* The participant supplies vague generalities; a superficial, image-oriented depiction; or clear discrepancies between the adjectives that are chosen and the examples intended to illustrate them The reader notes a difference between the generalized image of the parent, the self, or the relationship with the parent as normal and memories, descriptions, or anecdotes that show it is as less as optimal.; or between the ideal of an excellent relationship (including his or her role in it!) and examples that show the parent or the participant to be only average in supportiveness. However, the idealization is incomplete and the participant is aware of some difficulties
6.	
7.	*Considerable idealization* The reader's impression of the participant's relationship with his or her parent is strikingly different from the description provided. Though the parent/self/relationship is presented as good/normal, the transcript fails to confirm this. This participant provides extremely positive descriptions of the parent ("she is great.. she is just always there for me), self, or of the relationship ("it's terrific, it is very honest and we are very open to each other about everything"). But the lack of memories or examples to support this image, even when prompted by the interviewer, makes the reader suspect that the speaker is not giving the full picture. Or the participant says his /her parent is "just like all fathers", where the behavioural descriptions of the parent not only fail to support this normalizing description, but instead he sounds quit rejecting or notably insensitive. Or the participant may say his parent "is just like all mothers", and convincing accounts of loving behaviour are normalized or viewed as standard or typical behaviour.

	The participant differs from a rating in (9), in that he or she has not completely spilt the generalized from the episodic representation of the parent, so does have some access to apparently "real" memories or impressions of the parent and him/herself.
8.	
9.	Extreme idealization There is a sharp and unsettling disunity between the reader's assessment of the parent, and the participants description on the generalized level. The participant depicts a relationship which he or she describes as wonderful, but seems to the reader to be very unsatisfactory. This participant presents the parent in a consistently positive light, with no access to negative feelings. If negative information or conflicts are presented, they are passed off as being the fault of the participant ("sometimes I used to wish we could spend more time together, but she was right as usual, I have to learn to be less clingy to my mother") or of other people or situations. In the readers estimation, this parent scores as not loving or even abusive, yet the participant consistently presents the relationship a wonderful or even perfect. Throughout the interview, the reader has the impression that this participant is hiding something, not from the interviewer, but from him- or herself Or the participant gives convincing accounts of truly loving behaviour by (one of) the parent which considered normalized in the relationship is minimized or idealized.

12. Involving anger

Angry speech occurs when the participant engages in any of the following behaviours:

(a) Gets caught up in run-on, entangled sentences describing the offenses of another
(b) Reports surprisingly small affronts, or gets markedly upset over what seem to be minor provocations
(c) Tends to blame the other entirely for any conflicts of disagreements, instead of seeing his or her own role in the interaction of acknowledging the difficulty inherent in working out any relationship (parent-child)
(d) Directly addresses the absent individual during the interview
(e) Speaks as if he or she were other person during a report of a negative interaction, i.e., fails to mar quotations by stating "she said…", or "my father said…"
(f) Attempts to elicit the interviewer agreement ("Can you believe anyone could be so thoughtless?!", or frequent use of "you know", in the passage when discussing a problem.

1.	No current anger expressed
2.	
3.	*Mild anger* This person expresses some annoyance by some exaggeration of speech, attempt to elicit interviewer agreement, failing to use a quotation (e), but the annoyance is over with quickly and does not recur with any real frequency.

4.	
5.	*Moderate anger* Here, the participant expresses more than simple annoyance (there is a clear instance of one or more of the types of angry speech noted above), but the anger is under control (contained or else lightened with humour). The anger Is not a recurring theme of the interview, A single clear outburst, of frequent lower-level annoyance about the same person warrants this score.
6.	
7.	*Strong anger* One or more clear markers of high current anger listed in (a) through (f) above appear two or more times in the transcript, but anger is not the sole emotion expressed about the individual.
8.	
9.	*Extremely strong, current anger* The participant is clearly preoccupied by his/her anger towards the parent or another. This anger pervades the interview, appearing sometimes at unexpected junctures; negative effect is nearly always present when the parent or another is discussed. Several of the markers of current anger listed in (a) through (f) above appear in the interview

13. Derogation parents

1.	*No derogation of parent* The participant at no time puts down the parent
2.	
3.	*Mild derogation of parent* At least once the participant may be mildly sarcastic about the partner or attachment behaviour. However, there is an underlying valuing of the relationship which also comes through and makes the statements sound somewhat more good-humoured then negative.
4.	
5.	*Moderate derogation of parent* One or two sarcastic or disparaging comments are made about the parent or groups to which he/she belongs without excluding the parent. These are presented in a cold dismissing rather than angry way. The person uses words like “silly”, “foolish”, “ridiculous”, “stupid”, or “disgusting”. This rating is also given if instead of derogating the parent, the participant puts down important aspects of relationships, including with friends, partners, and family, as being unworthy of serious attention. This rating rather than a higher one is given if there are also some positive statements about attachment to counter the derogatory ones
6.	

7.	*Definite derogation of parent* The parent is described in a demanding manner, with little positive affect to balance out the portrayal. The rating of (7) is also appropriate for the participant who explicitly states that it is ridiculous or foolish to become emotionally caught up in a relationship whether happily or in distress
8.	
9.	*Strong derogation of parent* The disparaging depiction of the parent is virtually a theme of the interview. The scorer feels distinctly uncomfortable with the speaker's tone. The participant suggests that the parent in general is beneath contempt and not worth notice. For this rating, no positive feelings toward the attachment relationship with the parent are mentioned, and it seems a mystery why they still have close contact.

All overall states of mind Categories

14. Overall derogation of attachment-related experiences and / or relationships

This scale deals with the cool, contemptuous dismissal of attachment relationships or experiences and their import, giving the impression that attention to attachment-related experiences (e.g., a friend's loss of a parent) or relationships (those with close family members) is foolish, laughable, or not worth the time.

1.	No derogation of attachment
2.	
3.	Mild derogation of attachment.
4.	
5.	Moderate derogation of attachment
6.	Gallow humour ("O hell I didn't mind another separation. I guess that one was # 13"
7.	Definite derogation of attachment
8.	
9.	Strong derogation of attachment The speaker makes no effort to soften or disguise his or her dislike of the individual or of the topic, so that – in keeping with the apparent intent of casting the individual (or topic) aside ("My mother? A nobody. No relationship. Next Question?!") – the participant uses often very brief sentences, and the topic is often quickly finished. Participants receiving this score are assigned to Ds2, the subcategory in which attachment figures are not so much idealized, but more derogated

15. Lack of memory / recall

1.	Clear recall Participant may start answer with a reference to lack of memory, but the actively and successfully appear to recapture access to the experience they have asked to describe
2.	
3.	Definite recall of memory
4.	
5.	Moderate recall of examples referring to statements made about relationship with parent
6.	
7.	Definite memory of examples referring to statements made about relationship with parent
8.	
9.	Insistence on lack of memory for childhood This scale is chosen when the participant insists on the inability to recall his or her childhood, especially as the reader evaluates that this insistence is used to block further queries or discourse. The first response to numerous questions in the interview queries is "I don't remember", especially when this reply is repeated or remains firmly unelaborated.

16. Passivity

1.	*No evidence for passivity of thinking / discourse* This rate is given when there are no indications of being lost in an attempt to think, even though there may be some use of meaningless phrases such as "or something" or a few training sentences when the person runs out of things to say. However, these are not considered true passive speech if the participant has first made the thought clear.
2.	
3.	*Slight passivity of thinking / discourse* One or two examples of clearly passive thought or somewhat more frequent slight passivity may be present (but this is never fully passive)
4.	
5.	*Moderate passivity of thinking/discourse* Marked passivity of thought regarding attachment to the parent may be present, but only in regard to a particular topic ;or some passivity is evident throughout the interview.
6.	
7.	*Marked passivity of thinking /discourse*

	Several of the indices of passivity listed above are present throughout the interview, or extreme passivity is seen for a lengthy passage and there is lower-level passivity elsewhere. However, compared to the transcript rated (9) this participant is not very difficult to follow
8.	
9.	*Fully passive thinking /discourse* Indices of passivity are marked and frequent, and parts of the interview consequently are difficult to follow, The reader will be unable to clearly ascertain the participant's meaning in several passages

17. Valuing Independence

The following may characterize a highly dependent participant:

a. The reader gets the feeling that this person's whole life revolves around the parent. They are with each other almost constantly, or, if the caregiver is not as involved, the dependent participant remains available, hoping that the caregiver will decide to be around.
b. The participant may seem immature or incompetent, requiring more help with ordinary activities than is usual for his / her age. OR He or she appears to have a weakly developed personality. The reader gets little sense of the person having any particular convictions or opinions of his/her own.
c. The partner/participant is willing to give in to the parent disproportionately. Dependent individuals appear to want the other to determine the course of their lives.
d. Dependent individuals readily give up other relationships with friends and sometimes even other family members (as well as activities and interests which they had previously enjoyed) if the caretaker shows no interest in joining in.
e. The participant may try excessively to please his or her caretaker and be over-reliant on the caretaker's approval, to the point of completely changing aspects of the personality if he or she perceives that as what the caretaker wants.

1.	*Not at all dependent* This person is self-reliant and self-directed, whether within normal limits or extreme in these characteristics.
2.	
3.	*Mostly non dependent* The person is generally self-reliant, with strong convictions and interests of his/her own, but occasionally expresses dependency or need for the parent, for example, there is some difficulty with separation or emphasis on the need for joint decision making.
4.	
5.	*Somewhat dependent* This person has some independent identity and separate life in some areas. However, one or more of the characteristics listed above appear, but in a mild

	form, such as an emphasis on activities with the parent, or efforts to get more help or advice from the caretaker than really necessary. The relationship with the parent is one of interdependence, rather than imbalance.
6.	
7.	*Dependent* Here the balance has tipped to one in which the person is rarely independent. Several of the characteristics listed on the previous page are present. The person's life largely revolves around the caretaker, who may be presented as the dominant force. Being in relationship with the caretaker is a major theme of the interview.
8.	
9.	*Extremely dependent* Most of the characteristics listed above are present. Either the person sounds unable to function without direction from the caretaker, or he/she is strikingly needful of the caretaker's constant involvement and presence in areas which extend beyond the domain of attachment. He/she seems to have willingly handed over control of his or her own life in order to avoid the possibility of losing the caretaking individual.

18. Fear of loss of one's child

1.	*No fear of loss reported*
2.	
3.	*Fear of loss connected to source* The participant explicitly and convincingly connects anxiety about the health of the child, or loss of the child to its source.
4.	
5.	*Somewhat fearful of loss* This participant expresses some anxiety about the child's health or losing the child, and the reader cannot be certain that the speaker is aware of how his / her past experiences have led to these fears Alternatively, this rating is given if it is clear that the participant does not connect the strong dears to their course, but he or she realizes that they should not be acted upon and is definitely not allowing them to affect behaviour.
6.	
7.	*Mild effects on behaviour* The participant expresses strong fears or worries about the child's health and safety, does not identify the source of the fears, and has acted upon them at times.

8.	
9.	*Strong effects on behaviour* The source of this person's fear of losing the child through death is unidentified, and he or she has acted upon that fear frequently.

19. Unresolved loss

1.	*No losses experienced* Either the participant has had no previous traumatic situations or experienced losses, or the participant is so convincing about the any losses or traumatic events being so casual that there was no sense of loss when it occurred.
2.	
3.	*No disorganizing effects of loss.* The person may express mild sorrow or regret about experiences losses in relationship / traumatic events, but nothing further. The participant may see good effects of the loss on the present relationship with own child, friends, close family members (e.g., knowing better now what is important in a relationship with the own child etc. or realizing that one must work at maintaining a good relationship, even if it involves the own child.)
4.	
5.	*Unsettled, but not cognitively disorganized* There is some lack of acceptance of the loss, and there may be some disorganized/disoriented language. The participant may bring up the topic of past experiences made with parents or others caretakers in the childhood, but not particularly jarring points. There are mild effects upon the present relationship with the own child (or partner), but these appear manageable and not overly detrimental to the relationship with the own child.
6.	
7.	*Some negative effects of loss or trauma upon the relationship with the own child* The previous loss is clearly affecting the present relationship with the child, though not to the extent of seriously jeopardizing its safe continuation. The participant reports continued anger, mourning, fear, shame or guilt that may have led to tensed situations with the own child (e.g., projection, re-enacting of the event of loss in the here and now), that cannot respond / does not understand the actions of the parent / cannot comprehend to what extend it is (not) responsible for the possible emotional reaction of the parent .
8.	
9.	Severe effects of loss on present relationship with own child

	The participant's confidence in

20. Unresolved Trauma

1.	No traumatic events experienced during childhood
2.	
3.	No disorganizing effects of trauma from childhood
4.	
5.	Unsettled, but not cognitively disorganized due to traumatic events during childhood.
6.	
7.	Some negative effects of the experienced childhood trauma on the relationship with the own child Emotionally traumatic experiences (e.g., physical or emotional abuse during childhood) associated with the parent leads into this rating if they are affecting the participants ability to relate to the child. If the participant makes the connection between the earlier experience and the present insecurities / stressing elements, but still suffers from the effects, the rating should be (7)
8.	
9.	Severe effects of trauma experience on present relationship with child This rating can be given when an earlier, emotionally traumatic experience in the childhood has impaired the participants ability to behave normally with her own child, and the participants reports serious difficulties in making any connection to what seems to the reader to be a fairly obvious choice.

21. Coherence of transcript & coherence of mind

1.	Highly incoherent The participant fails to make clear what his or her experiences and feelings are. The reader must struggle to follow the transcript, and the participant at times appears irrational. The transcript may be extremely vague, excessively detailed (but tangential, so nothing of substance is said), or there may be major contradictions in different sections. If the relationship of the participant with the parent can be determined, the reader is likely to disagree strongly with the participant's appraisal of the relationship
2.	
3.	*Incoherent* The participant does not seem to have a clear picture of his or her attachment experiences but does seem reasonably rational. The transcript is vague, tangential, or contradictory throughout, but with effort, the reader can interpret it, even when the reader has struggled toward a clearer picture of the relationship, however, he or she may not agree with the participant about the relationship and its effects

4.	
5.	*Neither coherent nor incoherent* This is a rating denoting acceptable coherence. The participant is not particularly articulate, but on the whole the transcript is understandable. In most cases, the participant is moderately coherent throughout; however, sometimes this rating is given when a participant is coherent for most of the interview yet rather incoherent in some other portions of the transcript or when dealing with some particular issue. In general, the reader has a fairly good idea of what the participant's experiences have been with his or her partner, and of their effects
6.	
7.	Coherent "The speaker seems truthful, non-contradictory, fairly concise and yet sufficient and complete, easily addressing the interview topic and seldom speaking in confusing ways. The speaker does not appear to contradict herself, and for the most part, the reader finds herself in agreement with the speaker's description and evaluation of her experiences and its effects" (Main and Goldwyn, 1994, p. 49). However, the transcript is off somewhat on one of the elements of coherency (quality, quantity, relevance, or manner): "perhaps it is not flowing, interpretation is required now and then. This rating may be given despite the presence of hesitations, occasional dysfluencies and distancing."
8.	
9.	Highly coherent "the participant has a steady and developing flow of ideas regarding the attachment-related questions addressed to her throughout this interview. She may be either reflective and slow to speak, with some pauses and hesitations, or chatty with a rapid flow of ideas (some fairly free in their associative nature), but her underlying intents, thoughts and feelings are clear and have a quality of freshness. Not only is the speaker at ease with the topic, but she seems to think afresh while she speaks, perhaps (though not necessarily) adapting to new ideas and experiencing new insights even while the interview is in progress" (Main and Goldwyn, 1994, p.49)

8.4 Individual scoring per category semi structured interview

8.4.1. Scales related to parents

(i) AAI Scales related do parents (1-9)										
	Loving mother	Loving father	Rejecting mother	Rejecting father	Role-reversing (mother)	Role-reversing (father)	Pressure to achieve (mother)	pressure to achieve (father)	Neglect (mother)	Neglect (father)
Participant										
AD3	5,0	4,0	4,0	5,0	1,0	1,0	3,0	7,0	3,0	3,5
AD1	1,0	1,0	8,0	8,0	1,0	1,0	1,0	1,0	2,0	1,5
AD6	1,0	1,0	7,0	7,0	1,0	1,0	1,0	3,0	1,5	1,0
AD5	1,0	5,0	8,0	7,0	1,0	1,0	7,0	7,0	1,0	3,0
AD9	3,0	3,0	7,0	7,0	1,0	1,0	3,0	5,0	3,0	3,0
AD8	5,0	5,0	6,0	7,0	1,0	1,0	1,0	5,0	3,0	3,0
AD7	1,0	3,0	9,0	7,0	1,0	1,0	1,0	3,0	1,0	3,0
AD2	2,0	2,0	8,0	7,0	1,0	1,0	1,0	6,0	2,5	2,0
AD10	3,0	2,0	7,0	7,0	1,0	1,0	7,0	7,0	2,0	2,0
AD4	3,0	2,0	5,0	7,0	1,0	1,0	1,0	1,0	3,0	2,0
Mean AD	**2,5**	**2,8**	**6,9**	**6,9**	**1,0**	**1,0**	**2,6**	**4,5**	**2,2**	**2,4**
CG4	9,0	9,0	1,0	1,0	1,0	1,0	1,0	1,0	9,0	9,0
CG6	7,0	1,0	3,0	7,0	3,0	1,0	1,0	1,0	7,0	3,0
CG8	9,0	6,0	3,0	3,0	1,0	1,0	1,0	1,0	8,0	8,0
CG9	9,0	9,0	3,0	1,0	1,0	1,0	5,0	1,0	7,0	8,0
CG5	9,0	9,0	1,0	1,0	1,0	1,0	1,0	1,0	9,0	9,0
CG7	3,0	9,0	5,0	1,0	1,0	1,0	1,0	1,0	5,0	9,0
CG3	9,0	5,0	1,0	5,0	1,0	1,0	1,0	1,0	9,0	5,0
CG10	5,0	5,0	5,0	3,0	1,0	1,0	5,0	1,0	5,0	3,0
CG1	9,0	9,0	1,0	3,0	1,0	1,0	3,0	3,0	8,0	8,0
CG2	9,0	5,0	1,0	3,0	1,0	1,0	1,0	7,0	9,0	5,0
mean Controll	**7,8**	**6,7**	**2,4**	**2,8**	**1,2**	**1**	**2**	**1,8**	**7,6**	**6,7**

8.4.2. States of mind related to parents

(ii) AAI States of Mind related to parents (1-9)					
	Idealization of father	Involving Anger towards mother	Involving anger towards father	Derogation of mother	derogation of father
Participant					
AD3	7,0	1,0	3,0	5,0	5,0
AD1	6,0	3,0	4,0	7,0	7,0
AD6	3,0	3,0	7,0	8,0	8,0
AD5	8,0	8,0	1,0	9,0	5,0
AD9	7,0	1,0	1,0	6,0	5,0
AD8	7,0	1,0	1,0	5,0	5,0
AD7	7,0	8,0	1,0	9,0	7,0
AD2	8,0	3,0	3,5	7,0	6,0
AD10	8,0	1,5	1,5	7,0	8,0
AD4	5,0	1,0	1,0	5,0	6,0
Mean AD	**6,6**	**3,1**	**2,4**	**6,8**	**6,2**
CG4	1,0	1,0	1,0	1,0	1,0
CG6	3,0	1,0	5,0	1,0	3,0
CG8	1,0	1,0	1,0	1,0	1,0
CG9	1,0	1,0	3,0	2,0	1,0
CG5	1,0	1,0	1,0	1,0	1,0
CG7	1,0	1,0	1,0	3,0	1,0
CG3	1,0	1,0	1,0	1,0	1,0
CG10	3,0	1,0	1,0	1,0	1,0
CG1	1,0	1,0	1,0	1,0	1,0
CG2	1,0	1,0	1,0	1,0	3,0
mean Controll	**1,4**	**1**	**1,6**	**1,3**	**1,4**

8.4.3. Overall States of Mind

(iii) AAI Overall States of Mind (1-9)							
	Overall derogation	Lack of recall	Valuing independence	Fear of loss of child	Unresolved Loss	Unresolved trauma	Coherence of script
Participant							
AD3	5,0	6,0	6,0	5,0	8,0	8,0	2,0
AD1	7,0	8,0	3,0	1,0	1,0	9,0	3,0
AD6	7,0	4,0	7,0	5,0	3,0	9,0	5,0
AD5	8,0	5,0	9,0	1,0	5,0	9,0	3,0
AD9	7,0	7,0	7,0	1,0	5,0	7,0	2,0
AD8	5,0	7,0	7,0	1,0	1,0	5,0	2,0
AD7	8,0	7,0	9,0	1,0	3,0	9,0	7,0
AD2	6,0	7,0	8,0	1,0	5,0	8,0	2,0
AD10	7,0	9,0	8,0	5,0	3,0	9,0	1,0
AD4	5,0	7,0	7,0	3,0	1,0	9,0	1,0
Mean AD	**6,5**	**6,7**	**7,1**	**2,4**	**3,5**	**8,2**	**2,8**
CG4	1,0	1,0	1,0	1,0	1,0	1,0	9,0
CG6	1,0	1,0	3,0	1,0	3,0	6,0	7,0
CG8	1,0	1,0	5,0	1,0	1,0	1,0	9,0
CG9	1,0	1,0	1,0	1,0	1,0	4,0	9,0
CG5	1,0	3,0	1,0	1,0	3,0	3,0	7,0
CG7	1,0	3,0	1,0	1,0	5,0	5,0	9,0
CG3	1,0	1,0	1,0	5,0	7,0	7,0	7,0
CG10	1,0	1,0	1,0	7,0	7,0	7,0	4,0
CG1	1,0	3,0	1,0	1,0	1,0	1,0	8,0
CG2	1,0	1,0	3,0	1,0	5,0	5,0	7,0
mean Contro	**1**	**1,6**	**1,8**	**2**	**3,4**	**4**	**7,6**

8.4.4 State of mind related to Pregnancy / Birth; State of mind related to Job

	(iv)Pregnancy / Birth (1-9)			(v) Job (1-9)	
	Perception on birth of child	Perception on first four months with child	% working (1=0% - 9=100%)	Job attitude	One parent has Atopic Disease
Participant					
AD3	3,0	1,0	5,0	5,0	1,0
AD1	3,0	1,0	3,0	3,0	0,0
AD6	3,0	3,0	7,0	7,0	1,0
AD5	1,0	5,0	4,0	9,0	0,0
AD9	1,0	7,0	7,0	7,0	0,0
AD8	3,0	1,0	9,0	7,0	0,0
AD7	3,0	5,0	6,0	7,0	0,0
AD2	3,0	1,0	7,0	7,0	1,0
AD10	3,0	8,0	1,0	6,0	0,0
AD4	3,0	1,0	7,0	6,0	1,0
Mean AD	**2,6**	**3,3**	**5,6**	**6,4**	**4**
CG4	1,0	1,0	7,0	3,0	0,0
CG6	3,0	1,0	7,0	5,0	1,0
CG8	7,0	7,0	8,0	5,0	1,0
CG9	3,0	1,0	1,0	3,0	0,0
CG5	5,0	1,0	6,0	5,0	1,0
CG7	1,0	1,0	1,0	3,0	1,0
CG3	1,0	1,0	1,0	1,0	0,0
CG10	3,0	1,0	7,0	3,0	1,0
CG1	0,0	0,0	7,0	3,0	1,0
CG2	5,0	1,0	7,0	5,0	0,0
mean Contro	**3,2**	**1,7**	**5,2**	**3,6**	**6**

8.5 ECR - questionnaire

Experiences in Close Relationships Scale (ECR)

Please return your answers before October 31, 2020 by mail (Elisabeth.schmidt@tum.de) or by post (in the return envelope you receive with the German "BoBi" questionnaire in the coming days).

Underneath you find 36 statements about interpersonal relationships. Based on those questions, we try to understand the possible influencing factors for the appearance of Atopic Dermatitis and allergies. For our evaluation of this questionnaire, it is important to fill out all 36 questions.
With the wording "Partner" is meant either your current relationship or past relationships.
Please indicate what answer on the scale of 1 (totally disagree) – 7 totally agree applies to you . There is no right or wrong!

1.	I prefer not to show a partner how I feel deep down.	1 2 3 4 5 6 7
2.	I worry about being abandoned.	1 2 3 4 5 6 7
3.	I am very comfortable being close to romantic partners.	1 2 3 4 5 6 7
4.	I worry a lot about my relationships.	1 2 3 4 5 6 7
5.	Just when my partner starts to get close to me I find myself pulling away.	1 2 3 4 5 6 7
6.	I worry that romantic partners won't care about me as much as I care about them.	1 2 3 4 5 6 7
7.	I get uncomfortable when a romantic partner wants to be very close.	1 2 3 4 5 6 7
8.	I worry a fair amount about losing my partner.	1 2 3 4 5 6 7
9.	I don't feel comfortable opening up to romantic partners.	1 2 3 4 5 6 7
10.	I often wish that my partner's feelings for me were as strong as my feelings for him/her.	1 2 3 4 5 6 7
11.	want to get close to my partner, but I keep pulling back.	1 2 3 4 5 6 7
12.	I often want to merge completely with romantic partners, and this sometimes scares them away.	1 2 3 4 5 6 7
13.	I am nervous when partners get too close to me.	1 2 3 4 5 6 7
14.	I worry about being alone.	1 2 3 4 5 6 7
15.	I feel comfortable sharing my private thoughts and feelings with my partner.	1 2 3 4 5 6 7
16.	My desire to be very close sometimes scares people away.	1 2 3 4 5 6 7
17.	I try to avoid getting too close to my partner.	1 2 3 4 5 6 7
18.	I need a lot of reassurance that I am loved by my partner.	1 2 3 4 5 6 7
19.	I find it relatively easy to get close to my partner.	1 2 3 4 5 6 7
20.	Sometimes I feel that I force my partners to show more feeling, more commitment.	1 2 3 4 5 6 7

21. I find it difficult to allow myself to depend on romantic partners.	1	2	3	4	5	6	7
22. I do not often worry about being abandoned.	1	2	3	4	5	6	7
23. I prefer not to be too close to romantic partners.	1	2	3	4	5	6	7
24. If I can't get my partner to show interest in me, I get upset or angry.	1	2	3	4	5	6	7
25. I tell my partner just about everything.	1	2	3	4	5	6	7
26. I find that my partner(s) don't want to get as close as I would like.	1	2	3	4	5	6	7
27. I usually discuss my problems and concerns with my partner.	1	2	3	4	5	6	7
28. When I'm not involved in a relationship, I feel somewhat anxious and insecure.	1	2	3	4	5	6	7
29. I feel comfortable depending on romantic partners.	1	2	3	4	5	6	7
30. I get frustrated when my partner is not around as much as I would like.	1	2	3	4	5	6	7
31. don't mind asking romantic partners for comfort, advice, or help.	1	2	3	4	5	6	7
32. I get frustrated if romantic partners are not available when I need them.	1	2	3	4	5	6	7
33. It helps to turn to my romantic partner in times of need.	1	2	3	4	5	6	7
34. When romantic partners disapprove of me, I feel really bad about myself.	1	2	3	4	5	6	7
35. I turn to my partner for many things, including comfort and reassurance.	1	2	3	4	5	6	7
36. I resent it when my partner spends time away from me.	1	2	3	4	5	6	7

Please indicate the number (1- 7) that applies to you. Only one number can be chosen. If you hesitate, please choose the answer, that applies most to you. Please answer all questions carefully and on your own.

Your answers will be treated strictly confidential and underly the legal regulations of Data Protection.

We thank you very much for your time and cooperation!

Date:
Pat. Code:

9. Acknowledgements

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