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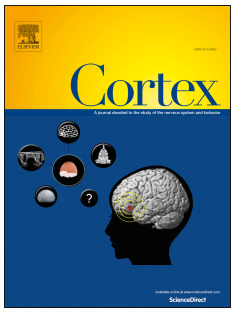

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Disentangling Developmental Prosopagnosia: A scoping review of terms, tools and topics

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Preregistration

A protocol for this review was preregistered; see https://osf.io/k9er2.

Data availability

A spreadsheet containing the data extracted from each reviewed record is available here: https://osf.io/pmnhj.

Author contributions

Erling Nørkær: Conceptualization, Methodology, Investigation, Formal analysis, Visualization, Writing - Original Draft; Silvia Gobbo: Conceptualization, Investigation, Writing – Review & Editing; Tone Roald: Conceptualization, Writing – Review & Editing; Randi Starrfelt: Conceptualization, Methodology, Investigation, Project administration, Funding acquisition, Writing – Original Draft, Supervision.

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Conflict of interests

The authors declare no conflicts of interest concerning the research, authorship or publication of this study.

Abstract

The goal of this preregistered scoping review is to create an overview of the research on developmental prosopagnosia (DP). Through analysis of all empirical studies of DP in adults, we investigate 1) how DP is conceptualized and defined, 2) how individuals are classified with DP and 3) which aspects of DP are investigated in the literature. We reviewed 224 peer-reviewed studies of DP. Our analysis of the literature reveals that while DP is predominantly defined as a lifelong face recognition impairment in the absence of acquired brain injury and intellectual/cognitive problems, there is far from consensus on the specifics of the definition with some studies emphasizing e.g. deficits in face perception, discrimination and/or matching as core characteristics of DP. These differences in DP definitions is further reflected in the vast heterogeneity in classification procedures. Only about half of the included studies explicitly state how they classify individuals with DP, and these studies adopt 40 different assessment tools. The two most frequently studied aspects of DP are the role of holistic processing and the specificity of face processing, and alongside a substantial body of neuroimaging studies of DP, this paints a picture of a research field whose scientific interests and aims are rooted in cognitive neuropsychology and neuroscience. We argue that these roots – alongside the heterogeneity in DP definition and classification – may have limited the scope and interest of DP research unnecessarily, and we point to new avenues of research for the field.

Keywords: developmental prosopagnosia; review; face recognition; face perception

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Prosopagnosia is an impairment of the human ability to recognize other people by their face (Starrfelt & Barton, 2022). Individuals with prosopagnosia struggle to recognize friends, family, colleagues and – in some cases – even their own reflection in the mirror. For many this has negative psychosocial consequences with an impact on quality of life (Yardley et al., 2008). A distinction can be made between two types of prosopagnosia; prosopagnosia induced by brain injury such as stroke or traumatic brain injury (acquired prosopagnosia) and prosopagnosia believed to be present from birth (Cook & Biotti, 2016). This latter type has been referred to by several different names in the literature: Congenital Prosopagnosia (CP), Hereditary Prosopagnosia (HP) and Developmental Prosopagnosia (DP). CP refers to innate prosopagnosia (Behrmann & Avidan, 2005), while HP emphasizes the genetic aspect of prosopagnosia (Kennerknecht et al., 2006). As such, both these concepts include prosopagnosia caused by prenatal factors. In this context, however, we will use the third term, DP, which, in addition to subjects with CP/HP, includes cases where the cause of prosopagnosia is not known, which is the majority of published cases. Individuals with DP have life-long difficulty in recognizing or learning to recognize faces. Barton & Corrow (2016) referred to this definition of DP as *deceptively simple* (p. 119), and there is indeed far from consensus on the specifics of how to define the phenomenon at hand. This dissent ranges from defining DP as the *failure to develop a face recognition system* (de Gelder & Stekelenburg, 2005) to defining it as *a condition in which face perception is impaired in the absence of an obvious brain damage and given intact sensory and intellectual functions* (Tanzer et al., 2016). These differences in definitions constitute a problem for the research field, because it makes it unclear whether different research groups are

dealing with the same phenomenon, and thus whether findings are transferable to DP populations in other contexts.

The differences in DP definitions and the fact that several different concepts are used to denote what is assumed to be the same phenomenon, suggests disagreement in the field about what DP is. Scratching the surface reveals not only dissent about whether the condition is best conceptualized as developmental or innate, but a fundamental discussion about the P in DP, that is, what are the core characteristics of this type of prosopagnosia, and should it even be called prosopagnosia in the first place. This discussion unfolded in a special issue of Cognitive Neuropsychology on DP from 2018, spearheaded by a review by Geskin & Behrmann (2018) examining the association or dissociation between face and non-face object processing in DP, that is, whether the impairment in DP is face specific. The review sparked a vigorous debate on – among other issues – how to classify cases of object agnosia (Garrido et al., 2018), how to meaningfully compare deficits in non-face object processing to deficits in face processing (e.g. Campbell & Tanaka, 2018; Gerlach et al., 2018), how to approach these issues methodologically (de Gelder & Van den Stock, 2018; Eimer, 2018; Ramon, 2018; Starrfelt & Robotham, 2018), and whether the term prosopagnosia should even be used in non-acquired cases, as discussed by Rossion (2018a) who proposed the competing term prosop*dys*gnosia for the lifelong variant. Rossion (2018b) has put this critique forth in the context of acquired prosopagnosia research also, suggesting that the term prosopagnosia should be reserved for neuropsychological cases of recognition impairments specific to faces, more strictly in line with Bodamer's (1947) original definition. It should be noted, though, that the specificity of the face recognition impairment in Bodamer's original cases has also been a subject of discussion (Ellis & Florence, 1990; Gainotti, 2010). Together, this debate encircles whether non-face processing deficits are – and indeed even

meaningfully *can* be – a part of the DP condition, and so the definition of prosopagnosia and even more so of *developmental* prosopagnosia, remains unsettled. Therefore, the first aim of this review is to map all conceptualizations and definitions of DP in the empirical literature. A conceptualization is here understood as the term used to denote prosopagnosia (i.e. DP or CP), while a definition is the concrete description of the psychological phenomenon (e.g. *lifelong face recognition deficit with no brain injury*).

The heterogeneity in DP conceptualization and definition is closely tied to the issue of how to classify individuals with DP. The instruments used to detect a phenomenon set the epistemological scene; what DP is – and can be – is delimited by the diagnostic tools and criteria used to classify it. So far, no universal criteria for classifying a subject with DP have been established, and the means of classification vary substantially, with different research groups adopting different classification criteria and a wide range of performance tests, subjective measures and diagnostic interviews (Barton & Corrow, 2016; Bate & Tree, 2017; DeGutis et al., 2023). Some researchers use rather strict classification criteria such as scores below 2 standard deviations from control mean on two or more face processing tests such as the Cambridge Face Memory Test (CFMT) (Avidan et al., 2011; Duchaine & Nakayama, 2006). Others recommend relying only on self-report measures such as the 20-Item Prosopagnosia Index (PI20, Shah et al., 2015b) when classifying DP, as some individuals who report severe impairment in face recognition are able to perform within control range on objective face processing tests (Burns et al., 2022). Others still have argued that DP classification should include both objective and subjective assessment tools (Arizpe et al., 2019; Barton & Corrow, 2016). Because of these differences in how individuals are classified with DP, the second aim of our review is to map all the assessment tools actively used for DP classification in the literature.

Upon establishing how DP is defined, denoted and diagnosed across the DP research field, we finally examine which aspects of DP are investigated in the literature. The rationale of this exploration is, that if there is a lack of consensus on what DP is and how to assign individuals to the DP category, these issues must be reflected in the DP research questions. As an example, the previously discussed issue of whether non-face object processing impairment is a part of DP is presumably reflected in a large number of studies investigating object processing and the specificity of the face processing impairment in DP. As such, the idea of this third part of our review is to examine which questions are asked in the DP literature rather than which answers are given.

Based on these general problems in the current state of the DP research field, our scoping review asks the following three questions:

1) How is DP defined and conceptualized in the literature?
2) How are individuals classified as having DP in the literature?
3) Which research questions about DP are asked in the literature?

To answer these questions, we perform a systematic, exhaustive search of all empirical studies of DP and extract information from them based on the PRISMA-ScR guidelines for conducting a scoping review (Tricco et al., 2018). The review protocol was preregistered in June 2022 and is available here: https://osf.io/k9er2. The protocol was developed based on the guidelines for scoping review protocols proposed by Peters et al. (2022).

2.0 Methods

2.1 Search strategy

A systematic literature search was conducted in the following databases: PubMed, Scopus, Embase, Web of Science and PsycInfo.

In each database the search consisted of a combination of free text search and, when possible, a search using terms from a controlled vocabulary. This latter search type was only possible to include in the PubMed search, as it is the only one of the selected databases with a controlled vocabulary containing a topic specifically for the variant of prosopagnosia with no brain damage (i.e. the MeSH term 'Prosopagnosia/congenital'). In e.g. PsycInfo the thesaurus only contains the broad topic 'Prosopagnosia', which would create too many irrelevant search results, as it includes all indexed articles on acquired prosopagnosia in addition to those on DP.

Thus, the free text search was the backbone of the systematic search. This aligns well with the fact that the review is tied to the *concept* of DP and its synonyms. We can assume that all records relevant for the review will contain these words – otherwise, they would not be relevant. The free text search consisted of 'developmental prosopagnosia' and its synonyms separated by the Boolean OR separator. To capture all relevant records of DP, the search string contained synonyms to DP that are infrequently used (i.e. 'childhood prosopagnosia' and 'prosopdysgnosia').

Search results were limited to publications from the year span 1976-2022 and limited to records written in English. The complete search string for each individual database is listed in Table 1.

Table 1. Search string for the literature search in each of the five included databases.

Database	Search string
PubMed	("developmental prosopagnosia"[all fields] OR "congenital prosopagnosia"[all fields] OR "childhood prosopagnosia"[all fields] OR "hereditary prosopagnosia"[all fields] OR "prosopdysgnosia"[all fields] OR "Prosopagnosia/congenital"[Mesh]) AND (1976:2022[pdat])
Scopus	TITLE-ABS-KEY("developmental prosopagnosia*" OR "congenital prosopagnosia" OR "childhood prosopagnosia" OR "hereditary prosopagnosia" OR "prosopdysgnosia") AND PUBYEAR > 1975
Embase	(developmental prosopagnosia or congenital prosopagnosia or childhood prosopagnosia or hereditary prosopagnosia or prosopdysgnosia).af
Web of Science	(ALL=((“developmental prosopagnosia” OR “congenital prosopagnosia” OR “childhood prosopagnosia” OR “hereditary prosopagnosia” OR “prosopdysgnosia”))) AND DOP=(1976-01-01/2022-07-01)
PsycInfo	(“developmental prosopagnosia” OR “congenital prosopagnosia” OR “childhood prosopagnosia” OR “hereditary prosopagnosia” OR “prosopdysgnosia”) AND DT 1976-2022

2.2 Eligibility criteria

Interestingly, the majority of studies of DP include adult participants, even if it is considered a developmental disorder, and indeed, measuring face recognition and classifying DP

in children remains challenging (Bennetts et al., 2017; Dalrymple et al., 2014b). Thus, we included only peer-reviewed articles that examine adult human participants with DP in accordance with the definition of DP given above (cf. Supplementary Table S4 for a list of studies investigating DP in children). Studies that investigated only children with DP were excluded in order to better disentangle the studied phenomenon from other developmental conditions. As mentioned, different classification criteria for DP are used across the literature, so we included all accounts of prosopagnosia without known brain damage. As such, inclusion of studies in the review is tied to the *concept* of DP rather than a set of criteria for classifying DP. In other words, any empirical article that claims to investigate subjects with DP (or any of its synonymous concepts) was eligible for inclusion. The empirical material could be of any kind; quantitative, qualitative, collected in a lab setting, online or in the field, but only original, peer-reviewed accounts of the data were be considered. Data that was merely referenced from other sources was not included. Other reviews, conference abstracts and theoretical commentary articles on DP were also not included.

As the first known account of developmental prosopagnosia is from 1976 (McConachie, 1976), it was deemed appropriate to limit the search of literature to the years 1976-2022. Earlier accounts of DP may exist, but to keep the phenomenon within reasonable conceptual boundaries, we limited the search to literature published after the first registered case of *developmental prosopagnosia* was described. The upper year limit of 2022 was chosen in accordance with the preregistered review protocol. For an overview of more recent publications, the reader is referred to section 3.4.

2.3 Selection process

The selection of records was conducted in Covidence (2022) based on the eligibility criteria above. Initially, duplicate records were removed. The searched records were screened by the first and second author by reading the abstracts. The same authors then assessed the remaining records as full-text articles and excluded any irrelevant records. Discrepancies between the two assessors' selection were discussed until consensus was reached. During abstract screening, 38 conflicts were encountered (92.8 % agreement). Assessing the full-text records resulted in 25 conflicts (91.2 % agreement). Consensus was reached between the two reviewers in all cases of disagreement by discussing each record in relation to the eligibility criteria.

To qualify the assumption that we made an exhaustive search and an appropriate selection, we crosschecked our selected records with the sources included in previous reviews of the field (Geskin & Behrmann, 2018; Kress & Daum, 2003a). The inclusion and exclusion process is shown in Figure 1.

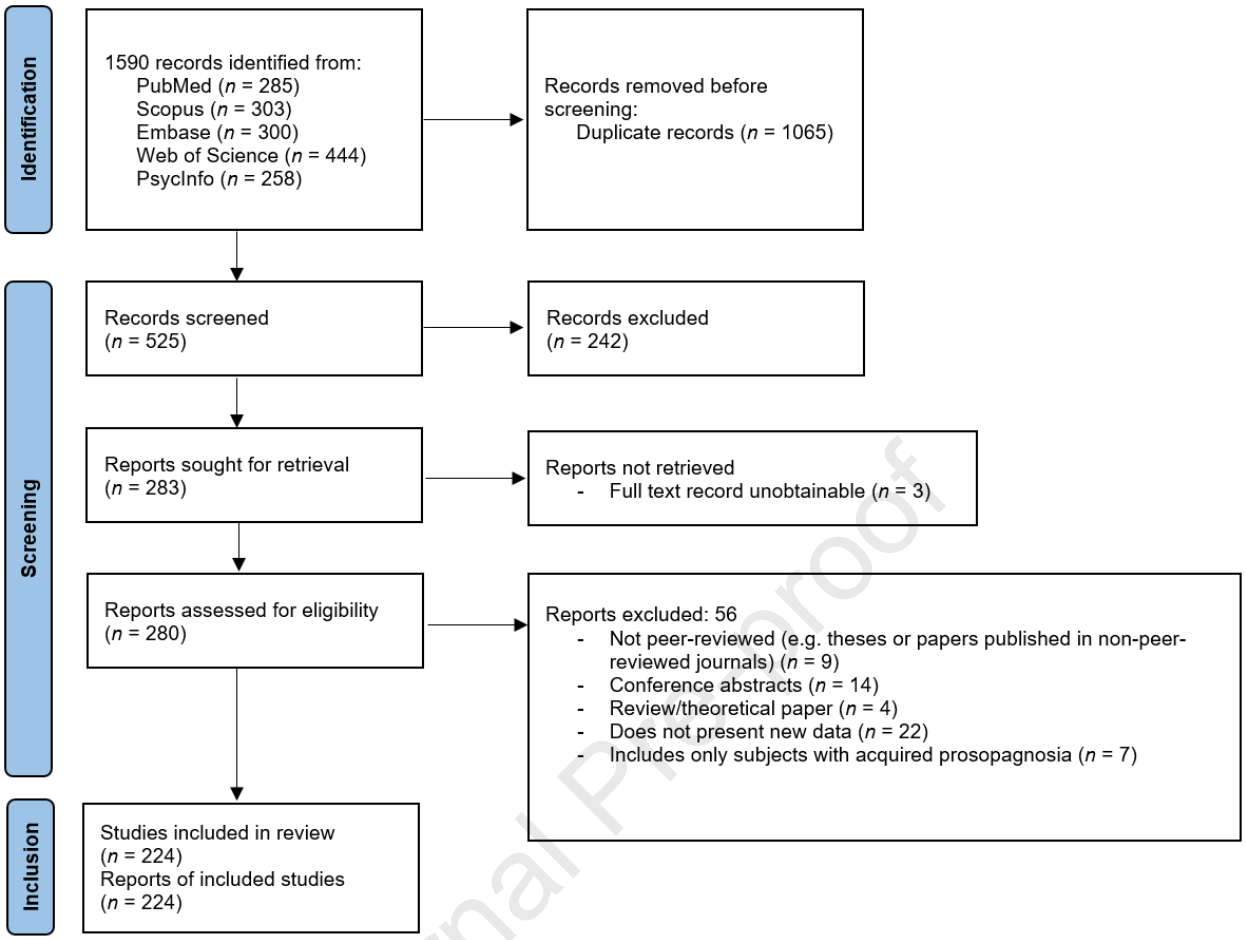


Figure 1. Flowchart of the inclusion and exclusion process.

Note. Figure layout adopted from Page et al. (2021)

2.4 Data synthesis

To answer our three research questions, a wide range of information was extracted from each included record and registered in a spreadsheet, available here: https://osf.io/pmnhj (see also Supplementary Table S1). The extracted information is outlined below and the preregistered review protocol can be referred to for a full description. In the data synthesis process all included records were treated equally in the sense that the extracted information was not weighted based on sample size or other metrics. As such, a single case study (e.g. Bentin et al., 1999, N_{DP} = 1)

contributed with the same amount of information to all our analyses as did a study of a larger sample of DP individuals (e.g. Little et al., 2022, N_{DP} = 101). Although a weighting of studies based on sample size or a case-by-case analysis akin to the approach by Geskin & Behrmann (2018) is well suited to synthesize knowledge about a given research topic (e.g. object recognition), a drawback of such an approach is that the same (larger) samples of DP individuals appear in more than one publication (e.g. Zhao et al., 2016; Liu et al., 2021) which would for our purposes result in an over approximation of the significance of those samples on the field. Further, sample sizes have organically grown over time as the access to online participant recruitment and testing alongside public awareness of DP has increased, and accounting for sample size in our analyses might underestimate the relative impact of the early, pioneering, small-scale DP studies. Finally, some research topics are arguably better suited for smaller samples and case studies such as in-depth investigations of the psychosocial consequences of DP (e.g. Diaz, 2008), while larger samples are required for investigations of e.g. symptom heterogeneity (Bate et al., 2019a). As such, we have not emphasized sample size variability in our review of the field (e.g. by weighting the information in Figures 2, 3 and 4 based on sample sizes), however the reader may be referred to Supplementary Figure S1 for an overview of how sample sizes have changed over time.

2.4.1 Conceptualization and definition. For each record, the concept used to denote prosopagnosia (DP, CP or HPA) was registered. Further, text sections from each record containing definitions of DP were manually coded into definition 'building blocks' by the first author, and all codings were affirmed by the last author. For instance, Palermo et al. (2011) defines DP as follows: *People with congenital prosopagnosia (CP; also referred to as developmental prosopagnosia) have severe, life-long deficits recognising the identity of familiar*

people from their faces despite intact low-level vision and general cognitive abilities. This definition was coded into consisting of the following four building blocks: *Lifelong + Face identification impairment + Absence of visual or other sensory problems + Absence of intellectual/cognitive problems*. The process of coding text into definition building blocks was accompanied by a certain amount of reduction and merging definitions that vary slightly in semantics. For instance, the terms *impairment* and *deficit* were coded interchangeably here, and all for all relevant building blocks, *impairment* was used, meaning that studies that define DP as e.g. a *face recognition deficit* were coded as *face recognition impairment*. The guiding principle in the coding process was to strike a balance between highlighting the heterogeneity of DP definitions while keeping at a reasonably low and surmountable number of definition building blocks. As such, new building blocks were added when studies were encountered that provided definitions that differed in conceptually important ways from already coded studies. As an example, a distinction was made between *face recognition impairment* and *face identification impairment* building blocks, because it is conceptually significant whether face recognition (knowing that you have seen someone before) or face identification ability (being able to identify specific individuals based on their face) is considered the defining feature of DP.

2.4.2 Classification of DP. The primary focus when mapping how individuals are classified with DP was to look at which diagnostic measures are adopted in the classification of DP. First, however, we made a crude distinction between studies that explicitly described how individuals were classified, and studies that did not contain such descriptions. This distinction was made based on a rather strict criterion: Studies were only considered to have descriptions of DP classification if they listed explicit criteria for diagnosing subjects with DP. Many studies

(especially some of the early, pioneering studies of DP) describe thoroughly which tests they use to assess the subjects' face processing problems. They also report the scores on these tests and (sometimes) how much they deviate from control scores. But they rarely list how many of these scores must deviate and by how much in order to classify a subject as a DP. Such assumptions may indeed exist for the relevant studies. The authors may have had criteria for diagnosing DP that are not listed in the papers themselves. For instance Nunn et al. (2001) thoroughly describe a neuropsychological examination of an individual with DP using a total of nine different tests of face processing, but the study does not explicitly specify any diagnostic criteria. In other cases, the presence of criteria is more unclear, so a certain amount of interpretation of the text was necessary. For instance, in the case study of a horse expert by Weiss et al. (2016), the DP subject is described as having *z*-scores of -2.16 and -2.45 compared to control means on the CFMT and an FFT, respectively. Additionally, the authors define '*the threshold for abnormal face perception in the specified tests was defined as 2 SDs below average similarly to other papers*' (Weiss et al., 2016, p. 67). Does this mean that the DP subject would not have been classified as a DP, if she had not fallen below 2 SD's on both tests? Would an abnormal (> 2 SD's) performance on only one of the diagnostic tests be sufficient for a DP classification? As such, it is a general assumption of this review that the criteria for category classification of DP is determinant for *what DP is regarded to be*. More or less liberal diagnostic criteria come with a definitional power – if, for instance, a study explicitly uses a face *perception* test as a diagnostic measure, face perception impairment becomes an integral part of what DP is regarded to be. Additionally, the prevalence of DP depends heavily on the diagnostic criteria adopted (cf. Barton & Corrow, 2016; DeGutis et al., 2023). Thus, any variability in how DP is classified across the literature is worth scrutinizing. For all included records, the measures involved in the

classification process were registered. For the studies that explicitly described how individuals were classified as having DP, these diagnostic tools were examined in depth (see Results).

2.4.3 Research questions in the DP literature. To investigate which research questions are most frequently asked in the DP literature, all included studies were grouped based on which specific aspect(s) of DP, they studied. The aim of this was to systematically examine and illustrate which aspects of DP are most frequently investigated, in order to point at potential problems and gaps in the existing literature.

3.0 Results and discussion

A total of 224 studies were deemed eligible for review. Characteristics of all studies can be explored in the supplementary Table S1.

3.1 Conceptualization and definition of DP

The majority of the included records (*n* = 151, 67.4 %) used the term *developmental prosopagnosia* (DP) to denote the studied phenomenon. *Congenital prosopagnosia* (CP) is widely used as well (*n* = 67, 30.0 %), while *hereditary prosopagnosia* (HPA) is rare (*n* = 6, 2.7 %). This conceptual dissent in the field warrants an examination of what content is implied when using the terms *developmental* versus *congenital*. A congenital disorder is present from birth (following the definitions of CP by e.g. (Albonico et al., 2017; Bate et al., 2008; Stollhoff et al., 2010), and in the congenital view, prosopagnosia is either a result of a specific genetic disposition or complications before or during birth. In contrast, 'developmental' or 'neurodevelopmental' is defined in DSM-5 as simply 'a group of conditions with onset in the developmental period' (APA, 2013), implying that an individual deviates from a developmental path of neurotypical individuals during early life – either as a consequence of a genetic disposition, complications before or during birth or of environmental influences during childhood. As such, the term DP implies a more broad definition than CP, because it keeps open the possibility that an individual's face processing impairment is not a given certainty from birth. This discrepancy highlights the fact that little is known about how, when and why the disruption of face recognition ability happens. Further research on impaired face recognition in early childhood may shed light on which nomenclature is more correct, but it is also possible that both a strictly congenital variant of prosopagnosia and a variant in which the problem occurs as a

consequence of environmental influences during childhood exists, and that we are simply unable to diagnostically distinguish between them at present. At least it is clear that for some people with lifelong prosopagnosia, there is a strong hereditary factor (Grüter et al., 2008; Kennerknecht et al., 2008b), but it is still unclear if this is inherited through different genes than face recognition ability in general, which has a strong genetic component (Wilmer et al., 2010). On this note, we find it remarkable that so relatively few (n = 14) studies investigating DP in children exist (see Supplementary Table S4). While we restricted the scope of this review to studies of DP in the adult population, including the studies investigating children might have helped shed further light on the 'developmental' aspect of the DP concept, and, indeed, more research in how DP develops and manifests in childhood would benefit this endeavor, as others have noted (e.g. Epihova & Astle, 2024).

Of the 224 records included here, 197 papers stated clear definitions of the phenomenon DP. Coding these 197 definitions into 'building blocks' yielded a total of 18 different blocks. 4 of these (e.g. *Lifelong* and *Hereditary basis*) pertained to the 'developmental' part of DP, while 14 of the blocks can be thought of as positive/present and negative/absent properties of the 'prosopagnosia' part of DP (e.g. *face recognition impairment* and *absence of acquired brain injury*). The result of this coding process is visualized in Figure 2.

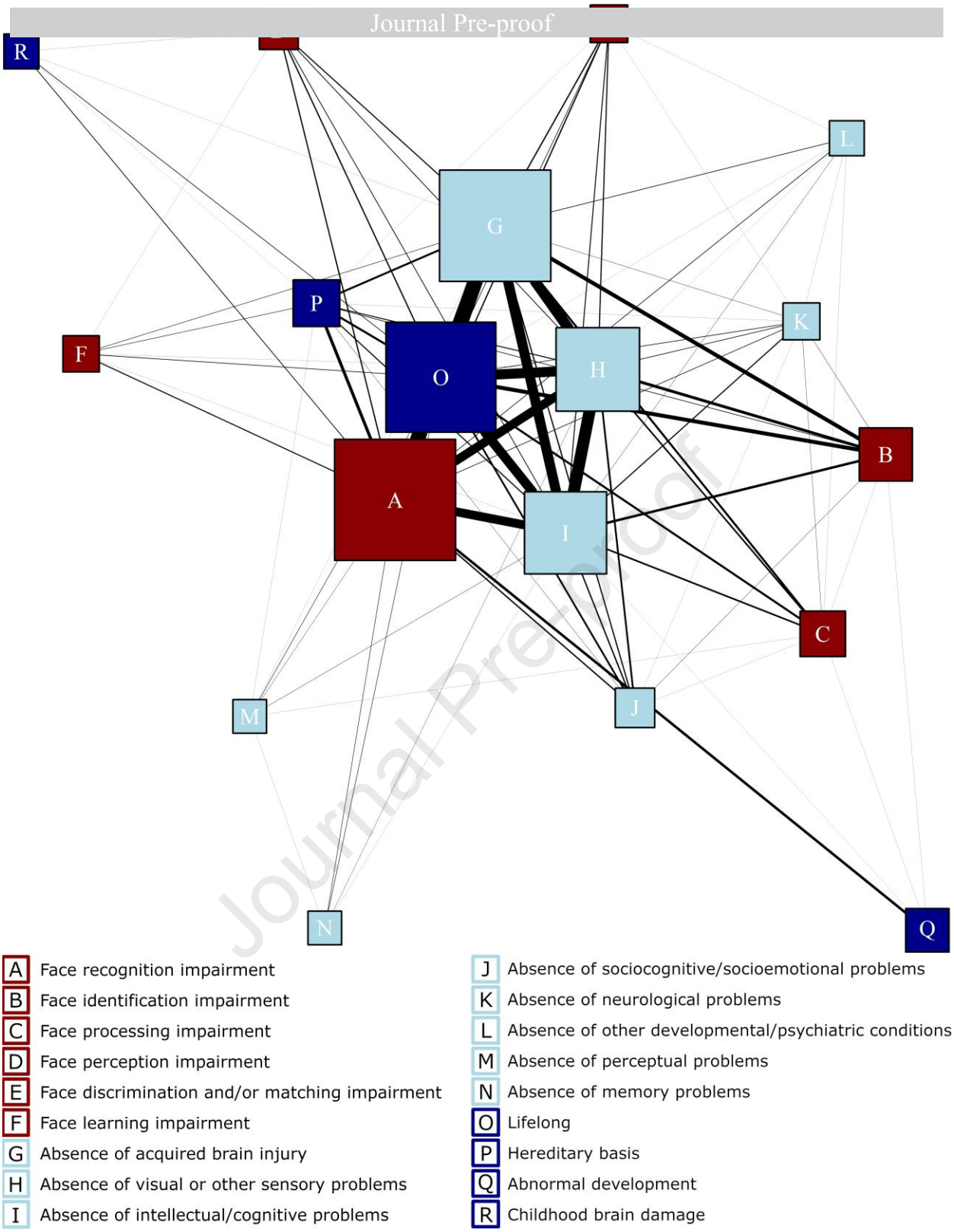


Figure 2. Network graph of definition 'building blocks' of DP.

Note. Each node represents a semantic building block used in definitions of DP, with larger nodes indicating building blocks more frequent across the literature. The width of the edges indicates how frequently two building blocks appear together. The plot layout was created with the Fruchterman-Reingold algorithm.

As the figure indicates, the predominant definition of DP is that it is a *lifelong face recognition impairment* in the *absence of acquired brain injury* and in the *absence of intellectual/cognitive problems*. Other buildings blocks appear more sporadically in the literature. In 11 studies, DP is defined as having a component of face perception impairment. Intact face perception is definitely a condition for successful face recognition, and as such the *face learning/recognition/identification impairment* blocks may be thought of as nested within the *face perception impairment* block. It is interesting, however, that face perception problems (and in 12 studies face matching/discrimination) is an explicit part of the definition of DP in only a minority of studies. This implies that DP participants in most studies do not necessarily have problems with face perception, but in many cases this was not measured. Some studies (n = 20) refer to the broader *face processing impairment* which may refer to a breakdown of any process necessary for successful face identification. Another conceptual nuance worth highlighting is that 33 definitions of DP contain the building block *face identification impairment* rather than *face recognition impairment*. While it is not entirely clear what this particular difference in definition implies in all instances in the literature, we may refer to the distinction made by Rossion (2022). Here, face recognition is defined as the judgment of a previous occurrence of specific identities of faces, while face identification (or what Rossion refers to as 'face identity recognition') is the production of a unique response to a given face according to its individually distinctive characteristics (Rossion, 2022, p. 4). As an example, meeting a colleague at the supermarket may invoke a sense of familiarity or recognition (the former process), but not the ability to remember who they are, their name, or distinctive semantic information about them (the latter process). Whether this distinction is what is reflected in the discrepancy between defining DP as an

impairment in face recognition or face identification, is not obvious, but it is at least worth noting that this discrepancy exists.

Of course, the heterogeneity in DP definitions need not reflect a disagreement among researchers about what DP is. Rather, it is likely that different researchers highlight different core features of DP in their introduction to frame the problem they are addressing in their respective paper. However, the lack of consensus on how specifically to define DP suggests that a conceptual gap exists in the research field. This gap is literally represented by the tendency to define DP by its absence of properties (absence of brain injury, absence of visual problems, etc.). The focus on absence may be explained by DP's conceptual origin as an offspring of acquired prosopagnosia. Historical factors may have led to DP being defined mainly by how it differs from acquired prosopagnosia, and – as we will argue later – this is also reflected in the DP field adopting research questions and theoretical assumptions from acquired prosopagnosia research.

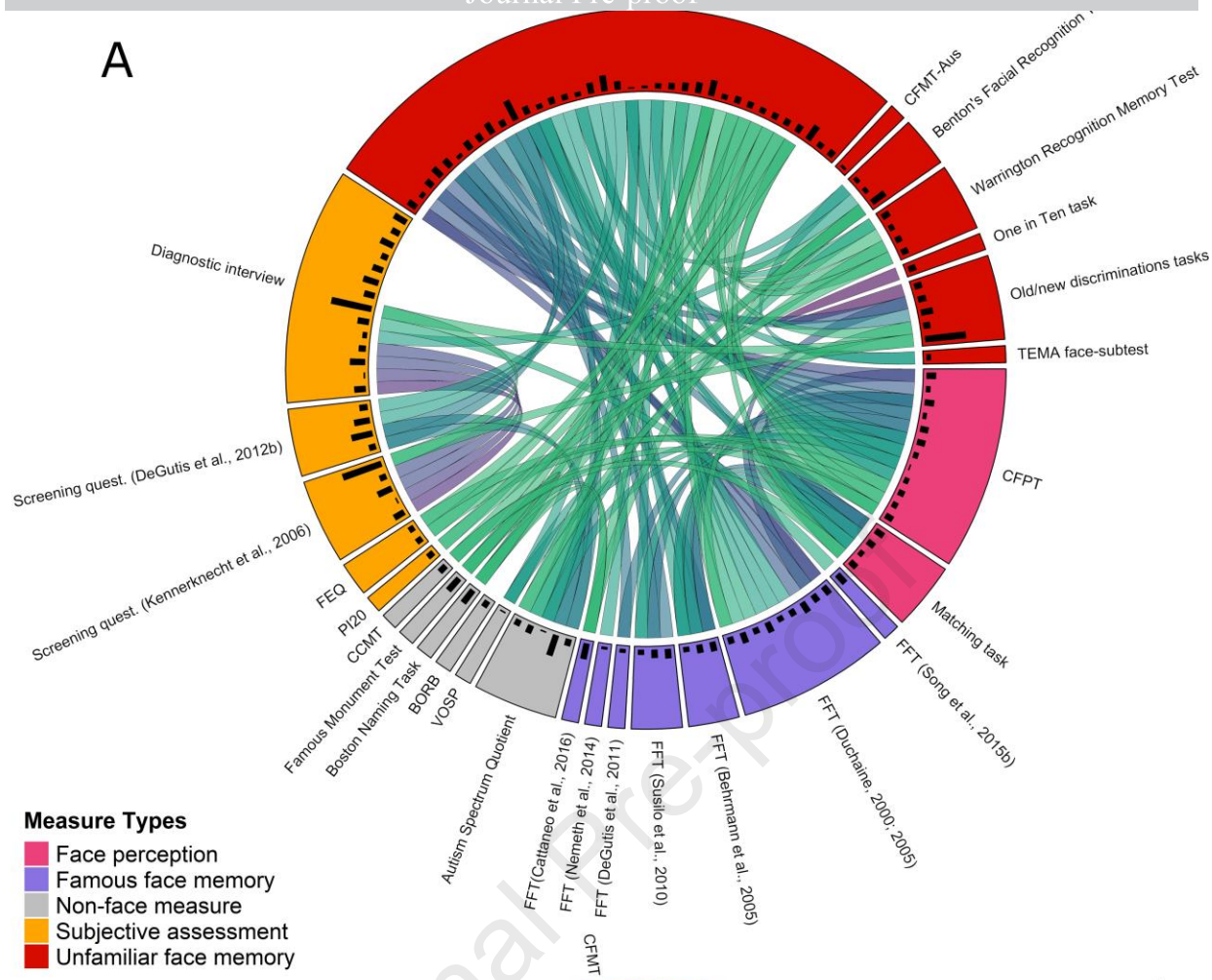
3.2 DP classification

Of the 224 included studies, roughly half (n = 111) explicitly describe how individuals were classified as having DP. In these 111 studies, a total of 40 different performance assessments, self-report measures and diagnostic interviews are used to classify DP. These include both measures used to assess the degree of face processing difficulties (e.g. the Cambridge Face Memory Test (CFMT, Duchaine & Nakayama, (2006)) and measures used for exclusion (e.g. the Autism Spectrum Quotient (AQ (Baron-Cohen et al., 2001)). Figure 3 illustrates how diagnostic measures are combined in studies that explicitly state how they classify individuals with DP (n = 111). While this figure first and foremost conveys the vast diagnostic diversity that dominates the field, an overall diagnostic pattern is clear: DP classification relies in most cases on a

combination of an assessment of a) objective performance with memory for unfamiliar faces, b) objective performance with recognition and/or identification of famous faces and c) subjective report of problems with face recognition assessed with questionnaires or interviews. These three types of diagnostic measures are the most frequent in the included records – and has been across the timespan of published papers. There are many variations however, with e.g., no less than 17 different famous faces tests administered across the 111 studies. While this is not surprising – as familiarity tests are highly culturally sensitive – it does constitute a problem for comparing results from DP research across countries and labs. Aside from differing methodologically, the different assessment approaches arguably tap different aspects of the DP phenomenon. For instance, the Famous Faces Tests measure semantic knowledge of celebrity faces (Wilson et al., 1981), the Cambridge Face Memory Test (CFMT) measures the ability to learn small differences in unfamiliar faces (Duchaine & Nakayama, 2006), the Cambridge Face Perception Test measures face perception performance (Duchaine et al., 2007), while the PI20 is a self-report measure of the ability to recognize faces on a day-to-day basis (Shah et al., 2015b). As such, the use of many different combinations of diagnostic tests is likely to constitute a sampling problem for the DP field. Unless a case can be made that the exact same population of individuals would score abnormally on all diagnostic tools outlined here, different research groups may well be dealing with different psychological phenomena simply as a consequence of adopting different diagnostic measures. This heterogeneity in how DP is assigned to individuals contribute to the loose conceptualization of DP. Further, the use of different classification criteria (e.g. being 1.7 or 2.0 SD's below the mean of a control group on one or more diagnostic tests), which is not directly addressed in this review, exacerbates the conceptual issue constituted by the use of many different diagnostic tools, and has recently been discussed elsewhere (e.g. DeGutis et al. (2023)).

Here, our primary aim is to highlight that a diagnostic heterogeneity exists and stress the importance of clearly describing how individuals are classified with DP in a given study. After all, the heterogeneity in DP classification may be an indication of the variability observed in the DP phenomenon itself – for instance, Johnen et al. (2014) found overall poor face recognition ability with varying patterns of impairment in non-face processing within a family where some members met the diagnostic criterion for DP. As such, scrambling for strict diagnostic consensus may not be a goal in itself. However, DP classification in future research would benefit from striving towards criteria that capture the three main conceptual components of DP, i.e. 1) that it is a *visual agnosia*, understood as the inability to *recognize* visual stimuli (Gerlach & Robotham, 2021; Tranel & Damasio, 2001), 2) that it is *face specific*, as the term *prosop*agnosia implies a problem clearly disproportionate for recognizing faces (Lahiri, 2020) and 3) that the face recognition deficit is neurodevelopmental, i.e. not a result of brain injury. In this context, solely relying on self-report measures for DP classification (cf. Burns et al, 2022) seems inadequate, as people cannot be expected to distinguish between an impairment in recognizing facial identity and e.g. impairments of low-level vision, and further may not be able to judge whether their difficulties are disproportionately larger for faces compared to other visual categories. In addition, some individuals with DP may not be aware of the severity of their impairment, but may assume (as most of us do) that other peoples' face recognition ability is on level with their own. DP classification, then, should ideally rely on a combination of objective and subjective assessment, as others have suggested (Arizpe et al., 2019; Barton & Corrow, 2016). With regards to the specificity of face recognition impairment in DP classification, we recently proposed adopting an approach contrasting face and non-face object recognition performance (Gerlach et

al., 2024). If the diagnostic logic inherited from clinical neuropsychology is not applied, one could argue that the term prosopagnosia is not even appropriate for the behavioral profile of DP (see Rossion (2018a) for an elaborate discussion of this point). Finally it should be noted, that in this review we assumed the diagnostic criteria to be a demarcation of what DP is regarded to be, and this assumption may not be applicable to all DP studies. For instance, Dobel et al., (2007) adopted a conservative criterion to ensure that the included patients exhibited severe face recognition difficulties. In such a case, classification criteria are not criteria for diagnosis as such, but rather for symptom severity (see also DeGutis et al., 2023). Increased clarity in describing how DP is diagnosed by individual research groups may help alleviating this uncertainty.



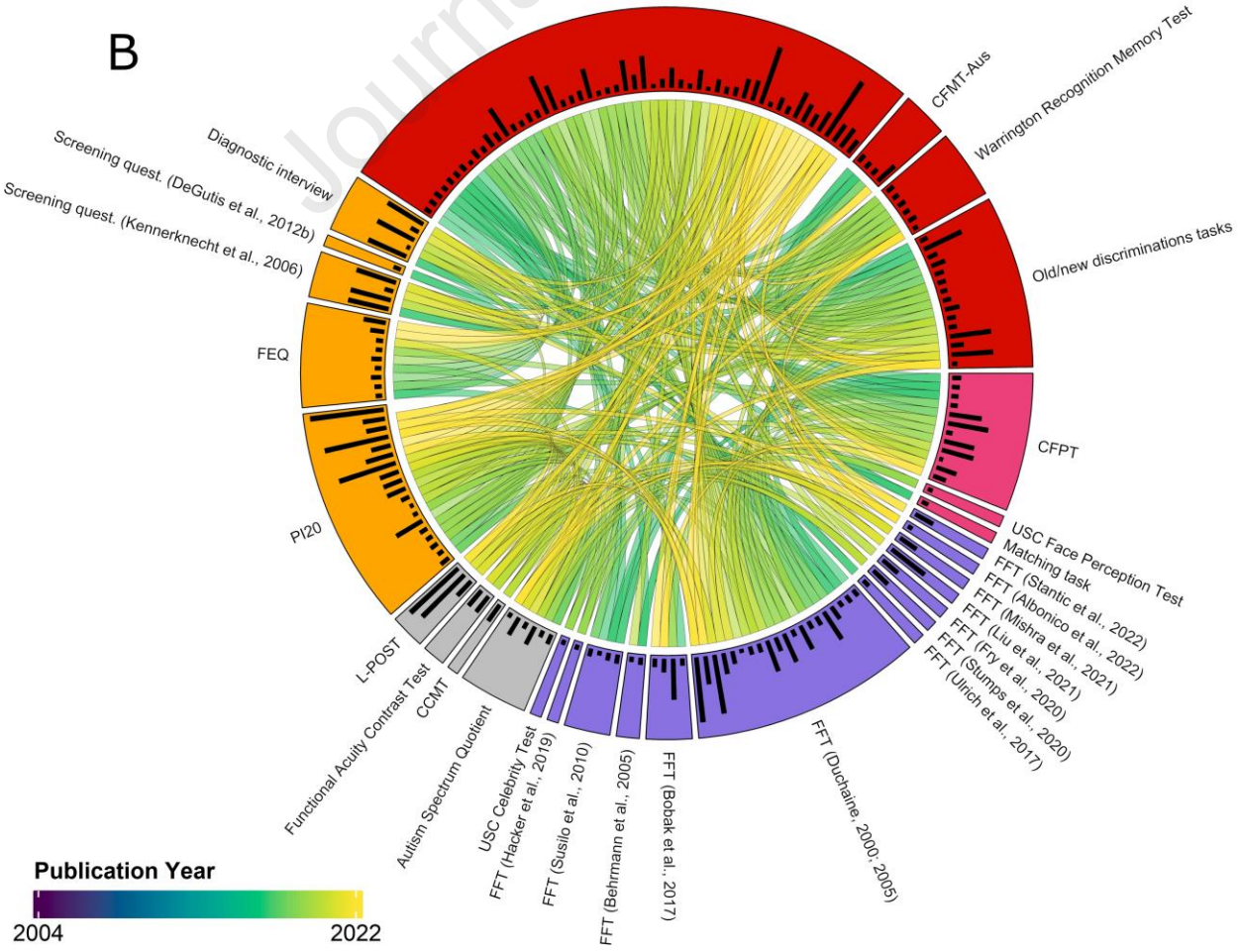


Figure 3. Chord diagram of diagnostic tools used to classify individuals with DP – median split by publication year.

Note. Panel A: Diagnostic tools used in publications from 2004-2016 (*n* = 53). Panel B: Diagnostic tools used in publications from 2017-2022 (*n* = 58).

Each black bar represents one study and the height of the bar indicate the sample size of the DP group of the respective study. A link between two bars indicate that the two tools are used in one study in combination to classify DP. Tools that exist in more than one edition (e.g. the FFT's) are accompanied by references to the study in which that respective edition was used. The distinction between tests of face perception and face memory was done on the basis of the principles outlined by Robotham & Starrfelt (2018).

BORB: Birmingham Object Recognition Battery; CFMT: Cambridge Face Memory Test; CFPT: Cambridge Face Perception Test; CCMT: Cambridge Car Memory Test; FFT: Famous Faces Test; FEQ: Faces and Emotions Questionnaire; L-POST: Leuven Perceptual Organization Screening Test; PI20: 20 Item Prosopagnosia Index; VOSP: Visual Object and Space Perception Battery.

3.3 Investigated aspects of DP

The third aim of this review was to examine which questions are asked in the DP literature. At first glance, it is obvious that DP research is firmly rooted within the disciplines of cognitive neuropsychology and neuroscience; the three by far most frequent scientific outlets of the reviewed studies are Neuropsychologia (n = 33), Cortex (n = 29) and Cognitive Neuropsychology (n = 22), and roughly one third (n = 76) of all studies utilize neuroimaging techniques. This tendency can be further explored by examining which aspects of DP are investigated. To this end, the main topics of investigation were derived from each of the included studies, with each study investigating between one and three overall topics. Figure 4 shows the frequency of each of these topics. Infrequent topics (topics that were investigated in only one study) were collapsed into one category in the figure and included topics such as musical pitch in DP (Corrow et al., 2019), processing of pareidolic objects (Epihova et al., 2022) and face trustworthiness judgments (Todorov & Duchaine, 2008). These infrequent topics are listed in supplementary table S2.

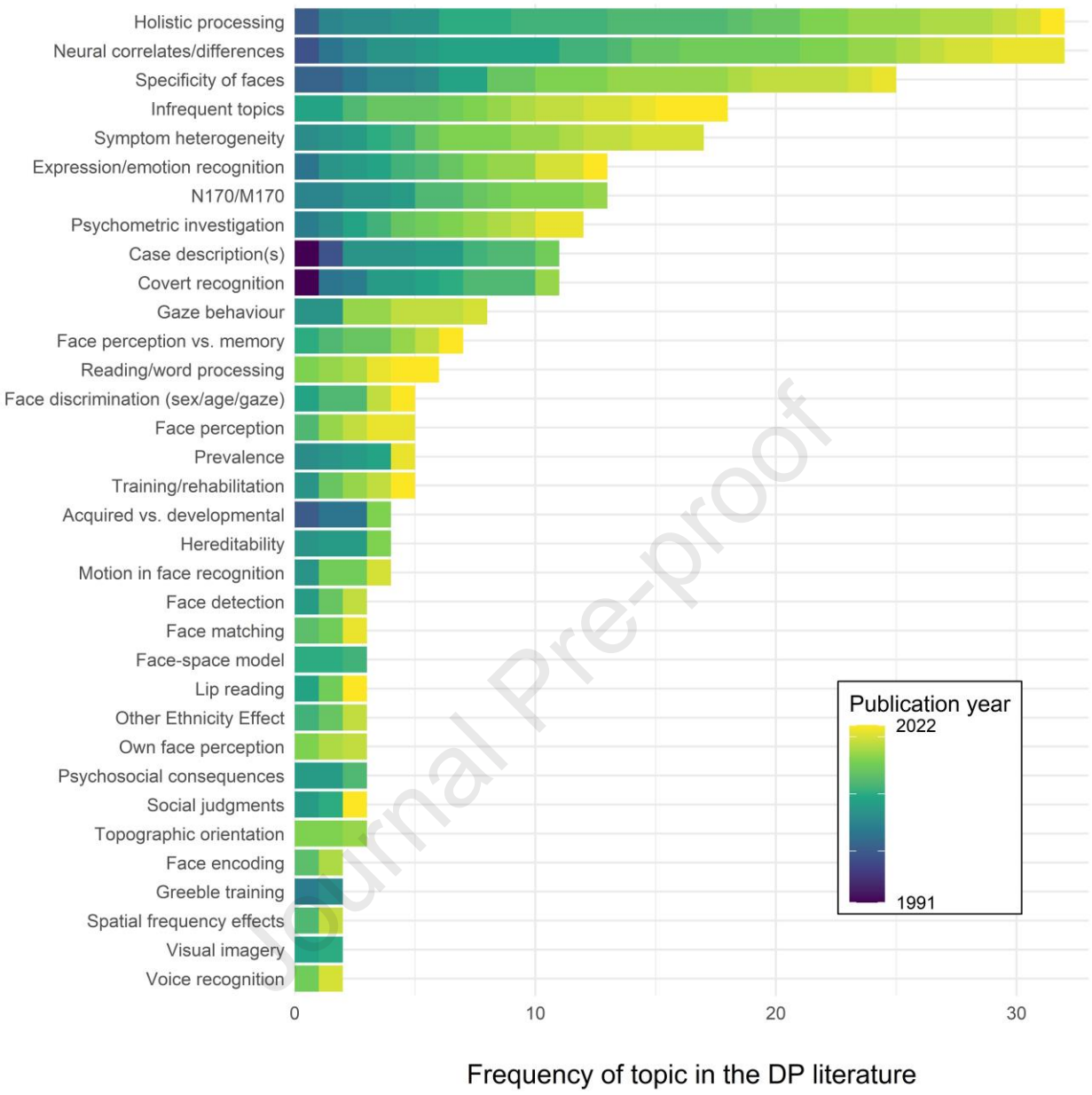


Figure 4. Histogram of topics investigated in the DP literature.

Note. Infrequent topics (topics that appear only once) were collapsed into one category.

45 of the 76 studies utilizing neuroimaging techniques are concerned with mapping the neural correlates of DP by searching for structural (e.g. Garrido et al. (2009)) and functional (e.g. Gerlach et al. (2019)) differences between DP's and controls. A substantial part of this literature (n = 13) is specifically focused on whether individuals with DP exhibit neurotypical N170/M170 potentials using EEG/MEG, and so this topic received its own category in Figure 4. The neuroimaging literature on DP was recently thoroughly reviewed by Manippa et al. (2023), and for our purposes the main issue to note is that the controversies related to definition and classification of DP may pose a challenge for determining the neural correlates of the condition.

Two of the most frequently investigated cognitive topics across the DP literature are holistic processing (n = 32, including papers that investigate 'configural' processing) and the issue of the specificity of faces (n = 25). The majority of the 32 papers on holistic processing aim to test the hypothesis that the face recognition impairment in DP is due to a general deficit in the ability to integrate parts into a whole. Holistic processing may be defined as *a perceptual phenomenon gluing together the features into a gestalt* (Esins et al. (2016), p. 2). The holistic processing hypothesis for faces originates in research on acquired prosopagnosia, where the contested issue is whether the loss of face recognition ability is a category specific deficit for faces (McNeil & Warrington, 1993) or a result of the breakdown of one or more domain general processes necessary for processing faces (Farah, 1990; Gauthier et al., 1999). This issue has also been thoroughly discussed in the context of neuroimaging studies, specifically regarding the existence and role of the fusiform face area (FFA, e.g. Gauthier, 2017; Kanwisher, 2017). Duchaine (2000) provided the first investigation of the holistic processing hypothesis in DP by reporting normal configural processing in a 53-year-old individual with DP, interpreting this as evidence against the holistic processing hypothesis, and in favour of a face specific deficit.

However, other studies point in the opposite direction (Avidan et al., 2011; Carbon et al., 2007), and the sheer amount of research on holistic processing in DP conducted since Duchaine's 2000 study – paired with the fact that the studies are scattered across publication years – suggests that this has been and remains an unresolved debate.

The related topic of the specificity of the impairment in DP – does it affect only faces or also other visual objects (n = 25) - is directly linked to the question of how DP should be defined, i.e. if *non-face object processing impairment* or similar should be a definition building block or an exclusion criterion. The papers in this category include studies that investigate the processing of human bodies (e.g. Rivolta et al. (2017), horses (Weiss et al., 2016) and cars (Gray et al., 2019), as well as mixed object classes (e.g., Gerlach et al., 2016). One could argue that even the studies of word processing / reading in DP (e.g., Rubino et al., 2016; Starrfelt et al., 2018) belong in this group, although we have classified these papers separately in Figure 4. The underlying motivation for examining the question of face specificity is not unrelated to that of the holistic processing hypothesis; if face processing is selectively impaired in DP, it suggests that faces can be dissociated from other perceptual categories. This in turn may be interpreted as reflecting an underlying face specific mechanism or process. The point here is that two of the most frequently studied topics in DP research both tackle a debate that arose within the cognitive neuropsychology of acquired brain injury. Many of these studies also aim to draw conclusions about the cognitive architecture neurotypical face processing, as is common in cognitive neuropsychological studies of acquired cases. Another example of this is the issue of covert recognition in DP (n = 11), which was also originally studied in cases of acquired prosopagnosia, as it was believed that some prosopagnosics *were* in fact able to recognize faces without being

aware of it (de Haan et al., 1987), and that this enabled inferences about neurotypical face processing.

As such, both the holistic processing hypothesis and the issue of the specificity of faces in DP (and to some extent the issue of covert recognition) are installations of perhaps the most central debate in cognitive neuropsychology, namely the debate about the modularity of the cognitive system (Coltheart, 2004; Plaut, 1995; Shallice, 1988). In relation to face processing, this debate is concerned with the question of whether visual cognition relies on specialized, dedicated modules for different visual categories, e.g., faces and words, or whether domain general processes contribute to visual (re)cognition of several types of objects, although perhaps differentially (Farah, 1990; Behrmann & Plaut, 2013). In this perspective, a holistic processing impairment in DP (as shown in e.g. Avidan et al. (2011)) could be interpreted as evidence in favor of the latter position, on the basis that holistic processing is one of the general-purpose mechanisms responsible for several perceptual tasks (e.g. face processing). The presence of non-face object processing impairments in DP (as reviewed thoroughly in Geskin & Behrmann (2018)) could be interpreted similarly following the logic that the processing of different perceptual categories rely on shared cognitive architecture, rather than separate specialized modules for processing face and non-face objects. This debate in relation to face processing is thus related to a similar discussion within cognitive neuroscience / neuroimaging (Dehaene & Cohen, 2011; Kanwisher, 2017; Kanwisher et al., 1997; McCandliss et al., 2003) and the neuropsychology of acquired agnosias (Behrmann & Plaut, 2014; Kleinschmidt & Cohen, 2006; Rice et al., 2021; Rossion, 2022). Indeed, many of the research questions posed in the DP literature aim to draw conclusions or make theoretical inferences about the cognitive architecture of (neurotypical) face processing, as one would in cognitive neuropsychological studies of

acquired deficits. However, this might not be straightforward. When prosopagnosia arises from acquired brain injury, we can be fairly certain that face recognition has changed from unimpaired to impaired based on the lesion, and thus – by the logic of cognitive neuropsychology (Coltheart, 2004; Shallice, 1998) - we may draw inferences about what the system must have been like before the injury. In developmental disorders, this logic does not necessarily apply (Bishop, 1997; D'Souza & Karmiloff-Smith's 2011). When we study DP, we are investigating a cognitive system that likely had a different starting point and developmental trajectory, and thus might operate in ways very different from the neurotypical face processing system. Thus, it is not clear whether DP research can function as a tool to make theoretical claims about the cognitive architecture of (neurotypical) face processing (Starrfelt & Robotham, 2018; Rossion, 2018a), at least not without additional assumptions. This can perhaps explain why many of the issues inherited from the research on acquired prosopagnosia (i.e., holistic processing, the specificity of face processing, and covert recognition) remain contested in DP research.

Another striking characteristic of the DP literature, as figure 4 shows, is that 18 studies investigated an infrequent topic, indicating that it is quite common to research aspects of DP that no one else does. As DP is a relatively new research field, it is not surprising – and not necessarily disadvantageous – that many different aspects of the phenomenon are explored. However, a sign of bifurcation in the literature is clear: on one hand, the DP field is occupied with research questions originating in the acquired prosopagnosia literature based on a framework adopted from cognitive neuropsychology and neuroscience. On the other hand, the field investigates an abundance of niche aspects of DP that have never quite "caught on" as research topics. It is striking that aspects of what DP *is* such as its hereditability (n = 4), its

prevalence (*n* = 5) and of own and other face perception in DP (*n* = 3 and 5, respectively) are so relatively rare. Additionally, only a few studies have aimed to develop therapeutic approaches to DP (5 training/rehabilitation studies and 2 greeble training studies), suggesting that alleviating face recognition problems for individuals with DP has not been a priority for the field. It should however be noted, that quite a few (*n* = 17) studies investigate symptom heterogeneity in DP, suggesting that some research *is* motivated by characterizing what DP is rather than using it as a tool to describe the neurotypical face processing system.

3.4 Recent publications

As the protocol for this review was preregistered in June 2022, only records up until then were included in the present analyses. However, a brief look at the DP literature published after June 2022 is warranted in order to ascertain whether the most recent literature digresses from the literature we reviewed in depth. A follow-up literature search in the five databases (PubMed, Scopus, Embase, Web of Science and PsycInfo) conducted on 23-11-2023 yielded 16 relevant records of empirical studies of DP published since the initial June 2022 search. Relevant records were identified by screening abstracts and were thus not subject to the same scrutiny as the 224 reviewed papers. The 16 studies are listed in supplementary table S3. A brief look at the studies suggests that most of them follow the tendency of previous literature in terms of which aspects of DP they investigate. As such, the studies include investigations of holistic processing (Bennetts et al., 2022), of the neural correlates of DP (Parker et al., 2023; Yan et al., 2023; Zhao et al., 2022) and psychometric investigations (DeGutis et al., 2022; Murray et al., 2022). However, a few of the studies address new questions such as the overlap between DP and autism (Fry et al., 2023; Kamensek et al., 2023) and the role of animal face processing in DP (Epihova et al., 2023).

3.5 Future perspectives

Based on the tendencies in the literature outlined in this review, we finally propose that the DP research field could benefit from branching out both methodologically and theoretically. While there appears to be a vast heterogeneity with regards to the methods used to classify individuals with DP (cf. Figure 3), the overall methodological approach to DP is predominantly experimental and quantitative. As part of our preregistered protocol, we asked whether each included DP study involved a quantitative or qualitative approach, and this analysis revealed that 210 of the 224 included studies took a quantitative approach, while merely 14 used qualitative or mixed methods designs to investigate DP. As such, future research might benefit from widening its overall methodological scope while narrowing its approach to classifying DP. Further – following the preceding discussion of Figure 4 – future research might benefit from posing research questions originating outside the fields of cognitive neuropsychology and neuroscience. This could be pursued by studying e.g. how DP is experienced, how it develops throughout life and how it links to other (medical) conditions through the scopes of clinical and developmental psychology.

4.0 Concluding comments

The goal of this review was to map the definitions, classification methods and topics of investigation in research on developmental prosopagnosia. This revealed that the DP research field has up till now been characterized by a) a multitude of conceptualizations and definitions of the DP phenomenon, b) a wide range of diagnostic criteria and tools and c) a rather narrow set of research questions mainly borrowed from the field of cognitive neuropsychology and neuroscience. On that basis, we argue that the DP literature is characterized by a *conceptual gap*, which is on one hand caused by the overwhelming heterogeneity in DP definition and classification and on the other hand by DP's scientific history as a spinoff subject of acquired prosopagnosia. Further we argue that at least one of the reasons why some central and massively posed questions in the DP literature ('is it just faces?'/'is it a deficit in holistic processing?'/'do DP's exhibit a neurotypical N170 potential?') remain unresolved is due to the conceptual gap brought forth here. Given the history of prosopagnosia as a phenomenon originally reported in patients who suffered brain injury (Bodamer, 1947) and only later demonstrated in individuals without brain injury (McConachie, 1976), it is no surprise that the DP field has adopted some of the fundamental questions from acquired prosopagnosia research. However, there is a stark contrast between losing a fully developed cognitive ability and never developing that ability in the first place (e.g. (D'Souza & Karmiloff-Smith, 2011; Rossion, 2018a; Starrfelt & Robotham, 2018)), and this may have an impact both on which questions are most relevant to address, and what type of conclusions may be drawn. In addition, the definition of DP is heavily resting on negative signs (absence of brain injury, absence of general visual impairment), and we suggest the field would benefit from future research that seeks to fill its conceptual gap by also investigating what DP *is*, rather than what it is not. To this end, more research is needed on how

DP develops, how it runs in families and how it progresses through life. In that endeavor, the DP field could benefit from branching out to publication outlets outside of cognitive neuropsychology and neuroscience. If DP is indeed a neurodevelopmental phenomenon, we would do well to study it also through lenses of developmental and clinical psychology. It is also curious, that while many definitions include self-report of life long problems with face recognition, the various challenges and impairments reported by participants is rarely the focus of investigation. Indeed, only few studies used more open questionnaires or interview techniques with the aim of gathering information about what is like to have prosopagnosia (Adams et al., 2020; Grüter et al., 2007; Murray et al., 2018; Yardley et al., 2008). It is, however, rather likely that collection of subjective experience by DP participants might open our eyes to as of yet unanswered (and unasked) questions. One way for the field to progress, then, could be by opening up not only the research questions asked about DP, but also the methods used to investigate them.

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7.0 Supplementary Tables

Table S1. Characteristics of the 224 included studies of DP.

Publication APA reference	Publica -tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
De Haan & Campbell, 1991	1991	UK	Cortex	1	DP	No	Quantitative	No	No
Bentin et al., 1999	1999	Israel	NeuroReport	1	DP	No	Quantitative	No	Yes
de Gelder & Rouw, 2000	2000	NL	NeuroReport	1	DP	No	Quantitative	No	No
Duchaine, 2000	2000	USA	NeuroReport	1	DP	No	Quantitative	No	No
Barton et al., 2001	2001	USA	Neurology	3	DP	No	Quantitative	Yes	No
Laeng & Caviness, 2011	2001	USA	Journal of Cognitive Neuroscience	1	DP	No	Quantitative	Yes	No
Nunn et al., 2001	2001	UK	Neurocase	1	DP	Yes	Quantitative	Yes	No
Barton et al., 2003	2003	USA	Brain and Cognition	3	DP	Yes	Quantitative	Yes	No
Duchaine et al., 2003a	2003	USA	Neurocase	1	DP	No	Quantitative	Yes	No
Duchaine et al., 2003b	2003	USA	Perception	1	DP	No	Quantitative	No	No
Hasson et al,. 2003	2003	Israel	Journal of Cognitive Neuroscience	1	CP	No	Quantitative	No	Yes
Kress & Daum, 2003b	2003	Germany	Neuroscience Letters	2	CP	No	Quantitative	Yes	Yes

Publication APA reference	Publica -tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Barton et al., 2004	2004	USA	Neurology	1	DP	Yes	Quantitative	Yes	No
Duchaine & Nakayama, 2004	2004	USA	Neurology	11	DP	No	Quantitative	No	No
Duchaine et al., 2004	2004	USA	Neuron	1	DP	No	Quantitative	Yes	No
Avidan et al., 2005	2005	USA	Journal of Cognitive Neuroscience	4	CP	No	Quantitative	No	Yes
Behrmann et al., 2005	2005	USA	Journal of Cognitive Neuroscience	4	CP	No	Quantitative	No	No
de Gelder & Stekelenburg, 2005	2005	NL	Neuroscience Letters	1	DP	No	Quantitative	No	Yes
Duchaine & Nakayama, 2005	2005	USA	Journal of Cognitive Neuroscience	11	DP	No	Quantitative	No	No
Harris et al., 2005	2005	USA	Neuropsychologia	5	DP	No	Quantitative	Yes	Yes
Duchaine & Nakayama, 2006	2006	UK	Neuropsychologia	8	DP	No	Quantitative	No	No
Duchaine et al., 2006	2006	UK	Cognitive Neuropsychology	1	DP	No	Quantitative	No	No
Kennerknecht et al., 2006	2006	Germany	American Journal of Medical Genetics Part A	17	HPA	No	Mixed	No	No
Le Grand et al., 2006	2006	Canada	Brain and Cognition	8	DP	No	Quantitative	No	No

Publication APA reference	Publica-tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Yovel & Duchaine, 2006	2006	Israel	Journal of Cognitive Neuroscience	13	DP	No	Quantitative	No	No
Barton et al., 2007	2007	USA	Experimental Brain Research	1	DP	No	Quantitative	Yes	No
Behrmann et al., 2007	2007	USA	Cerebral Cortex	6	CP	No	Quantitative	No	Yes
Bentin et al., 2007	2007	Israel	Journal of Cognitive Neuroscience	1	CP	Yes	Quantitative	No	Yes
Carbon et al., 2007	2007	Austria	Perception	14	CP	No	Quantitative	No	No
DeGutis et al., 2007	2007	USA	Journal of Cognitive Neuroscience	1	CP	Yes	Quantitative	Yes	Yes
Dobel et al., 2007	2007	Germany	Cortex	6	CP	Yes	Quantitative	No	No
Duchaine et al., 2007	2007	UK	Cognitive Neuropsychology	1	DP	No	Quantitative	No	No
Grüter et al., 2007	2007	Germany	Cortex	8	HPA	Yes	Mixed	No	No
Grüter & Grüter, 2007	2007	Austria	Perception	5	CP	No	Qualitative	No	No
Humphreys et al., 2007	2007	USA	Experimental Brain Research	3	CP	No	Quantitative	Yes	No
Kennerknecht et al., 2007	2007	India	Journal of Human Genetics	1	HPA	No	Qualitative	No	No
Minnebusch et al., 2007	2007	Germany	European Journal of Neuroscience	4	DP	No	Quantitative	Yes	Yes
Righart & de Gelder, 2007	2007	NL	PNAS	4	DP	No	Quantitative	No	Yes

Publication APA reference	Publica -tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Schwarzer et al., 2007	2007	Germany	Psychological Research	4	HPA	Yes	Quantitative	No	No
Steede et al., 2007	2007	UK	Cognitive Neuropsychology	1	DP	Yes	Quantitative	Yes	No
Avidan & Behrmann, 2008	2008	Israel	Journal of Neuropsychology	6	CP	No	Quantitative	Yes	Yes
Bate et al., 2008	2008	UK	Cortex	1	CP	Yes	Quantitative	No	No
Diaz, 2008	2008	USA	The Journal of School Nursing	1	DP	No	Qualitative	No	No
Dobel et al., 2008	2008	Germany	PLOS ONE	7	CP	No	Quantitative	No	Yes
Duchaine, 2008	2008	USA	American Journal of Medical Genetics Part A	19	DP	No	Qualitative	No	No
Garrido et al., 2008	2008	USA	Journal of Neuropsychology	14	DP	No	Quantitative	No	No
Kennerknecht et al., 2008a	2008	Hong Kong	American Journal of Medical Genetics Part A	10	HPA	No	Mixed	No	No
Kennerknecht et al., 2008b	2008	Germany	Frontiers in bioscience	23	HPA	Yes	Mixed	No	No
Rodrigues et al., 2008	2008	Brazil	Dementia & Neuropsychologia	1	DP	No	Quantitative	No	No
Schmalzl et al., 2008a	2008	Australia	Journal of Neuropsychology	6	CP	Yes	Quantitative	No	No
Todorov & Duchaine, 2008	2008	USA	Cognitive Neuropsychology	4	DP	No	Quantitative	No	No
Van den Stock et al., 2008	2008	NL	PLOS ONE	3	DP	No	Quantitative	Yes	Yes

Publication APA reference	Publica-tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Yardley et al., 2008	2008	UK	Journal of Psychosomatic Research	25	DP	No	Qualitative	No	No
Avidan & Behrmann, 2009	2009	Israel	Current Biology	6	CP	No	Quantitative	No	Yes
Bate et al., 2009	2009	UK	Cognitive Neuropsychology	3	CP	Yes	Quantitative	No	No
Bowles et al., 2009	2009	Australia/Israel	Cognitive Neuropsychology	6	DP	No	Quantitative	No	No
Duchaine et al., 2009a	2009	UK	Neuropsychologia	6	DP	No	Quantitative	No	No
Duchaine et al., 2009b	2009	UK	Cognitive Neuropsychology	12	DP	No	Quantitative	No	No
Garrido et al., 2009	2009	UK	Brain	17	DP	No	Quantitative	No	Yes
Gilaie-Dotan et al., 2009	2009	Israel	Cerebral Cortex	1	DP	No	Quantitative	Yes	Yes
Grüter et al., 2009	2009	Germany	Neuroscience Letters	53	CP	No	Quantitative	No	No
Lange et al., 2009	2009	Germany	PLOS ONE	5	CP	No	Quantitative	No	No
Minnebusch et al., 2009	2009	Germany	Behavioural Brain Research	4	DP	No	Quantitative	Yes	Yes
Striemer et al., 2009	2009	Canada	Neurocase	1	CP	No	Quantitative	No	No
Thomas et al., 2009	2009	USA	Nature Neuroscience	6	CP	No	Quantitative	No	Yes
Carbon et al., 2010	2010	Germany	Visual Cognition	14	CP	No	Quantitative	No	No

Publication APA reference	Publica -tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Lee et al., 2010	2010	Canada	Cortex	3	DP	No	Quantitative	No	No
Lobmaier et al., 2010	2010	Germany	Advances in Cognitive Psychology	6	CP	No	Quantitative	No	No
Nishimura et al., 2010	2010	USA	Neuropsychologia	6	CP	No	Quantitative	No	No
Rivolta et al., 2010	2010	Australia	Journal of clinical and experimental neuropsychology	1	CP	No	Quantitative	No	No
Stollhoff et al., 2010	2010	Germany	PLOS ONE	16	CP	Yes	Quantitative	No	No
Susilo et al., 2010	2010	Australia	Cognitive Neuropsychology	1	DP	No	Quantitative	No	No
Tree & Wilkie, 2010	2010	UK	Cortex	4	CP	No	Quantitative	Yes	No
Avidan et al., 2011	2011	Israel	Neuropsychologia	14	CP	No	Quantitative	No	No
DeGutis et al., 2011	2011	USA	Neuropsychologia	5	DP	No	Quantitative	No	No
Dinkelacker et al., 2011	2011	Germany	Journal of Neurology	24	CP	No	Quantitative	No	Yes
Dobel et al., 2011	2011	Germany	PLOS ONE	6	CP	No	Quantitative	No	Yes
McKone et al., 2011	2011	Australia	Cognitive Neuropsychology	3	DP	No	Quantitative	No	No
Palermo et al., 2011a	2011	Australia	Neuropsychologia	14	CP	No	Quantitative	No	No
Palermo et al., 2011b	2011	Australia	Neuropsychologia	12	CP	No	Quantitative	No	No

Publication APA reference	Publica -tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Schultz & Bertolucci, 2011	2011	Brazil	Dement Neuropsychol	1	CP	Yes	Quantitative	No	No
Stollhoff et al., 2011a	2011	Germany	PLOS ONE	16	CP	Yes	Quantitative	No	No
Stollhoff et al., 2011b	2011	Germany	Neural Networks	10	CP	Yes	Quantitative	No	No
Awasthi et al., 2012	2012	Australia	Cognitive Neuroscience	7	DP	No	Quantitative	No	No
Bate & Cook, 2012	2012	UK	Neuropsychology	1	DP	No	Quantitative	No	No
Chatterjee & Nakayama, 2012	2012	USA	Cognitive Neuropsychology	18	DP	No	Quantitative	No	No
DeGutis et al., 2012a	2012	USA	Visual Cognition	10	DP	No	Quantitative	No	No
DeGutis et al., 2012b	2012	USA	Cognitive Neuropsychology	33	DP	No	Quantitative	No	No
Eimer et al., 2012	2012	UK	Brain	12	DP	Yes	Quantitative	No	Yes
Fine, 2012	2012	UK	Cognitive Neuropsychology	1	DP	No	Qualitative	No	No
Huis in ’t Veld et al., 2012	2012	NL	Cognitive Neuropsychology	10	DP	No	Quantitative	No	No
Kimchi et al., 2012	2012	Israel/USA	Cognitive Neuropsychology	10	CP	No	Quantitative	No	No
Leib et al., 2012	2012	USA	Neuropsychologia	4	DP	No	Quantitative	No	No
Rivolta et al., 2012a	2012	Australia	Cortex	11	CP	No	Quantitative	No	No

Publication APA reference	Publica -tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Rivolta et al., 2012b	2012	Australia	Frontiers in human neuroscience	6	CP	No	Quantitative	No	Yes
Russell et al., 2012	2012	USA	Neuropsychologia	10	DP	No	Quantitative	No	No
Towler et al., 2012	2012	UK	Neuropsychologia	16	DP	No	Quantitative	No	Yes
Van den Stock et al., 2012	2012	NL	Neurology	1	DP	No	Quantitative	Yes	Yes
Longmore & Tree, 2013	2013	UK	Neuropsychologia	4	CP	No	Quantitative	No	No
Tanzer et al., 2013	2013	Israel	Cognitive Neuropsychology	12	CP	No	Quantitative	No	No
Avidan et al., 2014	2014	Israel	Cerebral Cortex	7	CP	No	Quantitative	Yes	Yes
Bate et al., 2014	2014	UK	Cortex	10	DP	No	Quantitative	No	No
Burns et al., 2014	2014	UK	Frontiers in human neuroscience	8	DP	No	Quantitative	No	Yes
Daini et al., 2014	2014	Italy	Frontiers in human neuroscience	6	CP	No	Quantitative	No	No
Dalrymple et al., 2014b	2014	USA	Developmental Cognitive Neuroscience	16	DP	Yes	Quantitative	No	No
DeGutis et al., 2014	2014	USA	Brain	24	DP	No	Quantitative	No	No
Esins et al., 2014a	2014	Germany	Nutritional Neuroscience	17	CP	No	Qualitative	No	No
Esins et al., 2014b	2014	Germany	Frontiers in human neuroscience	21	CP	No	Quantitative	No	No

Publication APA reference	Publica -tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Golan et al., 2014	2014	Israel	Attention, Perception, & Psychophysics	12	DP	No	Quantitative	No	No
Johnen et al., 2014	2014	Germany	Neuropsychologia	1	CP	No	Quantitative	No	No
Liu & Behrmann, 2014	2014	USA	Frontiers in human neuroscience	8	CP	No	Quantitative	No	No
Németh et al., 2014	2014	Hungary	PLOS ONE	3	CP	No	Quantitative	No	Yes
Rivolta et al., 2014	2014	UK	Frontiers in human neuroscience	7	CP	No	Quantitative	Yes	Yes
Verfaillie et al., 2014	2014	Belgium	Visual Cognition	6	CP	No	Quantitative	No	No
Bennetts et al., 2015	2015	UK	Neuropsychology	9	DP	No	Quantitative	No	No
Gomez et al., 2015	2015	USA	Neuron	8	DP	No	Quantitative	No	Yes
Kitamura et al., 2015	2015	Japan	Psychiatry and Clinical Neurosciences	1	DP	Yes	Quantitative	No	No
Liu et al., 2015	2015	Canada	Cortex	12	DP	Yes	Quantitative	Yes	No
Lueschow et al., 2015	2015	Germany	PLOS ONE	13	CP	No	Quantitative	No	Yes
Maguinness & Newell, 2015	2015	Ireland	Neuropsychologia	2	DP	No	Quantitative	No	No
Mendez et al., 2015	2015	USA	Cognitive Behavioural Neurology	5	DP	Yes	Quantitative	No	No
Parketny et al., 2015	2015	UK	Neuropsychologia	10	DP	Yes	Quantitative	No	Yes

Publication APA reference	Publica-tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Shah et al., 2015a	2015	UK	Cortex	16	DP	No	Quantitative	No	No
Shah et al., 2015b	2015	UK	Royal Society Open Science	18	DP	No	Quantitative	No	No
Song et al., 2015a	2015	USA	Neuropsychologia	16	DP	No	Quantitative	No	Yes
Song et al., 2015b	2015	China	The Journal of Neuroscience	17	DP	No	Quantitative	No	Yes
Wathour et al., 2015	2015	Belgium	B-ENT	1	DP	No	Quantitative	No	No
Zhang et al., 2015	2015	China	The Journal of Neuroscience	8	DP	No	Quantitative	No	Yes
Behrmann et al., 2016	2016	USA	Neuropsychologia	6	CP	No	Quantitative	No	No
Biotti & Cook, 2016	2016	UK	Cortex	17	DP	Yes	Quantitative	No	No
Cattaneo et al., 2016	2016	Italy	Neuroscience	24	CP	No	Quantitative	No	No
Corrow et al., 2016	2016	Canada	Cortex	7	DP	No	Quantitative	No	No
Esins et al., 2016	2016	Germany	i-Perception	21	CP	No	Quantitative	No	No
Fisher et al., 2016	2016	UK	Cortex	10	DP	No	Quantitative	No	Yes
Gerlach et al., 2016	2016	Denmark	PLOS ONE	9	DP	No	Quantitative	No	No
Klargaard et al., 2016	2016	Denmark	Cognitive Neuropsychology	8	DP	No	Quantitative	No	No
Lohse et al., 2016	2016	UK	The Journal of Neuroscience	15	DP	No	Quantitative	No	Yes

Publication APA reference	Publica-tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Malaspina et al., 2016	2016	Italy	Laterality	10	CP	No	Quantitative	No	No
Moroz et al., 2016	2016	Canada	Neuropsychologia	9	DP	No	Quantitative	Yes	No
Rubino et al., 2016	2016	Canada	Cognitive Neuropsychology	10	DP	No	Quantitative	Yes	No
Tanzer et al., 2016	2016	Israel	Neuropsychologia	12	CP	No	Quantitative	No	No
Towler et al., 2016a	2016	UK	Journal of Neuropsychology	16	DP	No	Quantitative	No	Yes
Towler et al., 2016b	2016	UK	Cortex	10	DP	No	Quantitative	No	Yes
Weiss et al., 2016	2016	Israel	Neuropsychologia	1	DP	No	Quantitative	No	No
Zhao et al., 2016	2016	China	Neuropsychologia	64	DP	No	Quantitative	No	Yes
Albonico et al., 2017	2017	Italy	Neurological Sciences	23	CP	No	Quantitative	No	No
Bate et al., 2017	2017	UK	Neuropsychological Rehabilitation	1	DP	No	Quantitative	No	No
Biotti et al., 2017a	2017	UK	Cortex	20	DP	No	Quantitative	No	No
Biotti et al., 2017b	2017	UK	Cortex	40	DP	No	Quantitative	No	No
Bobak et al., 2017	2017	UK	The Quarterly Journal of Experimental Psychology	10	DP	No	Quantitative	No	No
Burns et al., 2017a	2017	UK	Scientific Reports	11	DP	Yes	Quantitative	No	No

Publication APA reference	Publica -tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Burns et al., 2017b	2017	Singapore	Neuropsychologia	10	DP	Yes	Quantitative	No	No
Collins et al., 2017	2017	USA	Visual Cognition	7	CP	No	Quantitative	No	Yes
Fisher et al., 2017	2017	UK	Cortex	12	DP	No	Quantitative	No	Yes
Gerlach et al., 2017	2017	Denmark	PLOS ONE	9	DP	No	Quantitative	No	No
Jackson et al., 2017	2017	UK	Neuropsychologia	10	DP	No	Quantitative	No	No
Malaspina et al., 2017	2017	Italy	Neuropsychology	12	CP	No	Quantitative	No	No
Palermo et al., 2017	2017	Australia	The Quarterly Journal of Experimental Psychology	13	CP	No	Quantitative	No	No
Rivolta et al., 2017	2017	Australia	The Quarterly Journal of Experimental Psychology	11	CP	No	Quantitative	No	No
Rosenthal et al., 2017	2017	Israel	eLife	10	CP	No	Quantitative	Yes	Yes
Ulrich et al., 2017	2017	UK	The Quarterly Journal of Experimental Psychology	11	DP	Yes	Quantitative	No	No
White et al., 2017	2017	Australia	The Quarterly Journal of Experimental Psychology	6	DP	Yes	Quantitative	No	No
Zhao et al., 2017	2017	China	NeuroImage	64	DP	No	Quantitative	No	Yes

Publication APA reference	Publica -tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Corrow et al., 2018	2018	Canada	Perception	15	DP	No	Quantitative	No	No
Gerlach & Starrfelt, 2018	2018	Denmark	Cognitive Neuropsychology	10	DP	No	Quantitative	No	No
Jiahui et al., 2018	2018	USA	PNAS	22	DP	No	Quantitative	No	Yes
Klargaard et al., 2018	2018	Denmark	Neuropsychologia	15	DP	No	Quantitative	No	No
Malaspina et al., 2018	2018	Italy	Neuropsychology	7	CP	No	Quantitative	No	No
Murray et al., 2018	2018	UK	Scientific Reports	50	DP	No	Qualitative	No	No
Robson et al., 2018	2018	Australia	Neuropsychologia	11	CP	No	Quantitative	No	No
Starrfelt et al., 2018	2018	Denmark	Neuropsychology	9	DP	No	Quantitative	Yes	No
Towler et al., 2018	2018	UK	Cortex	14	DP	No	Quantitative	No	No
Barton et al., 2019	2019	Canada	Cognitive Neuropsychology	12	DP	No	Quantitative	Yes	No
Bate et al., 2019a	2019	UK	Brain Sciences	63	DP	Yes	Quantitative	No	No
Bate et al., 2019b	2019	UK	Cognition	40	DP	Yes	Quantitative	No	No
Biotti et al., 2019	2019	UK	Neuropsychologia	72	DP	Yes	Quantitative	No	No
Cenac et al., 2019	2019	UK	Cortex	50	DP	No	Quantitative	No	No
Corrow et al., 2019a	2019	Canada	Neuropsychologia	10	DP	No	Quantitative	Yes	No

Publication APA reference	Publica-tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Corrow et al., 2019b	2019	Canada	Neuropsychologia	12	DP	No	Quantitative	Yes	No
De Luca et al., 2019	2019	Italy	Neuropsychology	1	CP	No	Quantitative	No	No
Gerlach et al., 2019	2019	Denmark	Brain Communications	15	DP	No	Quantitative	No	Yes
Gray et al., 2019	2019	UK	Cognitive Neuropsychology	46	DP	No	Quantitative	No	No
Hacker et al., 2019	2019	USA	Vision Research	7	CP	No	Quantitative	No	No
Hendel et al., 2019	2019	Denmark	Neuropsychologia	9	DP	No	Quantitative	No	No
Lee et al., 2019	2019	Canada	Brain Sciences	10	DP	No	Quantitative	Yes	No
Malaspina et al., 2019	2019	Italy	Experimental Brain Research	8	CP	No	Quantitative	No	No
Marsh et al., 2019	2019	UK	Scientific Reports	17	DP	Yes	Quantitative	No	No
Murray & Bate, 2019	2019	UK	Psychological Assessment	47	DP	No	Quantitative	No	No
Peterson et al., 2019	2019	USA	Journal of Vision	22	DP	No	Quantitative	No	No
Tardif et al., 2019	2019	USA	Psychological Science	6	DP	No	Quantitative	No	No
Wegrzyn et al., 2019	2019	Germany	BMC Psychology	1	DP	No	Quantitative	Yes	No
Adams et al., 2020	2020	UK	Neuropsychological Rehabilitation	50	DP	No	Qualitative	No	No
Bylemans et al., 2020	2020	Belgium	frontiers in Psychology	5	DP	No	Quantitative	No	No

Publication APA reference	Publica-tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Djouab et al., 2020	2020	Canada, USA	Journal of Cognitive Neuroscience	13	DP	No	Quantitative	No	No
Fisher et al., 2020	2020	UK	Cortex	10	DP	No	Quantitative	No	Yes
Fry et al., 2020	2020	USA	Royal Society Open Science	30	DP	No	Quantitative	No	No
Jiahui et al., 2020	2020	USA	Cognitive Neuropsychology	12	DP	No	Quantitative	No	Yes
Pertzov et al., 2020	2020	Israel	Cortex	7	CP	No	Quantitative	No	No
Stumps et al., 2020	2020	USA	Cortex	30	DP	No	Quantitative	No	No
Tian et al., 2020	2020	China	Cerebral Cortex	64	DP	No	Quantitative	No	Yes
Tsantani & Cook, 2020	2020	UK	Scientific Reports	22	DP	No	Quantitative	No	No
Tsantani et al., 2020	2020	UK	Cortex	22	DP	No	Quantitative	No	No
Wilcockson et al., 2020	2020	UK	Visual Cognition	5	DP	No	Quantitative	No	No
Abudarham et al., 2021	2021	Israel	Neuropsychologia	19	DP	No	Quantitative	No	No
Burns & Bukach, 2021	2021	UK/Denmark	Cortex	28	DP	No	Quantitative	No	No
Gerlach & Starrfelt, 2021	2021	Denmark	Cognitive Neuropsychology	10	DP	No	Quantitative	Yes	No
Haeger et al., 2021	2021	Germany	Frontiers in Behavioural Neuroscience	13	DP	No	Quantitative	No	Yes

Publication APA reference	Publica-tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Liu et al., 2021	2021	China	Frontiers in Behavioural Neuroscience	64	DP	No	Quantitative	No	Yes
Mishra et al., 2021	2021	USA	Neuropsychologia	30	DP	Yes	Quantitative	No	No
Murray et al., 2021	2021	UK	Behavior Research Methods	32	DP	No	Quantitative	No	No
Olivares et al., 2021	2021	Spain	Cortex	1	DP	Yes	Quantitative	No	Yes
Pressl et al., 2021	2021	USA	Journal of Clinical and Translational Science	?	DP	No	Quantitative	No	No
Smith & Susilo, 2021	2021	New Zealand	Scientific Reports	92	DP	No	Quantitative	No	No
Albonico et al., 2022	2022	Canada	Neuropsychologia	7	DP	No	Quantitative	Yes	No
Bate et al., 2022	2022	UK	Brain Communications	20	DP	No	Quantitative	No	No
Bennetts et al., 2022	2022	UK	Cognitive Research: Principles and Implications	12	DP	No	Quantitative	No	No
Berger et al., 2022	2022	USA	Quarterly Journal of Experimental Psychology	43	DP	No	Quantitative	No	No
Epihova et al., 2022	2022	UK	Cortex	30	DP	No	Quantitative	No	No
Gerlach et al., 2022	2022	Denmark	Neuropsychologia	21	DP	No	Quantitative	No	No
Gerlach & Starrfelt, 2022	2022	Denmark	Cortex	34	DP	No	Quantitative	No	No

Publication APA reference	Publica -tion year	Country of research	Journal	*N* (DP)	Term used to denote prosopagnosia?	Distinguishes between associative and apperceptive prosopagnosia?	Predominantly qualitative or quantitative approach?	Neuroimaging used diagnostically?	Neuroimaging used experimentally?
Little et al., 2022	2022	Australia	Cortex	101	DP	No	Quantitative	No	No
Stantic et al., 2022	2022	UK	Behavior Research Methods	31	DP	No	Quantitative	No	No
Svart & Starrfelt, 2022	2022	Denmark	Brain Sciences	115	DP	No	Mixed	No	No
Tsantani et al., 2022	2022	UK	Cortex	34	DP	Yes	Quantitative	No	No

Note. DP: Developmental prosopagnosia; CP: Congenital prosopagnosia; HPA: Hereditary prosopagnosia.

Table S2. List of infrequent topics in the DP literature

APA reference	Topic of investigation
Duchaine et al., 2009b	Social cognition
Lange et al., 2009	Biological motion
Leib et al., 2012	Perception of crowds of faces
Bate et al., 2014	Effects of oxytocin on face processing
Burns et al., 2014	The role of recollection and familiarity on face recognition
Esins et al., 2014a	Pharmocological intervention
Mendez et al., 2015	Overlap between DP and semantic dementia
Tanzer et al., 2016	Alertness
Palermo et al., 2017	Insight into face recognition abilities
Malaspina et al., 2018	Right perceptual bias
Corrow et al., 2019b	Musical pitch
Murray & Bate, 2019	Gender differences
Adams et al., 2020	Coping strategies
Jiahui et al., 2020	Attentional modulation
Smith & Susilo, 2021	Color perception
Albonico et al., 2022	McGurk effect
Epihova et al., 2022	Pareidolic object processing
Svart & Starrfelt, 2022	Comorbidities

Table S3. Relevant DP publications from June 2022 to November 2023.

Publication APA reference	Journal
Bell et al., 2023	Cognition
Bennetts et al., 2022	Neuropsychologia
Burns et al., 2022	Behavior Research Methods
DeGutis et al., 2022	Cognitive Neuropsychology
DeGutis et al., 2023	Cortex
Epihova et al., 2023	Cognition
Fry et al., 2023	Journal of Autism and Developmental Disorders
Kamensek et al., 2023	Autism Research
Little and Susilo, 2023	Psychonomic Bulletin & Review
Murray et al., 2022	Behavior Research Methods
Parker et al., 2023	Brain Structure and Function
Portch et al., 2023	PeerJ
Rahavi et al., 2023	Cognitive Neuropsychology
Stantic et al., 2022	Cortex
Yan et al., 2023	Scientific Reports
Zhao et al., 2022	Neuropsychologia

Table S4. List of studies investigating DP in children.

Publication APA reference	Journal	Primary topic of investigation
McConachie, 1976	Cortex	Case description
Young & Ellis, 1989	Brain and Cognition	Case description
Jones & Tranel, 2001	Journal of Clinical and Experimental Neuropsychology	Case description
Joy & Brunsdon, 2002	Child Neuropsychology	Case description
Brunsdon et al., 2006	Cognitive Neuropsychology	Case description
Schmalzl et al., 2008b	Cognitive Neuropsychology	Training/rehabilitation
Schmalzl et al., 2009	Cognitive Neuropsychology	Face inversion superiority
Wilson et al., 2010	Cognitive Neuropsychology	Specificity of faces
Dalrymple et al., 2014a	Journal of Psychosomatic Research	Psychosocial consequences
Dalrymple & Duchaine, 2016	Developmental Science	Face detection
Bennetts et al., 2017	Quarterly Journal of Experimental Psychology	Prevalence
Dalrymple et al., 2017	Quarterly Journal of Experimental Psychology	Specificity of faces
Pizzamiglio et al., 2017	Neuropsychological Rehabilitation	Training/rehabilitation
Piccardi et al., 2019	Applied Neuropsychology: Child	Topographic orientation

8.0 Supplementary Figures

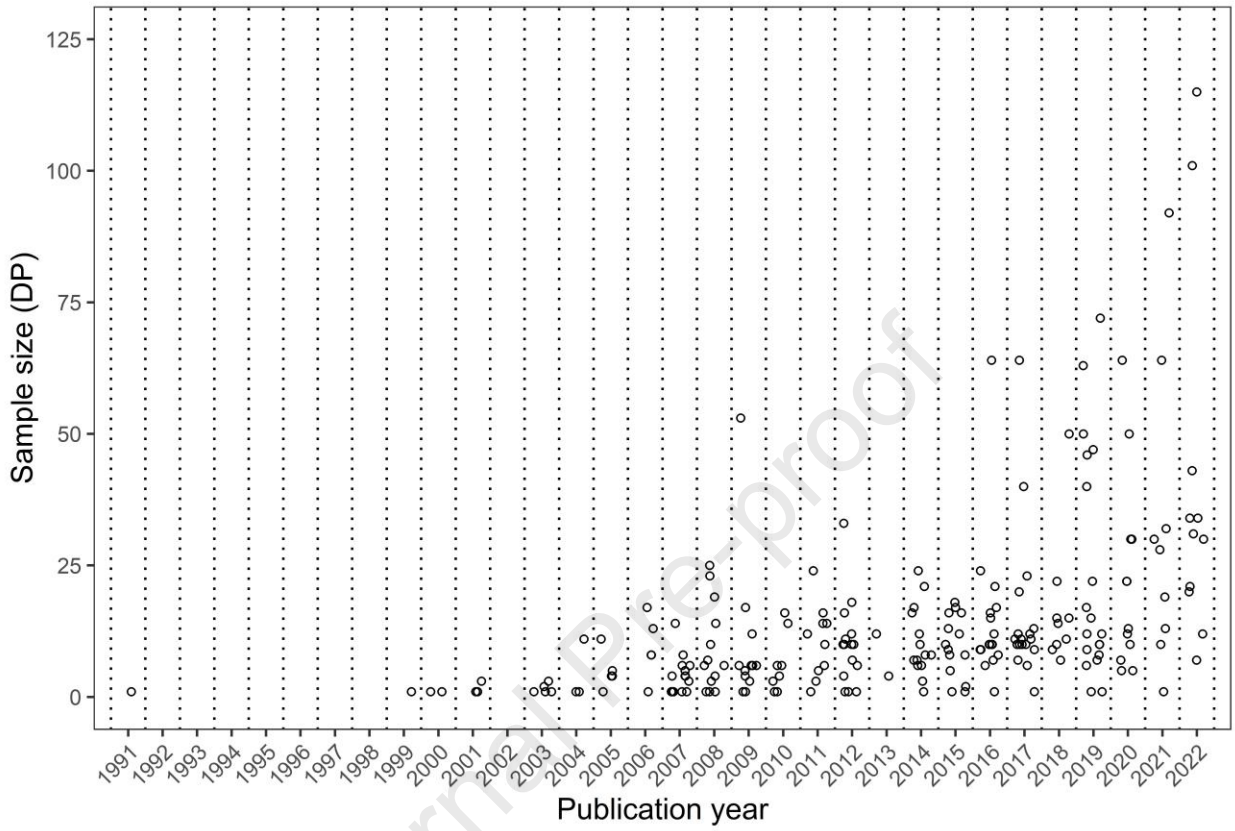


Figure S1. Scatter plot of sample size as a function of publication year of all reviewed DP studies.

Note. Each dot represents one empirical study.

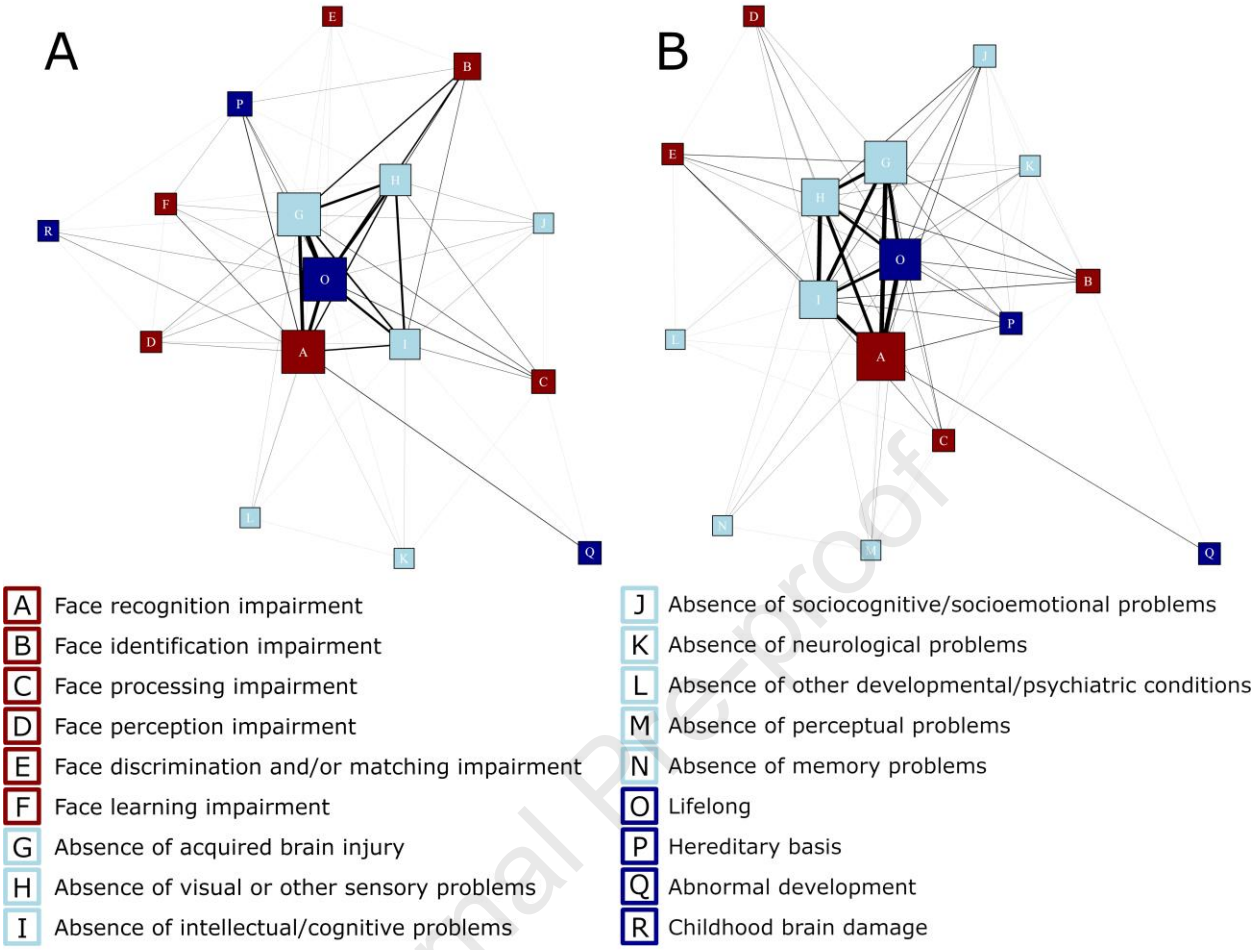
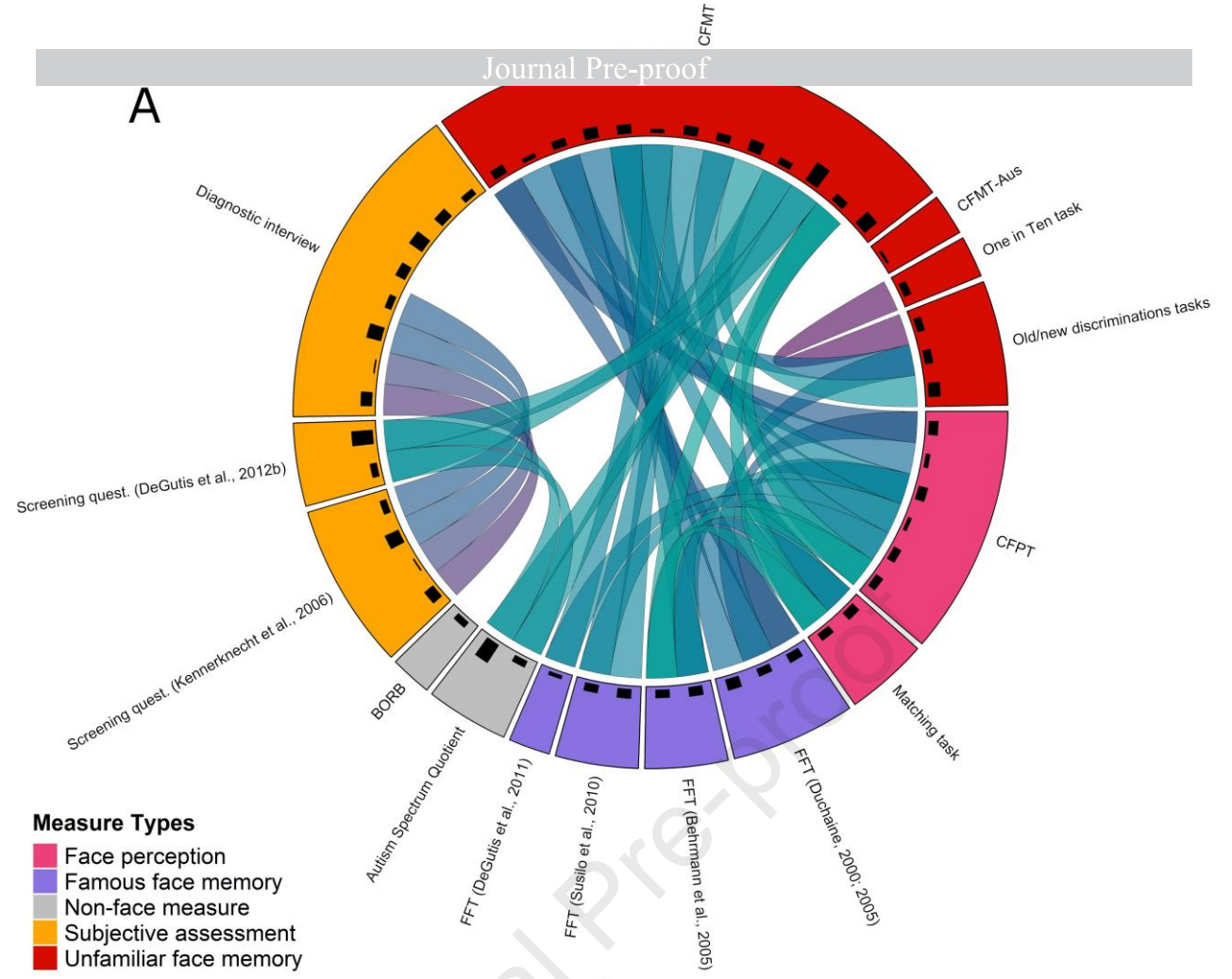


Figure S2. Network graphs of definition 'building blocks' of DP – median split by publication year.

Note. Panel A: Definition building blocks in DP studies performed in the years 1991-2014 (n = 98). Panel B: Definition building blocks in DP studies performed in the years 2015-2022 (n = 98).

Each node represents a semantic building block used in definitions of DP, with larger nodes indicating building blocks more frequent across the literature. The width of the edges indicates how frequently two building blocks appear together. The plot layout was created with the Fruchterman-Reingold algorithm.



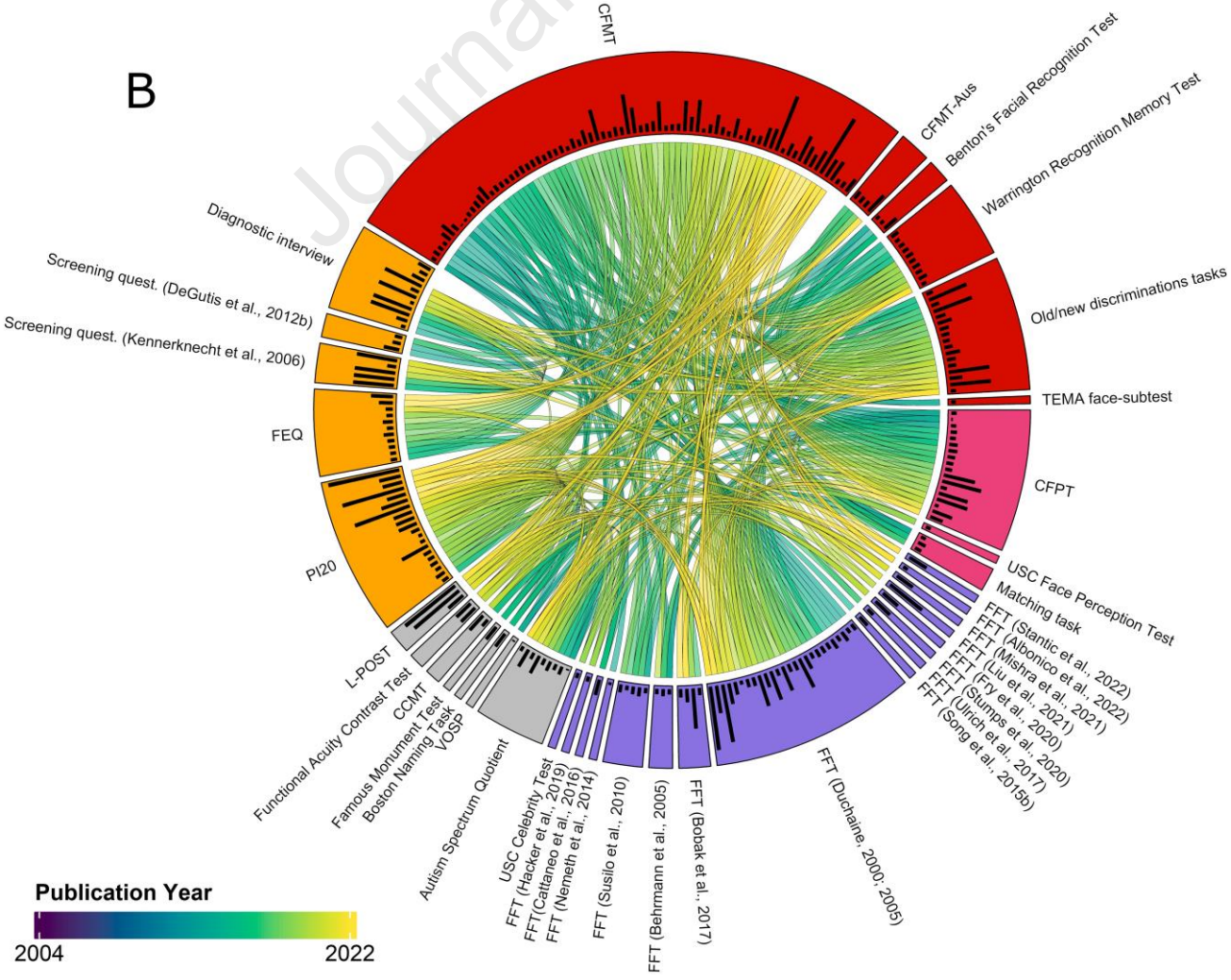


Figure S3. Chord diagram of diagnostic tools used to classify individuals with DP – median split by publication year.

Note. Panel A: Diagnostic tools used in publications from 2004-2013 (*n* = 24). Panel B: Diagnostic tools used in publications from 2014-2022 (*n* = 87).

Each black bar represents one study and the height of the bar indicate the sample size of the DP group of the respective study. A link between two bars indicate that the two tools are used in one study in combination to classify DP. Tools that exist in more than one edition (e.g. the FFT's) are accompanied by references to the study in which that respective edition was used. The distinction between tests of face perception and face memory was done on the basis of the principles outlined by Robotham & Starrfelt (2018).

BORB: Birmingham Object Recognition Battery; CFMT: Cambridge Face Memory Test; CFPT: Cambridge Face Perception Test; CCMT: Cambridge Car Memory Test; FFT: Famous Faces Test; FEQ: Faces and Emotions Questionnaire; L-POST: Leuven Perceptual Organization Screening Test; PI20: 20 Item Prosopagnosia Index; VOSP: Visual Object and Space Perception Battery.

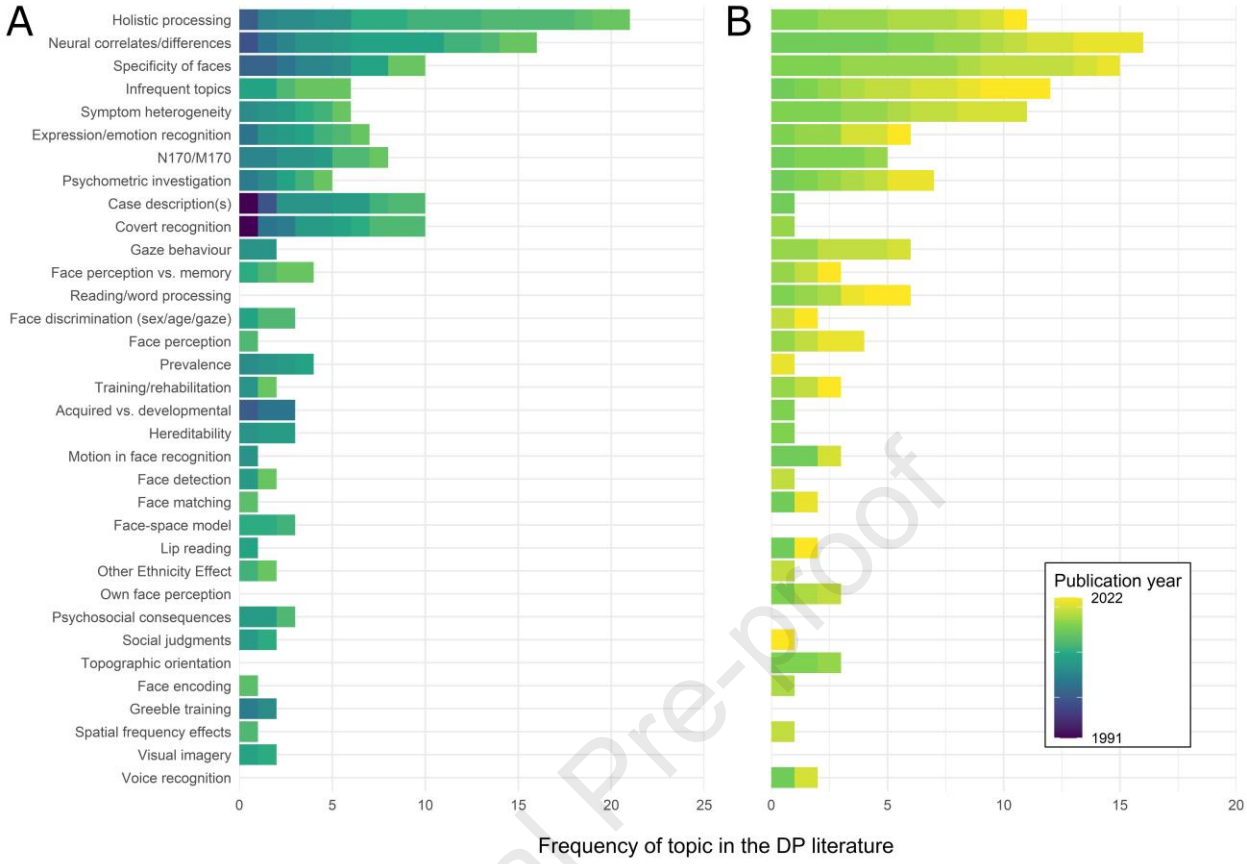


Figure S4. Histograms of topics investigated in the DP literature – median split by publication year.

Note. Panel A: Topics investigated in publications from 1991-2014 (*n* = 114). Panel B: Topics investigated in publications from 2015-2022 (*n* = 110). Infrequent topics (topics that appear only once) were collapsed into one category.