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How observing develops and affects well-being throughout childhood

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How observing develops and affects well-being throughout childhood

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ABSTRACT

The purpose of this study is to map the empirical and theoretical evidence of children's ability for 'observing' or 'noticing' as a core capacity for life within the Learning for Well-Being Foundation's (L4WB) theoretical framework, and how it interacts with overall child development (ages 0–18).[1] More specifically, this review aims to contribute to existing knowledge in three ways: (i) it adds to the evidence of 'observing' as a core capacity for children from a childhood development perspective, (ii) it assesses the interaction of 'observing' with other core capacities and with overall child well-being, and (iii) it looks at the development of 'observing' as a core capacity among significant adults in children's lives (e.g., teachers, educators, parents). Although the available evidence is limited, results show a significant link between children's levels of observation or attention and cognitive skills in general, such as working memory and executive attention. Studies tended to focus on the middle-childhood age range, and with the exception of 'inquiry', are not linked to other core capacities. No studies were found that assessed the levels or application of 'observing' among significant adults.

1 The core capacity was originally called 'noticing' in the Learning for Well-Being Foundation's (L4WB) theoretical framework, but renamed 'observing' over the course of the research project.

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CONTENTS

1. INTRODUCTION

The purpose of this study is to map the existing evidence of children's ability related to 'observing' as a 'core capacity'. The aim is to inform real, positive and efficient changes in general policies and practices for child development. From a developmental perspective, life skills or capacities such as 'observing' are commonly considered 'necessary' for children to achieve optimal development and reach their full potential. To the best of our knowledge, this is the first attempt to map the existing evidence of cultivating 'observing' as a key core capacity and understanding age-related development, links to well-being and other core capacities, and the levels and application of 'observing' among significant adults in children's lives.

This study has four sections. The first gives an overview of the background and general context of the project. The second details the methodology employed to search the literature and select the studies. In the third section, the results are described. The fourth section discusses these results in terms of main findings, data quality, limitations, contribution to existing knowledge and implications for future research.

2. CONCEPTUAL UNDERPINNINGS

Although this study focusses on the core capacity of 'observing', the literature search for this core capacity was undertaken using the original name used by L4WB, 'noticing'. According to L4WB noticing is defined as follows:

> Noticing involves being intensely, objectively and exquisitely aware of the details of life, including one's inner life. Observation is a central factor in noticing, but it is not a passive or distant type of observation; it requires cultivating a deep desire and motivation to engage intimately with oneself, others and the environment. Children often express this 'motivation' through their natural curiosity and their ability to stay intently engaged in something as seemingly simple as watching a bug move through its environment (O'Toole et al., 2016, p. 24).

L4WB argues that every capacity can be understood through physical, emotional, mental, and spiritual perspectives, which interact on a continuum from material to immaterial. Applying the definition of 'noticing' to the four dimensions of L4WB's framework, this capacity is expressed under each dimension as described in Table 1. According to the L4WB hypothesis, each core capacity can be experienced through each perspective (mental, emotional, and physical) and should have a spiritual dimension. Based on the L4WB definitions for 'noticing', the matrix is applied to categorize all studies identified in this working paper (*see Table 1*). Applying the matrix to the 'noticing' capacity contributes to understanding how the literature allows for the theoretical classification of this capacity within the L4WB's four perspectives. The results section compares all studies placed in the matrix as a full body of evidence. More background information on the development of the matrix is available in the MWM overarching background paper.

Table 1: Matrix of Four Perspectives on noticing

			SPIRITUAL (S)
	***content* 'what'**	***process* 'how'**	***intention* 'why'**
MENTAL (M)	A *mental perspective* refers to "our cognitive and rational processes" and the functions of "envisioning, planning and valuing" (O'Toole, 2016, p. 17).	"A *mental* expression of noticing is associated with precise focus and attention to details" (Learning for Well-Being, 2019, p. 3).	"At a *spiritual* level, noticing often relates to a sense of Presence" (Learning for Well-Being, 2019, p. 3).
EMOTIONAL (E)	An *emotional perspective* refers both to "our intrapersonal functions – our inner feelings, motivations and our interpersonal functioning – [and] our interactions with others" (O'Toole, 2016, p. 17).	"An *emotional* expression of noticing relates to attending to nuances, expressions, and the inner and outer connections that flow" (Learning for Well-Being, 2019, p. 3).	
PHYSICAL (P)	A *physical perspective* refers to "the physical senses, to our bodies, and to the material and natural environments" (O'Toole, 2016, p. 17).	"A *physical* expression of noticing is associated with a broad awareness of context, the environment, and the activities that are occurring" (Learning for Well-Being, 2019, p. 3).	

3. METHOD

To conduct the literature review on the capacity for 'noticing/observing' in children, a systematic search was conducted in the following electronic databases: Google Scholar, ERIC, PubMed, and the EBSCO Academic Search Premier database.

The screening stage retained only peer-reviewed studies. To be included, studies had to fulfil several criteria determined prior to starting the systematic search in order to reduce potential bias. First, each study had to focus on children, that is participants under the age of 18, or adults working with children (i.e., teachers, educators). The ethical considerations of each study were also reviewed but they were not an inclusion criterion for this review. Studies that explored the development of 'noticing/observing' solely in adults without any links to children or adolescents were excluded.

Furthermore, studies had to fulfil strict inclusion criteria: being conceptually coherent, using appropriate methods, and being scientifically valid (Appendix A). The time frame for inclusion of studies was set at 20 years (1999 to 2019), but some studies from the 1980s or 1990s were also considered based on their particular relevance for this study. All searches were recorded, including details for each search, number of studies included at the first screening stage, details of studies rejected at the eligibility stage and list of studies accepted. Duplicates were excluded in the identification phase (Appendix B, Records flow).

Guided by experts in areas of child development, the search was conducted using relevant and closely related keywords and combinations of keywords: ‘noticing/observing’, ‘concentration’, ‘focusing’, ’attention’, ‘observation’ AND child* OR adolescent* AND well-being OR development. All possible combinations of terms across keywords were used separately for each database (i.e., noticing AND child* AND wellbeing/ or noticing AND adolescent* and well-being, etc.).

All findings were sorted based on the ‘relevance’ criteria and the first 25 studies were retained for screening for each keyword or combination or words used (e.g., the first 25 studies ordered by relevance found through Google Scholar for ‘observing AND child* AND wellbeing’ were screened). For each combination of search terms, the relevant literature was screened by including empirical and theoretical studies.

Responding to the gap in evidence of ‘noticing/observing’ from the perspective of spirituality, an additional search round was conducted. To identify high-quality evidence relating to spirituality and ‘noticing/observing’, the input of various experts was considered including the Learning for Well-Being Foundation, the Fetzer Institute and individual researchers focusing on spirituality. Among a list of 44 articles, the same key search terms were used in the text of each full article or book chapter in order to search for connections of the ‘noticing/observing’ capacity linked to spirituality. The inclusion and exclusion criteria were applied to the resulting list of spirituality articles. Moreover, the same quality assurance inclusion criteria as in the general ‘noticing/observing’ searches applied (Appendix A).

After this process, none of these studies were suitable for the scope of this literature review regarding the core capacity of ‘noticing’ and its proxies. None of the articles included the terms ‘noticing’, ‘observation’ and ‘attention’ in a meaningful way for the objective of this review, nor was it possible for spirituality to be connected to the ‘noticing’ capacity in children.

3.1 The sample

The searches uncovered 43 papers in total, 27 of which were retained for this study. Among the 14 papers excluded from the review 7 articles did not meet the inclusion standards, while 4 articles were found twice, and 3 articles could not be downloaded from any database.

3.2 Applying the Matrix of Four Perspectives

Each of the studies included in the review was positioned within the Matrix of Four Perspectives to determine to what extent the L4WB hypothesis is supported with evidence. The matrix from Table 1 was applied to organize the articles in the various categories and levels (content, process or intention). Table 2 provides descriptions of possible studies for the various categories, and these descriptions were applied to the included studies. The descriptions in the boxes are based on L4WB publications (*see Table 1*).

After the matrix was applied, two of the authors compared the application matrix, discussed the placement of articles, raised questions, and made necessary adjustments. When agreement was not reached the authors checked the application of the matrix again and discussed the papers in question until agreement was reached. The inter-rater reliability rate was 96 per cent.

Table 2: Types of studies for the Matrix of Four Perspectives

			SPIRITUAL (S)
	content 'what'	*process* 'how'	*intention* 'why'
MENTAL (M)	Studies on the presence of the capacity in children.	Studies that explore how the capacity develops throughout childhood/ in response to specific individual interventions.	Studies that focus upon why children perform/show the capacity and studies that focus on spirituality explicitly.
EMOTIONAL (E)	Studies on the relationship between the capacity and feelings/interpersonal relationships.	Studies on how relationships and/or feelings relate to the capacity.	
PHYSICAL (P)	Studies that focus upon the physical aspects of the capacity, or on the action itself.	Studies into how doing the action and/or the physical environment relate to the capacity.	

4. RESULTS

The existing evidence does not provide a clear overarching definition for 'noticing'. Results emerging from the literature search using the search term 'noticing' are rarely straightforward. In fact, the term 'noticing' is not covered well with empirical evidence and relates mostly to aspects and proxies, such as 'observation', and 'scientific observation'. Indeed, only a few studies emerged as 'noticing' in the search of the keywords. Thus, expanding the search terms to 'observation' and 'attention' (further search terms suggested by research experts) brought in a larger evidence base related to effects and engagement of children in this area of study. In the following section the results of these studies are presented, starting from a theoretical overview extrapolated from studies selected for the scope of this review.

4.1 Observation and attention: theoretical issues

Observation is defined as the act of careful watching and listening, paying close attention to someone or something in order to get information and a statement about something you have noticed. It is a rigorous form of monitoring and an accurate activity, integrating what scientists are seeing with what they already know and what they think might be true (Eberbach and Crowley, 2009). The importance of observation has been nationally and internationally highlighted in existing literature as well as national and state standards (Fox and Lee, 2013). In the USA, observation is considered one of the critical scientific inquiry skills that children should begin to develop in early education (National Committee on Standards for Science Education, 1996). Several American states have identified observation as a basic scientific skill to be introduced in the kindergarten science curriculum, and it has mandatorily been integrated throughout state standards. However, there is a deficiency in research on how to promote observational skills in early childhood.

Children make observations all the time to learn about their everyday world. However, observation is more complex than it seems (Eberbach and Crowley, 2009). Observation must be learned and practised because it includes inference. Observation is also used as a motivation for raising questions, in gathering information, in linking experiences, and in understanding patterns and relationships between events and objects.

This logical reasoning allows scientists to use their observation to understand a phenomenon, even when it cannot be directly observed (Hanuscin and Park Rogers, 2008). The ability to make observations is a core skill of scientists, yet not far removed from the skills all humans use to get through life (Eberbach and Crowley, 2009).

Observation is fundamental to all scientific disciplines (Eberbach and Crowley, 2009). It is recognized as an important initial skill in the early years and in primary science because it assists in the recall of details and aids students in problem solving. Students learn to reflect, synthesize, and interpret material they find through the observation process (Johnston, 2009). Observing helps students focus their curiosity and builds a solid foundation for future scientific learning (Anderson et al., 2006). Attempts to develop scientific ideas without employing observation processing skills lead to rote learning and situationally confined knowledge. Quality observations are detailed, accurate, and often help create an image for those who are hearing them for the first time. The skill of observation is the cornerstone of inquiry in which students are learning to gather evidence, organize their ideas, and propose explanations based on their findings (Anderson et al., 2006). However, there is little common understanding of how observation skills develop in children (Johnston, 2009).

Children have been observing their entire lives. They observe the practical, and intuitive things they feel drive and inform their everyday lives. They make everyday observations with little or no knowledge of the constraints and practices of scientific disciplines (Eberbach and Crowley, 2009). Children's observations are the key to learning their cultural norms and practices, including their language, behaviour and the manipulation of tools. They are influenced by cultural contexts such as skills, values and mannerisms. These observations are necessary for development, but scientifically are considered unsystematic, unfocused and unsustained.

As children develop, they begin to focus their observations and filter out ideas unimportant to what they are engaged in. These observations are influenced by their previous ideas and interests, causing children to observe only what interests them (Johnston, 2009). Everyday expectations also influence how children structure a problem and decide what is important to observe. Expectations influence what observers do and do not notice. They are referred to as 'conceptual spectacles' because the observer is actively seeking what meets their expectations and ignoring the contradictory. These everyday expectations may or may not conform to scientific expectations and can often be considered misconceptions (Eberbach and Crowley, 2009). The ability to separate children's expectations from what they are actually observing is extremely important. Scientists notice multiple dimensions of phenomena when making observations. Children, however, typically notice only certain things such as physical features. Everyday observers are more likely to notice isolated instances of evidence rather than all available evidence owing to a lack of domain knowledge and the fact that many scientific phenomena are too complex to understand without the needed knowledge.

Even everyday environments are considered complex. It can be difficult for everyday observers to meaningfully explain them without background knowledge (Eberbach and Crowley, 2009). This all complicates a child's ability to critically evaluate his or her observational findings.

The methods that children use to record data also affect their ability to use the information. The information they record often does little to support the development of knowledge and reasoning. Children's observational evidence is typically incomplete or irrelevant information. This is due to both developmental constraints and a lack of understanding of the importance of keeping detailed observational notes (Eberbach and Crowley, 2009). The literature can give the impression of children being intent observers whose everyday expectations form their observations. However, their observations do share some similarities with those of scientific observers. Children's observations can be influenced and become more sophisticated by educating them and helping them separate their expectations from their observations.

Children can observe more scientifically when they learn in contexts that reflect disciplinary practice and connect their everyday observations with disciplinary knowledge (Eberbach and Crowley, 2009). Observational skills are best developed through structured experiences including exploration, experimental manoeuvres, generative learning, and the constructivist approach.[2] Children observe using their senses to notice details, sort, group, and classify or sequence (Johnston, 2009). When children can use these senses to observe natural phenomena, it produces positive effects on their development of language, social skills and attitudes. However, fewer formal and informal opportunities to observe and explore natural scientific phenomena are being offered to children due to child safety concerns. There is agreement that the development of good observational skills needs to be supported by focused and structured teaching in order to develop thinking and linguistic skills as well as creative thinking (Johnston, 2009).

Children should be active participants in their own scientific understanding, as it helps to scaffold both their own and others' learning, in a complex social process. This takes place with the child learning alongside the teacher (Johnston, 2009). As children move through the process of becoming better observers, they begin to notice categories and are more likely to relate those with a scientific discipline. The more frequent their observations, the more likely observers are to attach labels that are scientifically significant. Young children can start to make very sophisticated and detailed observations, and are also more likely to document those observations with a variety of representations (Eberbach and Crowley, 2009). They begin to use observational aids, yet can be distracted easily and continue to need support and quality interventions and interactions to refocus on the important information in front of them (Johnston, 2009). Children engaged in scientific activities learn through 'dynamically changing' social interactions with peers and adults, which allows them to begin to raise new lines of scientific inquiry. Without this social interaction and scaffolding, students are likely to move from unsophisticated creative and imaginative general observations to unsophisticated particular observations rather than improving their skills (Johnston, 2009). Multiple opportunities to participate in these types of activities help students transition from observations based on personal expectations to scientific observations (Hanuscin and Park Rogers, 2008). Social interaction during this transition also helps students begin to learn how to coordinate their expectations and evidence as they think, talk, and publicly organize their evidence in ways consistent with a disciplinary learning community (Eberbach and Crowley, 2009).

2 Constructivism is an approach derived from a conception of knowledge as a construction of personal experience rather than a reflection or representation of an independent reality.

Students also learn about differences between observation and inference, and to analyse their roles in developing scientific explanations (Hanuscin and Park Rogers, 2008). Questioning techniques play an essential role in the transition from observations based on expectations to scientifically based observations. Question-asking is important for engaging children in noticing the world (Ashbrook, 2010). By challenging children with questions throughout the process, they are forced to remain focused on the observational situation, even if it is not possible to gather information (Hanuscin and Park Rogers, 2008). To answer the questions, students need time to formulate answers based on the patterns they see (Ashbrook, 2010). They will also begin to take more detailed notes on their observations. Three factors affect the detail of the field notes that students take. The first is the extent to which the records explicitly solve the problem the child is interested in. The problem must be authentic, interest based, and engaging to the student (Eberbach and Crowley, 2009). The second factor is whether or not the child uses their own note taking system. Students need multiple opportunities to create, critique, and revise notes. This allows them to build bases of domain knowledge (Ibid.). The last factor is the amount of mediation by those with more experience. Students need structure to help them understand what is important to include in their notes and what is not. They need a guide and facilitator to encourage them and help them assess the data they have collected (Anderson et al., 2006). Ways teachers can foster children's abilities to observe, infer, and understand phenomena like scientific observers include giving students multiple opportunities to observe in natural environments, asking students challenging questions throughout the process, encouraging them to create their own system of note taking, and allowing them to share and discuss their findings in a safe learning environment.

The developmental neuropsychological literature has made few attempts to study the relationship of developing brain systems to the development of various components of attention. Multiple models of attention in the adult brain have been articulated (Mahone and Schneider, 2012); however, few have been considered as they may or may not apply clinically to the assessment of children. When attentional models are applied to younger children, there is a greater overlap with other developing skills, such as executive function, language and visuospatial skills (White et al., 2009). Tests designed to measure attention are affected by (and dependent on) skill development in these other neurobehavioural domains. Components of attention are typically called selective, divided, and sustained. The selective attention system includes two competing processes: bottom up attention, when the brain automatically orients to sensory features in the environment that stand out in some way, and top-down. Top–down attention involves conscious (effortful) control of attention toward some target (including shifting of attention) (Mahone and Schneider, 2012; Huang-Pollock et al., 2002). Selective attention is often measured using paradigms in which an individual is given two or more concurrent stimuli (or dimensions of stimuli) and must attend to one and ignore the others (Cooley and Morris, 1990). Examples of selective attention measures include: perceptual matching tasks, in which individuals are shown pictures or objects and asked to indicate if a picture is the same or different from another; central-incidental learning tasks, in which individuals are given stimuli representing two or more categories, with one designated as central (or important), and then asked to recall both central and non-central (incidental) details; and visual search or cancellation tasks in which individuals are asked to search a visual display for a predetermined target. Divided attention is required when one is given two concurrent tasks or stimuli and instructed to respond to both components. Tasks requiring divided attention differ from selective attention tasks by virtue of the additional demand for number of items attended to, thus requiring additional top–down control. Sustained attention or vigilance involves the maintenance of attention over time, and is often based on paradigms that require individuals to detect changes in stimuli over longer periods, such as continuous performance tests (Cooley and Morris, 1990).

Anderson (2002), in his review paper, described the developmental profile of attentional control and executive function (EF) processes across childhood. The author proposed a developmental model of EF that includes four components, 'attentional control', 'cognitive flexibility', 'goal setting' and 'information processing, which operate together producing 'executive control'. Literature reviewed stated that the 'attentional control' emerges in infancy and develops in early childhood, whereas 'cognitive flexibility', 'goal setting' and 'information processing' develop during early adolescence (12 years of age). The author stressed the importance of creating longitudinal studies to understand EF components and their functioning, which are very limited in the literature.

In conclusion, the existing evidence does not provide a clear overarching definition for 'noticing'. The concept has loose connections across different disciplines and integrates subtle nuances in different studies that relate to core capacities. In the following sections, empirical studies for the concepts of 'attention', and 'observation' are presented, which indeed are components (proxies/synonyms) of the L4WB definition of 'noticing'.

4.2 Observation and development across childhood

No studies were identified that apply the term 'noticing' to purely describing its development within children or adolescents. By contrast, a body of literature is exploring the development of noticing proxies, such as 'observation'. Of the 27 studies included in this review, 9 focused explicitly on observation in children, of which 8 are empirical studies and 1 theoretical. Most of these studies treat observation as a capacity relevant for the learning process in children but do not extensively analyse the effects that observing has on other capacities, skills or well-being outcomes.

Fox and Lee (2013) conducted a study in an urban school in the USA to assess whether observation was a key component of the inquiry process in young children, and promoted the reinforcement of observation skills by using drawing activities in class. Forty-two children participated (27 males, 15 females) enrolled in 8 different kindergarten classes. The sample was composed of 18 African-American children, 21 Latino, 1 Asian-American, and 2 Anglo-American children. The children were randomly divided into a drawing group and a non-drawing group. Each child had to conduct two observations of live animals. Children in the non-drawing group were asked to respond to some questions while children in the drawing group were asked to draw what they had observed. Results, which were statistically significant, showed that children in the drawing group scored higher on description of observation ($t = 3.08$, $p = .00$) and location ($t = 2.36$, $p = .02$).

Other studies approached observation as a core skill for scientific processing in young children, such as classification, prediction, and hypothesis testing. For example, Johnston (2009) conducted a study in the USA, with 56 children aged 4 to 11 years. The children were divided in seven groups and were asked to sort a collection of toys to assess: i) their skills of observation; ii) how their observations influenced other scientific skills (classification, prediction, hypothesis testing); and iii) what supported their skill of observation. Results showed that children's skills of observation were similar across all ages, and with increasing age of the children the observation skills become more advanced.

Another study on observation skills as the basis of scientific methods (e.g. experiments or comparisons) was made by Kohlhauf et al. (2011). The authors hypothesized that it is possible to foster observation competencies for preschool children. Indeed, a competency model was developed, consisting of three dimensions ('Describing', 'Scientific reasoning' and 'Interpreting'), that was empirically tested with 110 children. The authors analysed observation competency in relation to three skills: 'language skills', 'domain-specific interest' and 'previous knowledge'. Results showed that 'previous knowledge' influenced observation competency, while 'language skills' had weak influence and 'domain-specific interest' had no effect at all.

Furthermore, Tomkins and Tunnicliffe (2001) explored how 12-year-old English children (8 girls, 8 boys) reported for 10 minutes on a brine shrimp bottle ecosystem placed in front of them for observation. The authors analysed the tape-recorded observations and the written diaries compiled by the children after the observations. Findings showed that children mainly observed anatomical and behavioural characteristics of the ecosystem and they also formulated personal considerations and made hypotheses on the functioning of the ecosystem.

Another study focused instead on the importance of observation for the learning process and critical thinking. Vinter and Perruchet (2002) conducted a study in France, comparing observational learning in adults with children 6–10 years of age (71 females, 53 males) in a situation involving a different (non-spontaneous) drawing behaviour ('to watch closely as a figure was drawn on the screen', p. 257). The results demonstrated that children possess capacities similar to those of adults when using observational training, specifically when they reproduced the drawings they had observed.

The only study related to well-being for children found in this review was conducted by Klemm and Neuhaus (2017) in Germany. The authors examined the relationship of emotional well-being and involvement with observation competency in a sample of 70 children aged 4 to 6 years. The study analysed the steps of observation and found that emotional well-being and the capacity to observe were positively linked. The data showed that both emotional well-being and involvement are significant predictors of children's observation competency.

Observation has been studied from a broader perspective, as a component of other skills and capacities, such as critical thinking, drawing, language learning and scientific learning process (inquiry). Among these capacities, interconnection with the core capacity of 'inquiry' was found in two articles (Fox and Lee, 2013; Klemm and Neuhaus, 2017).

Across all studies presented in this section, no sex differences nor cultural traits were explored in the data analyses, even though sex demographics and diverse cultural backgrounds were taken in consideration in some studies.

These findings confirm some assumptions in the L4WB framework of core capacities. They have highlighted that certain aspects of the capacity to 'notice' can be developed through practice and training, and that this capacity has physical, mental and emotional dimensions (e.g., analytical thinking, better attention performance, language capacity, emotional well-being).

4.3 Attention and development across childhood

Research on noticing that includes evidence of children's development was limited to the search terms 'observation' and 'attention'. Attention appears to have been studied since the end of the 1980s and beginning of the 1990s, but in a limited way. Existing evidence shows that attention is conceived as an intrinsic human capacity strictly connected to executive function and that it can be extended through intentional training and educational learning. Below 16 studies on attention are presented, of which 4 are theoretical or reviews and 12 empirical.

4.3.1 Executive attention, selective attention and sustained attention in children

In the child development literature, research on attention comes from two major sources: studies of children with attention deficits and studies of attentional development in non-impaired children. These, in addition to the adult literature, have produced diverse theories, concepts and measures of the construct of attention (Cooley and Morris,1990).

Cooley and Morris (1990) stated that attention is the foundation of most cognitive and neuropsychological functions, even though the developmental neuropsychological literature at that time had made few efforts to study the relationship of developing brain systems and the development of various components of attention. An empirical study conducted by Shapiro et al. (1998) in the USA analysed children's attention functioning, and the various components of attention. 107 children, average age 8.1 years, participated; 44 per cent were male, 59 per cent were white, 36 per cent were black, and 5 per cent were of other ethnic origins. The authors measured patterns of performance using computerized tasks to assess hemispheric activation, verbal and nonverbal attention and sustained attention, by applying complex multidimensional assessment models. Results were not statistically significant but the authors considered that attention in children appeared to be multidimensional.

A study conducted in Australia by Betts et al. (2006) explored the development of sustained attention in 57 children (5–12 years). Children completed a Test of Everyday Attention for Children on computers ('CogState and Score'). Results showed that sustained attention developed throughout childhood, with a fast growth from 5–6 to 8–9 years, and with a developmental plateau from 8–9 to 11–12 years (p. 217). The development plateau was visible on measures of speed, accuracy and variability.

Griffiths et al. (2013) conducted a study in Norway on a regional cohort of 28 extremely pre-term (EPT)/ extremely low birthweight (ELBW) children compared to a control group of 28 term-born children (11 years old). The authors studied a difference in blood oxygen level-dependent activation while children were performing a selective attention and working memory task simultaneously. Overall, EPT/ ELBW children showed significantly reduced blood oxygen level-dependent activation while carrying out the tasks, resulting in a lower performance (fewer correct responses). The authors concluded that extremely pre-term and extremely low birthweight children can often have problems with executive functions, such as working memory and selective attention when reaching adolescence.

Joyce et al. (2018) conducted a longitudinal study analysing individual differences in the development of executive attention among 25 children. The children were tested at 4.5 years old and then at approximately 8.25 years old. Children (44% female) were tested on three measures: EEG recordings (electroencephalography), a Conflict Task, and Parent report of Attention. Results showed that executive attention in 8-year-old children was significantly predicted by a combination of the EEG, conflict task test and parent reporting of children at 4 years. Specifically, attention focusing at 4 was a predictor of executive attention at 8 years of age. In conclusion, data demonstrated individual differences in the development of executive attention and its rapid development during early and middle childhood.

Other studies confirm individual differences in the development of attention throughout childhood. For example, Lane and Pearson (1982) in their review paper described research on the developmental course of attentional processes. Also, in this case, research papers of the 1980s suggested that the development of selective attention in children showed both quantitative and qualitative differences in different age groups. The authors found that qualitative differences between older and younger children depend on the way each age group perceives and organizes incoming information. Moreover evidence showed a progressive improvement in older children in the ability to maintain selective attention.

Klenberg et al. (2001) conducted a study in Finland among 400 3–12-year-old children on the development of attention and executive functions (EFs). The authors administered subtests of attentional and EFs, which included "measures of inhibition and control of motor responses, measures of auditory and visual attention, and measures of planning and fluency" (p. 410). The number of subtests administered to children varied according to their age. Analysis was made by investigating the effects and interactions of age, sex, and parent education level, applying the analysis of variance (ANOVA) in each subset. Significant effects of age were seen in all subtests, and in five subtests girls performed better than boys. Results showed that inhibition, attention and EFs are linked, but they still develop separately. Indeed, the development of inhibitory functions in children is prior to the development of selective attention capacity, which is a more complex cognitive function.

Huang-Pollock et al. (2002) measured the developmental patterns of selective attention in children. The authors carried out two studies in which they compared a group of young adults (27 undergraduate students) and a group of children (44 children, aged 9–10 years), measuring visual selective attention, using the 'perceptual load model' (p. 363). The test consisted of performing a task, using the MEL programming language with a laptop. In Study 1, children's performance of selective attention in responding to high loads of unattended stimuli was as efficient as young adults', while it was not efficient in responding to low loads. In Study 2, four age groups of children were tested in a task that included letter recognition skills under high-speed conditions. In this case, children's performance of selective attention was less efficient than adults'. Results suggested that adults have better control than children over the span of attention, as children found it extremely difficult to perform the task in Study 2.

Ridderinkhof and Van der Stelt (2000) conducted a meta-analysis examining the developmental changes in 'attentional selection' across childhood. The authors used hierarchical regression analysis to investigate age-related differences in attention effects. The main results of the meta-analysis showed that the processes necessary for the development of attentional selection can be found in early childhood. And the performance of these processes tends to improve as the children become adolescents. For example, filtering information is performed well at early stages of information processing among young children, but when introducing other task requirements, filtering decreases at early stages, meaning that young children are more sensitive to tasks and external inputs, which tend to modify their locus of selection whereas older children preserve better their early locus of selection. Also, this study suggests how attention features vary across child development.

Mahone and Schneider (2012) studied the clinical literature assessing the development of attention and its features during preschool childhood. Their review lists the major primary psychometric assessment methods used to characterize the functioning of attention in preschool children. Among the methods for the measurement, tests have been developed to assess mainly sustained attention, selective attention and span of attention. Unfortunately, many of these tests remain experimental and convey little about how to measure attention uniformly in children. For the authors this also meant a general lack of reliable and valid studies that rely on the current available measurement methods.

Only one study examined attention capacity in adolescents. Esteban-Cornejo et al. (2018) examined early life factors (birthweight, birth length, and exclusive breastfeeding) with attention capacity in 421 European adolescents. The sample was composed of 178 boys and 243 girls, aged 12.5–17.5 years, who participated in the 'Healthy Lifestyle in Europe by Nutrition in Adolescence Study'. The authors employed an attention test to assess attention capacity. The main results demonstrated that attention capacity in boys was influenced by early life factors (range 0.144–0.196; all $p < .05$). Moreover, boys who possess three early life risk factors (low birthweight, low birth length, and <3 months of breastfeeding) produced lower scores in attention capacity compared with boys with no risk factors. A limitation of the study was that early life factors did not have any influence on attention capacity of girls, and the study did not inquire into these aspects.

Attention training for learning

Burling and Yoshida (2016) conducted two experiments among 33 children, from 3 to 6 years old, to understand the 'highlighting effect', which is a specific type of learning outcome. Experiment I tested children using an image-based task to capture the highlighting effect which was designed specifically for young children. Experiment II tested the validity of the same image-based task with adult participants. The results from Experiment I provided evidence of the highlighting effect among children and showed differences related to age: older children's ability to shift attention between cues when learning multiple cues was higher than younger children's. Notably, results suggested that memory plays an important role in the generation of these biases.

Ma and Wei (2016) investigated concentration in the learning process among children in elementary school, Grade 3 and Grade 6. The authors used 'picture books', 'pop-up books', 'talking books' and 'e-books' to measure the improvement of concentration performance. The electroencephalogram was used to measure concentration. Children in Grade 3 showed higher concentration and interest in picture books than children in Grade 6. Moreover, the effect of sex was higher than that of school grade regarding the concentration performance employed while looking at various picture book media forms.

Napoli et al. (2005) conducted an experimental study on first, second and third grade students (N = 194) who participated in a 24-week mindfulness training programme. The programme included exercises that should have helped reinforce attention and concentration, such as breathwork, body scan, movement and sensorimotor awareness practices. The authors employed three different tests to measure attention: ADD-H Comprehensive Teacher Rating Scale, Test Anxiety Scale (TAS) and Test of Everyday Attention for Children (TEA-Ch). The control group and experimental group showed statistically significant differences. An increase in selective attention, or the ability to choose what to pay attention to, provided the greatest variance in terms of performance improvement for the experimental group which participated in the mindfulness programme. Moreover, the experimental group showed a reduction of both test anxiety and teachers' ratings of students' attention deficit hyperactivity disorder (ADHD).

Gruzelier et al. (2014) studied the impact of music performance in relation to sustained attention in 33 11-year-old school children studying music. Fifteen had attention indices in the ADHD range. The authors employed the alpha/theta (A/T) training for sustained attention, and sensorimotor rhythm (SMR) training (neurofeedback protocols), during rehearsals in one experimental group and a non-intervention control group. Sustained attention during music performance and creative improvisation was measured. A/T training was more effective than SMR training to improve sustained attention. Overall, results demonstrated that A/T and SMR training protocols helped novice music students in improving attention and could be used as potential learning tools.

4.4 Observing and its physical, emotional, mental and spiritual dimensions

The studies included in this literature review were categorized using the matrix of L4WB's four perspectives (*see Table 3*). Most studies fall within the mental and physical categories towards the tangible and middle part of the continuum. No studies could be classified towards the end of the continuum. Mostly, the articles focus on the mental and physical processes, such as how observation and attention abilities develop throughout childhood and how external inputs influence this capacity in children.

By considering the content and process levels of the continuum together, most studies can be grouped within the mental category, exploring the presence of 'observing' and the proxy of observing 'attention' and how they develop. Only one study (Klemm and Neuhaus, 2017) was linked to the emotional domain by exploring the presence and role of feelings in influencing the observation capacity. A longitudinal study by Joyce et al. (2018) was the only study that linked conflict relationships and effects on the development of attention.

The results show that 'observing' demonstrates clear sensory characteristics (observing, listening, experiencing) that can be placed under the physical dimension of the L4WB theoretical framework, and cognitive characteristics (thinking, reasoning, envisioning, analysing, prioritizing), which are grouped within the mental category. The emotional dimension is hardly supported by the literature identified in this review, while the spiritual dimension is not supported at all.

Two articles were categorized in more than one dimension (Griffiths et al., 2013; Ridderinkhof and Van der Stelt, 2000) while it was not possible to categorize a further eight articles (either theoretical or reviews) into any of the categories.

Table 3: All studies in the Matrix of Four Perspectives

			SPIRITUAL (S)
	***content* 'what'**	***process* 'how'**	***intention* 'why'**
MENTAL (M)	4 studies[3]	8 studies[4]	0 studies
EMOTIONAL (E)	0 studies	2 studies[5]	
PHYSICAL (P)	3 studies[6]	6 studies[7]	

Note. 8 studies could not be placed in the matrix.[8]

3 The four studies placed at the Mental (M) content level are: Esteban-Cornejo et al. (2018); Griffiths et al., 2013; Shapiro et al. (1998); and Eberbach and Crowley (2009).

4 The eight studies placed at the Mental (M) process level are: Lane and Pearson (1982); Fox and Lee (2013); Kohlhauf et al. (2011); Betts et al. (2006); Anderson (2002); Ridderinkhof and Van der Stelt (2000); Burling and Yoshida (2016); and Ma and Wei (2016).

5 The two studies placed at the Emotional (E) process level are: Joyce et al. (2018); Klemm and Neuhaus (2017)

6 The three studies placed at the Physical (P) content level are: Klenberg et al. (2001); Griffiths et al. (2013); Huang-Pollock et al. (2002).

7 The six studies placed at the Physical (P) process level are: Fox and Lee (2013); Vinter and Perruchet (2002); Napoli et al. (2005); Gruzelier et al. (2014); Tomkins and Tunnicliffe (2001); Ridderinkhof and van der Stelt (2000).

8 The eight studies not included are: Anderson et al. (2006); Ashbrook (2010); Cooley and Morris (1990); Hanuscin and Park Rogers (2008); Huang-Pollock et al. (2002); Johnston (2009); Mahone and Schneider (2012); White et al. (2009).

5. DISCUSSION

This study maps the existing evidence of 'observing', as it is covered by the available empirical and theoretical literature. 'Observing' can be understood as a capacity that includes neuropsychological (executive function) and cognitive aspects (observation training, working memory). Based on the database search undertaken using predefined keywords, studies emerged which only look at the mental dimension of this capacity in children, mainly associated to working memory, executive functioning and observation competency.

Indeed, empirical research is focused on analysing the effects of the performance of attention in association with executive functioning or the development of the scientific skill of observation to achieve outcomes for better performance. Few studies were found on practices or interventions and techniques for strengthening observation capacity. 'Observing' appears to be studied as attention competence. As such, this study and much of the available literature seems to suggest that observation and attention are processes to reach 'attentional focus' among children.

When considering 'observing' in combination with children and well-being, only one study faced this issue (Klemm and Neuhaus, 2017). Other studies indirectly show that a better performance on observation or attention can positively influence cognitive skills in general, such as working memory and executive attention. Two studies on practices found that the involuntary actions of playing and drawing reinforced attentional focus (Fox and Lee, 2013; Vinter and Perruchet, 2002). More evidence is needed to prove the reliability of these studies.

Each article reviewed measured outcomes differently. Moreover, the review provided hardly any comparative angle across country contexts, and most of the empirical studies involved limited samples; none were nationally representative. Furthermore, most of the studies were not experimental – many were case studies or non-randomized trials.

Nevertheless, the agreement across studies is that 'observing' and 'attention' improved children's skills related to cognitive functions, such as working memory, executive functioning and scientific observational method. Studies also emphasized that childhood may be a particularly opportune or fruitful period during which to reinforce attention, as self-regulation and executive functioning skills develop markedly during this period.

The available evidence does not include a full developmental perspective of interventions. Studies employ different well-being outcomes and methodological tools to evaluate impact and these impede comparisons across developmental outcomes and contexts.

Notably, most of the studies do not have a clear life course perspective when targeting children. Specifically, the reviewed evidence is mostly based on children of middle childhood age (6 to 11), while evidence of early and late adolescence is less available; the most frequent age ranges were 6–7, 7–9, and 9–11 years, targeting children in primary schools; only one review paper targeted preschool children (3–6 years old) (Mahone and Schneider, 2012). Regarding evidence of adolescents, only one study included children aged 12.5–17.5 years (Esteban-Cornejo et al., 2016).

Samples of the reviewed studies were generally balanced in terms of sex, but sex differences were not routinely analysed or deemed relevant. Only Ma and Wei (2016) noted an effect of sex on children's concentration performance, while Klenberg et al. (2001) showed that girls performed better than boys in some components of attention). Studies were mostly set in Western and high-income countries, and no cultural background nor socioeconomic differences were discussed as variables.

The literature review did not find any evidence of the effects of 'observing' and its proxies on adults working with children.

Apart from these limitations, evidence from the available literature shows that 'observing' and related proxies are linked to the physical and mental development of children, with limited evidence of emotional development. The observation interventions were also found to improve children's physical health, although the physical effects were analysed to a lesser extent. The spiritual dimension of 'observing', according to the L4WB framework, was not well represented in the reviewed studies. Nevertheless, the inclusion of a 'transcendent' or 'spiritual' perspective in 'observing' and contemplative practices studies, could be an interesting area of investigation, particularly considering the diverse contexts and stressors children grow up in.

5.1 Complementarity with other core capacities

Another focus of this study was to capture the complementarity and interlinking of 'observing with other core capacities. The literature rarely included a focus on this complementarity, even if some relationships could be extracted informally from evaluations. Evidence showed a rather poor complementarity of 'observing' practice with other core capacities. When an interlinkage could, however, be observed through proxies, observation was related to inquiry (two studies). More evidence is needed to further ascertain the link between 'observing' and other capacities or skills among children.

5.2 Limitations

This study is not without limitations. One limitation relates to the search for studies documenting the empirical and theoretical evidence of the capacity as 'noticing' among children. The search involving the exact wording 'noticing' did not produce studies relevant for the review. Using proxy keywords such as 'attention' and 'observation' was helpful to retain enough studies but not all may relate exactly to the concept of noticing as defined in the L4WB framework. This finding suggests: (1) the term 'noticing' is not an established keyword in domains measuring this core capacity among children; (2) the empirical evidence of noticing as a core capacity does not sufficiently cover children or significant adults in children's life; (3) observation and attention capture variations of noticing in empirical work and they are studied predominantly as competencies associated with other cognitive skills in currently available empirical research; and (4) most studies are performed within the medical paradigm, especially by psychology and neuroscience.

Another limitation was that no study included objective measurements of children's outcomes, such as student achievement, grades or office discipline referrals. Finally, studies lacked similarities in the methodological tools, enrolled samples and measured outcomes. This leads to difficulties in comparing the true effects of 'observing' on well-being in a more sophisticated way.

5.3 Implications for practice and next steps

The implication of using evidence-based studies on 'observing' warrants further discussion. Many studies on children are about attention and observation in learning processes of some kind. Evidence shows that observation and attention training can produce better learning performance, better working memory, improved attention and better executive functioning. In doing so, evidence also shows some effects and stimulation of areas of the brain that influence the executive functioning, and the cognitive skills of children. Evidence can relate these effects to practice in reinforcing intentional attention. However, school-based intervention studies are less explored in the scientific literature and there is limited empirical evidence that they produce positive effects on physical and psychological outcomes (better well-being). Most studies concentrate on cognitive performance or mental patterns. As such, it could be that the core capacity involving 'observing' could also engage with other activities and practices, such as playing an instrument or doing sport.

However, no consistent studies were found on these activities involving children. Future evidence-based interventions targeting 'observing' among children would do well to test a broader range of practices in which this core capacity may relate to children.

In conclusion, there is still a gap in the literature regarding 'observing' itself and other practices that could foster it. Empirical studies are scarce and, in most cases, did not use sufficiently large sample sizes. There is a need to understand the real implications and traits of 'observing' in children and its effects in relation to the other life outcomes. Furthermore, there is a need to map the complexity of 'observing' and its direct effects to better capture this inner and intrinsic capacity in children and youth.

Future studies need to develop appropriate qualitative and quantitative measurements, using larger samples, to capture the effects of 'observing' and its complexity when it comes to children. This means that future research should focus more on large-scale interventions with the same programme characteristics for targeted child age groups, in order to compare and analyse results using the same methodology. Additional research that has a holistic view of 'observing' would also be beneficial, covering all dimensions suggested by the L4WB framework.

Finally, research is needed to understand the 'observing' practices surrounding adults working with children and how the effects of adults are transferred to children. The implementation of programmes in schools on strengthening attention and observation may reinforce cognitive skills and education performance outcomes. School environments usually provide a safe setting for children and these types of studies can be easy to implement, involving benefits also for teachers. Thinking of future research, schools also present a good study environment for randomizing child study participants towards more rigorous study designs. Importantly, such studies tend to exclude many vulnerable groups, such as children who move in out-of-school contexts, or who are not in school, or in specialized care settings. As such, other informal education contexts should be explored to capture these groups as a focus in future research.

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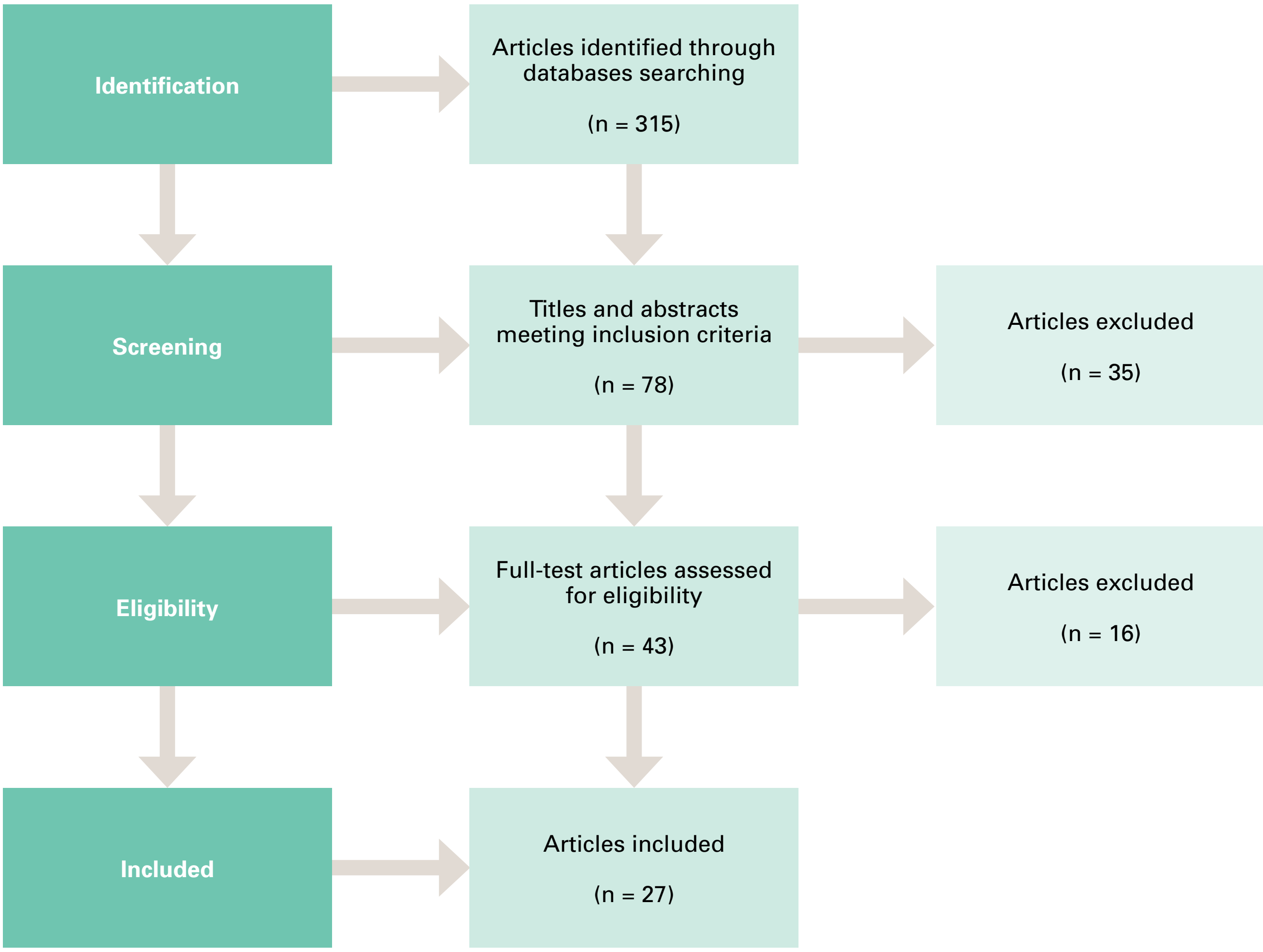
APPENDIX A: INCLUSION CRITERIA

	Criteria	Sub-categories	Description
1	What does it mean for a study to be **Conceptually Coherent**?	Introduction	Topic, purpose, and study rationale are clearly stated.
		Literature Review	The relevant conceptual underpinnings of the issue are fully explained.
		Research questions	Research questions and/or hypotheses are well defined and drawn from sound evidence-based theoretical or conceptual framework.
2	What does it mean for a study to use **Appropriate Methods**?	Methods	The research design and sampling are appropriate for the study. The study includes a well-articulated rationale.
		Theory (especially for studies with a primary theoretical framework)	A sound and established theoretical line is present.
		Data	Relevant data have been employed. Where survey data are used, the sample is well described and clearly appropriate for the task at hand.
		Analyses	The procedures and measures have been selected correctly and applied correctly.
3	What does it mean for a study to be **Scientifically Valid**?	Results	The results of the statistical/empirical tests are fully and correctly interpreted. Basic statistical information, such as probability stats, sample sizes, etc., and coherent explanation of findings are included – avoids overstating the study's importance and generalizability.
4	**Ethics (important but not a requirement to be accepted**)	Ethical review	If the research involves primary data collection and/or the use of sensitive secondary data, ethical considerations are described in the study. For example, the article might include details of the procedures followed to ensure the ethical review of data, an indication that the study received the proper oversight from review board or any mitigation strategies.

APPENDIX B: RECORDS FLOW



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