

Children's Self-Talk in Naturalistic Classroom Settings in Middle Childhood: A Systematic Literature Review

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Highlights

1. The first comprehensive review of research on children's self-talk in naturalistic classroom settings.
2. Children's self-talk mainly functions to regulate task engagement and social processes.
3. Self-talk is mediated by age, ability, gender, task, teachers, and peers.
4. Research methods are reflective (e.g., journals) or momentary (e.g., think alouds).
5. Sociocultural theory and metacognition are the main conceptual perspectives.

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Abstract

Children's self-talk, also known as inner speech, is an adaptive tool for regulating learning and managing the social demands of classrooms. This systematic literature review identified and analysed the existing research on children's self-talk in naturalistic classroom settings in middle childhood. Twenty-four empirical studies on naturalistic self-talk in classrooms met the inclusion criteria and were quality rated. The study methods were varied, and included reflective techniques (e.g., questionnaires, journals, and thought listing) and momentary techniques (e.g., experience sampling method, think alouds). The studies were mainly grounded in sociocultural theory or metacognition. Generally, studies found that self-talk functioned to help children to regulate task engagement and cope with social challenges. Self-talk was also highly malleable: it was moderated across studies by internal and external factors including age, gender, ability, creativity, anxiety, and interactions with teachers and classmates. Suggestions for theory, methodology, and practice are discussed.

Keywords

Self-talk; inner speech; private speech; classroom context; learning; middle childhood.

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A Systematic Literature Review

1 Introduction

An overarching goal in education is to enable children to become self-sufficient learners who can regulate their thoughts and behaviours (Cooper et al., 2007). Self-controlled learners plan, evaluate, and manage their own skills, and develop an enduring interest in learning (Horner & O'Connor, 2007). Self-talk is an important tool which has been widely recognised as a means of regulating thinking and behaviour (Winsler et al., 2007). Accordingly, self-talk can empower children in their personal learning process. It is developmental in nature and constitutes an important part of children's cognitive development (Vygotsky, 1986). The sociocultural context of the classroom is where children continue to acquire language and develop their cognitive skills (Witherington, 2015). However, although much research has been conducted on children's self-talk, research has typically been conducted on audible self-talk in experimental or unnaturalistic classroom settings. Intervention studies typically instruct children to think positive statements and then check if this condition impacts children's engagement and learning outcomes (e.g., Thomaes et al., 2020; Zourbanos et al., 2019). However, the statements that children are directed to think about are generated by the researchers therefore the results of these studies do not give insights into what children naturalistically think to themselves in classrooms. This presents a need to study children's self-talk in naturalistic classroom contexts, taking an exploratory approach and placing a focus on self-talk which influences learning and personal development. This systematic review fulfils an important function by providing the first comprehensive map and summary of the evidence base on children's use of self-talk occurring naturalistically in classrooms. In the review we acknowledge that self-talk is

socially constructed, and that self-talk development is contingent on sociocultural factors and interactions with others in a social environment.

1.1 Self-Talk

Almost as soon as children begin to talk, children will also begin to talk to themselves. This phenomenon is widely referred to in the literature as ‘self-talk’. It is recognised that children make use of self-talk as a tool in regulating their thinking and behaviour (Meichenbaum, 2017; Thibodeaux et al., 2019). This helps children learn efficiently, achieve academically (Thomaes et al., 2019) and can improve their social and emotional competencies (Ashdown & Bernard, 2012). Children who use more self-talk are found to have greater emotional regulation and demonstrate more effort, and persistence (Wang et al., 2017), meaning that self-talk is important for individual development in childhood. Self-talk enables individuals to behave adaptively in academic settings, through the process of coordinating their personal needs with the demands of the learning environment (Zimmerman & Schunk, 2013). Consistent with this view, self-talk enables students to harness their resources to approach tasks, maintain task involvement, recover from frustration or distraction, learn from failure, and correct errors when necessary.

As a social construct, the definition of self-talk has changed over time. It is also defined in a variety of manners by different theorists and researchers. Across studies it has been referred to as inner speech, self-directed speech, internal dialogue, self-statements, egocentric speech, and silent verbal thinking, among other terms. Many researchers have employed definitions of self-talk that do not capture the full extent of this construct or refer to one aspect of it specifically. Vygotsky, for example, deserves special mention for highlighting that self-talk develops out of social talk and is imperative to the development of higher mental functions.

The way a construct is defined has implications for how it is measured. For this reason, one clear and concise definition of self-talk was chosen to encapsulate the self-talk referred to in this systematic review. Burnett (1996) defines self-talk as “what people say to themselves with particular emphasis on the words used to express thoughts and beliefs about oneself and the world to oneself” (p.58). This definition signifies that self-talk can be overt (externalised) or covert (internalised) and that self-talk is comprised of statements that are addressed to oneself and not to others.

1.2 Self-Talk in Middle Childhood

Whether speech is internalised or externalised depends on a child’s psychosocial stage of development (Vygotsky, 1986). However, children’s ability to engage in self-talk generally improves across childhood, and their self-talk becomes increasingly internalised over the preschool and early primary school years (Fahy, 2014; Mishra, 2013). As children enter middle childhood, which spans the ages of 6 – 11-years (DelGiudice, 2018), children have more awareness of the content of their thought processes including an understanding that thoughts can influence mental states and emotions (Carr, 2011). They can also grasp that the mind is not fully controllable and that thoughts can be involuntary or intrusive (Davis et al., 2010).

According to Vygotsky’s (1986) sociocultural theory of cognitive development, individuals develop purposeful speech that becomes self-talk or verbal thought. This aspect of cognitive development is impacted by the social linguistic experiences and abilities of the learner, therefore is culturally constructed. Vygotsky (1986) theorised that development proceeds through the internalisation of social interactions and language within a cultural context (Fox & Riconscente, 2008). From this perspective, self-regulation is deliberate control of one’s own attention, thoughts, and actions, and can therefore be achieved through self-talk (Vygotsky, 1986).

Many researchers consider internalised self-talk as the most sophisticated form of self-talk (Ostad, 2013; Al-Namlah et al., 2012). However, within the field of psychological research, accessing and measuring internalised self-talk poses a significant challenge (Brinthaupt et al., 2015). Consequently, there is little attention given to the study of children's self-talk after the age of seven (Lee et al., 2014). This limits our knowledge on the progression and uses of self-talk across development.

1.3 Self-Talk in Classrooms

In order for students to be able to monitor and regulate their own learning, they must be provided with a positive environment and classroom context in which to learn (Stanulis & Manning, 2002). As previously considered, self-talk that guides thought and action develops in relation to the child's social world and through a process of internalisation (Vygotsky, 1986). In this way, it could be said that internal thought originates in learning experiences to become a child's individual, internal mental thought. Hence, it is important to examine the nature and functions of self-talk in a context in which it regularly occurs: the classroom.

There are many uses for self-talk in classrooms. Through using self-talk, children actively organise and use information while engaging in their activities of the school day (Menzies & Lane, 2011). Self-talk can also be used by students to mentally rehearse the steps in a procedure to prompt them how to accomplish a task. It can be used to provide self-encouragement or validation (Menzies & Lane, 2011). Therefore, children's self-talk can partially control their information processing. What they say to themselves has the potential to direct their cognition while they attempt to solve problems (Vygotsy, 1934/1962). As their self-talk becomes largely internalised, they can use it to deal with cognitive and social-emotional challenges (Lee, 2011) that occur daily in classroom contexts.

Arguably, therefore, self-talk is an important educational resource. By better understanding naturally occurring self-talk in classrooms, educators can use pedagogical

approaches and create classroom contexts that are conducive to adaptive self-talk development. Self-regulatory processes such as self-talk, are teachable and potentially lead to increased student motivation and achievement (Gawrilow et al., 2013; Zimmerman, 2002). In classrooms as sociocultural environments, experiences and relationships cumulatively impact on children's self-talk through communication and interaction (Vygotsy, 1934/1962). Communicating and modelling self-talk that is correcting, coping, reinforcing, or guiding is central to a child's learning and development (Stanulis & Manning, 2002). This places emphasis on teachers as key agents in promoting ways of being in classrooms that can reinforce positive self-talk (Bandura, 2001; Zimmerman, 2013).

If educators and practitioners are to be convinced that self-talk can play an important role in students' development and learning, it is important to understand that self-talk is socially constructed, and that self-talk development is contingent on interactions with others in a social environment. Further research is needed to examine students' use of self-talk in classrooms (Winsler et al., 2007). A renewed appreciation of the fundamentality of self-talk in learning and development, could help ensure that future classroom conversations, pedagogy, and practice, are enacted in ways that align with children's use of positive self-talk, thus promoting children's motivation and achievement in classrooms.

2 Objectives

The present review offers a significant contribution to existing knowledge as there is no current synthesis of research on children's self-talk in naturalistic classroom contexts. The review focuses on the period of middle childhood, given that children aged 6 – 11-years are developing their motivational strategies (Symonds & Hargreaves, 2016) which are central to the longer-term development of their motivation and engagement across adolescence and young adulthood (Symonds et al., 2019). Evidence of self-talk in middle childhood is scarce, possibly due to researchers' difficulty gaining access to internalised self-talk. Few researchers

have sought children's perspectives and have instead tended to rely on adult interpretations and observations. Therefore the empirical evidence on self-talk in middle childhood needs to be gathered and evaluated to best demonstrate its value. To address this issue, the review asks the key question: **What is known about how children use self-talk in naturalistic classroom settings in middle childhood?**

The overarching question is subdivided into five more specific questions about the evidence base on children's self-talk in classroom settings in middle childhood.

1. **What are the theoretical perspectives used to understand self-talk?** Here we map the ontological landscape of self-talk research by cataloguing study theoretical perspectives.
2. **Which research methods are used to study self-talk?** Because capturing internalised self-talk can be challenging for researchers, and studies of this kind are relatively sparse, a summary of methods should help researchers make informed decisions about research methodology going forward.
3. **Which tasks and situations elicited self-talk?** In keeping with a sociocultural, constructivist perspective on the central role of environment in psychological functioning, we sought information from studies on the types of tasks (e.g., solving a mathematics problem) and situations (e.g., participating in oral presentations or a classroom competition) that were the basis for the self-talk children engaged in across studies.
4. **What types and functions of self-talk are commonly captured?** This section of the review aims to identify the diversity and commonalities of self-talk as it is used for a functional purpose in classroom contexts. For example, a self-oriented statement can be used to motivate and self-regulate, or to restrict and discourage, a child's behaviour (e.g., I always remember my homework); as can a negative self-oriented

statement (e.g., I tend to forget to bring my homework to school). Therefore, the types and functions of self-talk can be usefully investigated under the same broad theme.

5. **Which intrapersonal and interpersonal factors commonly impact self-talk?**

Identifying factors important for promoting and hindering self-talk is important for informing classroom pedagogy, and for understanding how children and their classroom environments interact to influence self-talk in development.

To address these research questions, we developed several inclusion and exclusion criteria. The studies included in this systematic review had to i) investigate children's self-talk (as defined by Burnett, 1996) as it occurred in response to ecologically authentic and naturalistic classroom contexts. This criterion was selected to keep the review focused on naïve forms of self-talk to provide a comprehensive description of how self-talk in this age group occurs naturally. Furthermore, self-talk is more forthcoming in naturalistic, classroom environments (Bivens & Berk, 1990) and can be inhibited in laboratory settings (Fuson, 1979). In keeping with this criterion, we excluded intervention studies that manipulated or influenced children's self-talk as well as laboratory-based studies of self-talk.

The studies also had to ii) be an empirical qualitative, quantitative, or mixed methods study; iii) involve participants who were in middle childhood (age 6 – 11-years; DelGiudice, 2018).; and iv) involve participants sampled from the typically developing population who are without diagnosis of a developmental disorder, emotional disorder, learning disability or categorised special educational need—to keep the review focused on the normative development of self-talk. Following from this, participants were not to be sampled explicitly from bilingual populations or be predominantly exposed to their second language while at school. This exclusion criterion was developed to keep the focus of the review on the typical expression of self-talk in middle childhood, which is aided by studying children in first

language classroom settings. Finally, the studies included had to v) rely on children's perspectives and reports as evidence for self-talk rather than the reports of others such as parents or teachers. Again, this exclusion criterion was designed to keep the review findings closely focused on children's experiences of self-talk (i.e., as naturalistic as possible).

3 Search Methods

The review methods were informed by the PRISMA statement and guidelines (Liberati et al., 2009) and the EPPI centre guidelines (Gough et al., 2017), to create a reliable and valid appraisal of the evidence base.

3.1 Selection Criteria

The qualitative and quantitative studies selected, investigated children's self-talk in naturalistic classroom settings in middle childhood. The study participants were typically developing children with English as a first language and the studies reported the children's own perspectives on their self-talk.

3.2 Search Strategy

We searched the databases of PsychInfo (2,285 journals), Education Resources Information Centre (ERIC; 1,201 journals) and ProQuest Dissertations and Theses, to identify published and unpublished studies in the field(s) of psychology and education. These databases were searched simultaneously using ProQuest on 16th September, 2019. The search string was tested and refined using scoping searches. Numerous synonyms for self-talk were identified and used as inclusion terms. Exclusion terms limited studies to those with middle childhood samples. Wildcards were used to extend word endings and to ensure spelling variations (e.g., self-talk vs. self-talk; internalised vs. internalized) were included.

3.2.1 Search String

AB, TI, IF ("self talk" OR ""internalized speech" OR "inner speech" OR "inner voice" OR "self directed speech" OR "private speech" OR "subvocal speech" OR "covert speech"

OR "acommunicative speech" OR "egocentric speech" OR speech-for-self OR "propositional thought" OR self-verbalizations OR "internal dialog*" OR "internal monolog*" OR "sub-vocalizations" OR "self-statements" OR "silent verbal thinking" OR "egocentric speech" OR "internal speech" OR "silent speech") AND AB, TI, IF (school OR classroom OR pupil OR student) NOT AB, TI, IF (preschool* OR kindergarten OR "high-school*" OR "secondary school*" OR "junior high" OR college OR university OR undergraduate OR adolescen* OR youth).

3.3 Screening and Selection Process

The search returned 522 records for screening against the inclusion criteria. The researchers were cognisant of reviewer bias throughout the article screening process. After title and abstract screening, 37 duplicate documents were removed, and 332 records were excluded that did not fit the topic. Of the remaining 190 records, 19 documents could not be retrieved through university library holdings or personal communication to the authors. The remaining 134 documents were retrieved, and their methods and participants sections were reviewed to determine whether they met the inclusion criteria. This resulted in the exclusion of 20 studies that were intervention based, 22 studies with atypical samples (e.g., learning disabilities), 33 studies that did not directly investigate self-talk in classroom settings, 26 studies of samples outside the age range of middle childhood, and 11 documents that were not empirical studies. The remaining 24 studies met all the inclusion criteria and were included in the review.

3.4 Data Extraction and Synthesis

The contents of each study were extracted using a data extraction table designed specifically for this study, to capture demographic data about the studies (i.e., country of origin, sample age range and size) and information pertaining to the five research questions on (1) theoretical and conceptual frameworks, (2) methods, (3) categories of self-talk, (4)

functions of self-talk, and (5) factors influencing self-talk. The information was carefully synthesised using the approach of Narrative Synthesis (Snilstveit et al., 2012).

3.5 Quality Appraisal Method

Gough's (2007) framework for appraising the quality and relevance of evidence was used and Weight of Evidence A (WoE A) and WoE C were adopted. WoE A is the extent to which a study has been well executed and it is a measure of methodological soundness and trustworthiness. WoE C is the fine-grained relevance of the evidence to the review questions (e.g., having the correct sample, relevant methods of data collection, relevant results, and ethical underpinnings). WoE B was not used given that all studies were already pre-screened for the relevance of the overall study design (e.g., empirical descriptive studies of self-talk).

WoE A (methodological soundness) was assessed using the scoring framework developed by Bond et al. (2013) for evaluating quantitative and qualitative studies, that comprises the categories of (1) appropriateness of design, (2) clear sampling rationale, (3) well executed data collection, (4) analysis that was close to the data, (5) emergent theory related to the problem, (6) evidence of explicit reflexivity, (7) comprehensiveness of documentation, (8) negative case analysis, (9) clarity and coherence of reporting, (10) evidence of researcher-participant negotiation, (11) transferrable conclusions, and (12) evidence of attention to ethical issues. Studies received scores of 1 (indicating full alignment), 0.5 (partial alignment), and 0 (no alignment) for each criterion. Bond et al.'s (2013) cut off scores were adopted for each study (a total score of: 0 – 4 = low quality; 5 – 8 = medium quality; 9 – 12 = high quality).

WoE C (appropriateness of focus) was evaluated using author designed criteria of: (1) utility of the evidence to the four research questions (scored 0 – 4) and (2) explicit methods underpinned by ethical practice (scored 0 – 2). Following Bond et al.'s (2013) logic, we

scored the studies as having low (scores of 0 – 2), medium (scores of 3 – 4), or high (scores of 5 – 6), appropriateness of focus.

4. Results

Table 1 summarises the 24 studies according to their study and sample characteristics, main methods, theoretical perspectives, and weight of evidence.

[Insert Table 1 here]

4.1 Quality Appraisal Results

Following WoE A, none of the review studies were judged as being of low methodological quality (Table 1). Fourteen were judged as medium methodological quality while ten were judged as high methodological quality. It is important to note that some studies could have included clearer descriptions of their participants and sampling methods, which affected the evaluation of their appropriateness of focus (VanLeuvan & Wang, 1997; Burnett & McCrindle, 1999; Burnett 1995/1999; Berk, 1986). The majority of studies left some evidence of attention to ethical issues remaining to be seen with only two areas providing sufficient detail in their writing (Lodge et al., 1998; Lee et al., 2014).

In relation to WoE C, seventeen studies were evaluated as having high appropriateness of focus, meaning that they contributed valuable and relevant information across many of the review questions and used explicit methods underpinned by ethical practice. Six were evaluated as having medium appropriateness of focus, while just one was deemed as having low appropriateness of focus (Burnett & McCrindle, 1999). This study did not succeed in outlining the overarching theoretical perspective of the study nor in outlining categories or functions of self-talk.

4.2 Overview of the Studies

The twenty-four studies that met inclusion criteria were published between 1984 and 2015, with 5 studies published in the 1980s, 10 studies in the 1990s, 3 studies in the 2000s

and 6 studies in the 2010s, potentially signalling a resurgence of research on self-talk in middle childhood classroom contexts in more recent years. Study samples ranged in size from eight children (Lee et al., 2014) to 747 children (Burnett, 2003). The sample size seemed to be determined by the feasibility of using certain methods with either a small or a larger sample. The average age across the 15 studies that reported a mean age, was 10 years with the youngest participants being 7-years and the oldest 13-years. The remaining studies reported school grades which ranged from 2nd grade to 7th grade or middle school. The majority of studies were conducted in North America (12 studies). Six studies were conducted in Australia, two in New Zealand, two in the Netherlands, one in Spain and one in England.

4.3 Theoretical Perspectives

Below we discuss the most common theoretical perspectives used across studies, with the full list available in Table 1. Vygotsky's sociocultural theory of cognitive development was most frequently referred to (12 studies, 50%). In Vygotsky's (1986) perspective, private speech originates in early socialised language and is used for self-direction. Children learn to speak to themselves using the same words that their parents and teacher say to them when children encounter similar situations. In this way, goal-directed thought and other higher mental functions are founded in participation in dialogue and social interactions (Vygotsky, 1986).

Other sociocultural perspectives included Kohlberg et al's (1968) theory that private speech initially increases with development and then decreases (Berk & Potts, 1991; Berk, 1986; Zahner & Moschkovich, 2010); and Piaget's (1936/1952) theory of cognitive development, Bandura's Social Learning theory (e.g., Bandura, 2001), and Luria's Theory of Brain Functioning (1976) (Rohrkemper & Bershon, 1984; Zahner & Moschkovich, 2010;). Blöte's (1995) sociocultural model of classroom interaction was also used (by Burnett 1999;

2003). Blöte (1995) describes how teachers' expectations of students influence how feedback is presented to students. Students internalise the feedback received from their teachers then reconceptualise their self-expectations, so they are congruent with their teachers' expectations.

Metacognitive perspectives were also used by studies, including cognitive behavioural theory (Kendall, 1984) and cognitive behaviour modification (Meichenbaum, 1977) which were used by Cunniff (1999) and Berk (1995) to emphasise the link between what people say to themselves and how they feel and behave. Bronson's (2000) concept of cognitive self-regulation was used by Burnett (1999; 2003), Lee et al. (2014) and Lee & McDonough (2015). Bronson (2000) defines self-regulation as a process of goal directed action, on-task behaviour, cognitive self-monitoring, self-correction, self-organisation and following a plan of action. Finally, two studies used cognitive models of psychopathology to examine the self-talk of children experiencing anxiety, from the perspective that emotional distress is caused, at least in part, by dysfunctional self-talk (Lodge et al., 1998; Prins & Hanewald 1997).

The different theoretical perspectives through which self-talk can be studied, represent the complexity and richness of self-talk as a construct. These varied psychological perspectives offer different insights into the self-talk phenomenon. Collating the psychological perspectives which overarched the review studies, effectively pointed to theoretical assumptions about self-talk, the way it functions, what aspects of it are worthy of study and what research methods are aligned with a study's chosen perspective. Each perspective represented in Table 1, among other theoretical perspectives, are worth consideration when designing future self-talk studies. Different overarching perspectives offer different standpoints from which self-talk is observed, measured, and analysed, and therefore produce different results. Only as different perspectives build upon one another, can we understand, influence and harness children's self-talk in classrooms.

4.4 Research Methods Used to Study Self-Talk

There was a variety of methods used across studies which included think-aloud, thought listing, the experience sampling method, journaling, different forms of qualitative interview, observation, and structured questionnaires.

Think-aloud was used by Lodge et al. (1998) and thought listing was used by Lodge et al. (1998) and Prins and Haywald (1999). Think-aloud requires an individual to verbalise his or her self-talk while concurrently performing a predetermined task (Arnkoff & Glass, 1989). Thought-listing differs from think-aloud in that the individual provides a retrospective verbal or written account of the self-talk experienced during a specific time period.

The Experience Sampling Method (ESM) attempts to sample from people's everyday experiences and was used in one study (Manning, 1990). In ESM research, participants are signalled to respond to a questionnaire at random intervals by a beeper or mobile technology. In Manning's (1990) study, students completed a self-talk log twice each morning during independent seatwork activities.

Four studies used semi-structured interviews to collect children's reflections and opinions on their self-talk (Rohrkemper & Bershon 1984; Lee et al, 2015; Weng Fai Lee, 2011; Segal-Andrews,1994), with one study prompting children's prospective self-talk using vignettes (Segal-Andrews 1994).

Four studies used unstructured observation (Segal-Andrews 1994; Vanleuvan & Wang, 1997; Girbau, 2002; Matuga, 2003; Zahner & Moschkovich, 2010) to give a naturalistic description of children's self-talk utterances. Two studies used structured observation (time-sampling) to record self-talk during think-aloud tasks (Berk & Potts, 1991; Berk,1986).

Several studies used structured questionnaires to study self-talk. The questionnaires included the *Thought Matching Questionnaire* (25-items; focus on problem solving) (used in

Rohrkemper, 1986), the *Self Talk Inventory* (20-items; focus on reading and math related self-talk) (used in Burnett, 1999; Burnett, 1996; Burnett & McCrindle, 1999; and Burnett, 2003), and the *Children's Cognitive Assessment Questionnaire* (50-items; focus on different types of motivational self-talk) (used in Zatz & Chassin, 1985; and Prins & Hanewald, 1994). Other measures included the *Self-Talk Questionnaire (STQ)* (used in Lee and McDonough, 2015; Lee, McDonough & Bird, 2014) and the *Socialization Self-Statement Test (SSST)* (used in Stefanek et al, 1987).

Two studies used journaling (Weng Fai Lee, 2011; Cunniff, 1999). In Cunniff's (1999) study, participants were asked to record whatever was going through their mind while completing academic work. Weng Fai Lee (2011) took a similar but slightly different approach by asking children to write a reflective journal on the topic 'I talk to myself when ...', after a teacher had introduced the concept of self-talk to them.

Finally, Lidstone et al. (2010) used the articulatory suppression research method, along with the dual task paradigm, to investigate if planning is reliant on self-directed speech. Here, researchers prevented self-directed speech by asking participants to repeat a sequence of words while completing the primary task.

4.5 Study Trends

Fitting with a Vygotskian cultural historical approach, we analysed the trends in publication year, geographic locale, study theoretical perspectives, and study methods, to give further insight into the field of self-talk in classrooms in middle childhood. We found that the self-talk publications emerged in the USA in the mid-1980s, and it was not until the mid-1990s that research began to be published in Australasia (Australia and New Zealand) and Europe. Vygotsky's sociocultural perspective on self-talk was the predominant theory across the decades, with cognitive behavioural theories being used in the 1980s and 1990s but not in the 2000s. Questionnaires, observations, interviews, and methods of recording

utterances (e.g., think alouds) were used relatively consistently across time, with written methods for recording self-talk (journaling and thought listing) emerging in the late 1990s. All geographic locales (the USA, Australasia, and Europe) used Vygotsky's sociocultural perspective to frame their studies, with cognitive behavioural perspectives being used in the USA and Australasia but not in Europe (Figure 1). There was a clear trend in use of methods with observation only being used in the USA, and Australasian studies using questionnaires the most (Figure 2) mainly due to the popularity of Burdett's (1996) Self-Talk Inventory. Finally, the different theoretical perspectives did not appear to relate systematically to the different methods used, other than studies with no theoretical perspective using only questionnaires (Figure 3).

4.6 Tasks and Situations Which Elicited Self-Talk

There were a variety of tasks and situations which elicited self-talk across studies and are included in Table 1. It was considered important to appraise the influence of the qualities of a task or situation where the self-talk occurred or was measured, when collating the kinds and categories of self-talk which were produced. Notably, 10 of the included studies examined self-talk during mathematical tasks, tests or activities or in the context of mathematics. Perhaps this was because mathematics often involves problem solving tasks in which children are likely to encounter obstacles and difficulties (Berk, 1986). Moreover, elementary school mathematics has been found to depend heavily on verbal processing (McFie, 1975). One study used maths problems as well as a puzzle, namely the block design subtest of the Wechsler Adult Intelligence Scale-Revised (Wechsler, 1981). Two other studies also involved investigating self-talk during tasks of a problem-solving nature. These tasks included a Lego construction task and the Tower of London task. One study investigated children's self-talk during creative activity (drawing) and two studies elicited self-talk about social situations through vignettes or stories. Four studies made use of the

Self-talk Inventory (STI) as a tool to measure self-talk which meant self-talk was investigated in the context of imaginary classroom situations. The final four studies investigated self-talk in a more general way, during general classroom activities which were undisclosed or through open discussion.

Interestingly, the tasks or situations designed to elicit self-talk across studies also varied in whether they were individual or group tasks. Just two studies involved cooperative tasks where children worked in a pair or a group scenario. Additionally, whether the children produced self-talk under high threat or low threat conditions also varied. In some studies, the children produced self-talk under experimental conditions as opposed to more naturalistic conditions; although the elicited self-talk was primed to be representative of what would normally happen under similar circumstances in classroom contexts. Future research will require consideration of the variability of self-talk across tasks of a different nature, whether they are independent or cooperate and high threat or low threat. This will enable researchers and educators to better understand the situations and contexts which elicit self-talk of different types and for different functions.

4.7 Types and Functions of Self -Talk

The majority of studies included in this review (88%), categorised the self-talk of children in their sample. Conscious that the types of self-talk categorised were produced by a variety of methods (see above section), we compiled a list of the main categories (see Table 2). Some studies took a deductive approach, and some studies took an inductive approach to categorisation which lends itself to an interesting array of categories across studies. Although in many studies categories were broad and referred to just ‘positive or negative’ statements, a predominant and relevant pattern across the studies was for elicited and prospective self-talk to concern children’s regulation of their task-oriented engagement, i.e., managing their thoughts, emotions, and behaviours to maintain their focus on schoolwork (Table 2). Studies

also categorised statements reflecting children's critical and creative thinking about the task, children's resilience oriented self-talk (e.g., coping with challenges), and children's self-talk about their classroom social environments (Table 2).

[Insert Table 2 here]

Below we give an extended overview of main categories of self-talk, which are (1) task-related; facilitating task control through instructional, motivational, or affective statements; and (2) self-related; managing emotional states and perceived social challenges to maintain personal equilibrium in the classroom.

4.7.1 Task-Related Self-Talk

Across studies, self-talk was used by children to self-regulate to maintain high quality, successful task engagement. Self-talk was described as an important aid to help children overcome impulsive action and to metacognitively regulate their task-related behaviours (Burnett, 1995; Berk, 1986). Children were documented using self-talk for self-guidance, planning, cognitive processing, cognitive monitoring, and evaluation of behaviour (Lidstone et al., 2010; Matuga, 2003). In Lee and McDonough (2015) self-talk was noted as increasing in frequency during difficult or challenging tasks when there was high demand for self-regulation. Depending on the task at hand, self-talk was also observed to have a problem-solving function (Rohrkemper & Bershon, 1984), and involved strategising, strategic instruction, self-questioning and persevering to resolve issues (Lee et al., 2014; Rohrkemper, 1986; Prins & Hanewald, 1997). Matuga (2003) also noted that participants would often sing, make noises, and make up rhymes while they were engaged in drawing activities. This kind of self-talk was self-stimulating and supposedly helped reduce stress within certain situations, playing a self-regulatory role during creative activity (Matuga, 2003).

4.7.2 Self-Related Self-Talk

Researchers also documented self-talk being used to maintain psychological equilibrium while doing tasks and more generally to function within the social environment of the classroom. This type of self-talk regarded handling emotional challenges, exercising self-control in relating to others, self-comforting, self-rewarding and self-reprimanding competence (Weng Fai Lee, 2011). Self-talk was seen to play an important role in children's socio-emotional competence (Weng Fai Lee, 2011) and helped them cope with social and emotional challenges (Cunniff 1999; Prins & Hanewald, 1999).

While the task-related and self-related functions of self-talk have been discussed, it must be acknowledged that it is often difficult to completely separate them. Self and task can arguably co-act, rather than interact, during task involvement in the classroom. Across many of the review studies, the self-talk produced appears to be spontaneous and often both affiliated and attributable to aspects of both the self and the task in that moment. This self-talk can be positive or negative and inhibitory or facilitative as it arises in children's minds.

4.8 Factors Impacting Self-Talk

Following Vygotsky's (1986) sociocultural theory of cognitive development, self-talk originates in the outer world, then becomes individual, internal thought. Following from this, intrapersonal factors (residing within the individual who is doing the thinking), interpersonal factors (social and communication processes) and environmental factors (e.g., non-social elements of the outer world) can impact self-talk. Below we summarise the main factors identified by the reviewed studies.

4.8.1 Intrapersonal Factors

4.8.1.1 Age and Grade

Berk (1986) identified a developmental trend toward increasingly task-relevant and less audible self-talk with grade and cognitive ability. Similarly, Matuga (2003) found that first-grade participants used self-talk less than their fifth-grade peers for evaluative purposes. In

Rohrkemper and Bershon, (1984) older children (ages 11 – 12-years, versus ages 8 – 10-years) reported using self-talk in difficult situations more and using more affective and efficacy statements in successful learning situations. These older children also viewed the locus of learning as being more internal to themselves and under their own control in comparison to younger students. These findings are in keeping with Winsler and Naglieri's (2007) observation of self-talk becoming increasingly internalised with age; and point to age-graded increases in intentional self-regulation.

4.8.1.2 Ability and Creativity

In Manning (1990), having higher IQ scores and language attainment scores was positively associated with the amount of neutral self-talk, whereas having lower IQ scores and language attainment was positively associated with the amount of negative self-talk. Creativity has also been associated with self-talk. Matuga (2003) refers to creativity as “ideas that are fundamentally novel with respect to the individual mind” (Boden, 1991, p. 32). In this study, children who had high creative ability produced less private speech for labelling and planning during drawing tasks than did those children of average or low creative ability (Matuga, 2003).

4.8.1.3 Attention and Motor Quiescence

Some research indicated that the development of internalised, more complex forms of self-talk, is positively associated with children's focused attention and motor quiescence as they work on academic tasks (Berk, 1986). In Berk and Potts (1991), children with attentional difficulties employed as much self-talk as did controls however their self-talk tended to be more externalised and used for self-guiding purposes. Those children also depended more on externalised self-talk over a longer developmental period. Berk and Potts (1991) propose that this is because their attentional system is less responsive to self-directed efforts to guide and channel it in pursuit of learning goals. Practically, the findings indicate that children with

attentional difficulties require learning environments that permit them to use spontaneous self-talk actively and freely (Berk & Potts, 1991).

4.8.1.4 Negative Self-Evaluations and Anxiety

Children's negative self-evaluations and anxiety levels can impact their ability to control their own thinking and solve problems (Weng Fai Lee, 2011). For example, children with lower self-competence in Vanleuvan and Wang (1997) were found to use more self-monitoring statements than other children. Also, children experiencing higher anxiety in classrooms demonstrated higher rates of negative self-talk (Lodge et al., 1998; Zatz & Chassin, 1985). This type of anxiety driven negative self-talk can be directed towards regulating on-task behaviour and consist of coping and on-task statements (Zatz & Chassin, 1985; Prins & Hanewald, 1999). Logically, coping statements and on-task cognitions are presumably a self-regulatory response to negative thoughts (Zatz & Chassin, 1985). Surprisingly though, these thoughts were not task-facilitating and did not contribute significantly to performance (Zatz & Chassin, 1985; Prins & Hanewald, 1999).

4.8.1.5 Gender

A minority of studies identified key gender differences. In Vanleuvan and Wang's (1997) study of children aged 6 – 8-years in the USA, boys engaged in more self-monitoring self-talk than did girls during classroom activities. Also, the impact of statements made by significant adults differed depending on gender in studies of 8 – 12-year-old children in Australia (Burnett, 1995; Burnett & McCrindle, 1999). In these studies, boys' self-talk (positive and negative) was predicted by parental statements, however for girls, only teacher statements impacted their positive and negative self-talk. These results highlight that children's gender influences the impact of adult speech on their self-talk, with further research necessary to investigate the potential influences of adult gender.

4.8.2 Interpersonal Factors

4.8.2.1 Teacher Expectations

Segal-Andrews (1994) made the important supposition that teachers' perceptions affect students when those perceptions influence their behaviour towards the student. Teachers communicate differential expectations in various ways. The classroom climate, the amount and kind of feedback given, and to whom it is given afford different information to each student and result in differences in students' self-perception, self-talk and behaviour (Segal-Andrews, 1994). Accordingly, Manning (1990) found that children with behaviour rated as 'excellent' by their teachers, engaged in more positive self-talk statements, whereas students with poorly rated behaviour engaged in more negative self-talk statements. This study lacked detail on what behaviour constituted a rating of 'excellent'. Students were simply rated as "excellently", "average" or "poorly" behaved.

4.8.2.2 Teacher Feedback

In two studies, more positive teacher feedback associated with more child positive self-talk which subsequently impacted children's global self-esteem and academic self-concept (Burnett, 1995; Burnett & McCrindle, 1999). Accordingly, fewer positive statements made by teachers has associated with more negative self-talk in children (Burnett, 1995). Specifically, greater amounts of ability feedback from teachers have associated with children's higher levels of positive self-talk and lower levels of negative self-talk, whereas teacher feedback on children's effort has been associated with children's higher levels of negative self-talk during reading and mathematics tasks (Burnett, 2003), in contradiction to assumptions underpinning current research on mindset (e.g., Yeager et al., 2019). Collectively, these results suggest that children's internalisations of feedback and praise impact their self-talk and other important aspects of their development.

4.8.2.3 Teacher Modelling

Teachers' classroom organisation strategies create a model that children can use to develop their self-talk capabilities. By orchestrating learning environments, teachers can foster the development of self-talk that encompasses the interdependent goals of thinking and learning enrichment, and motivational and self-esteem enhancement (Rohrkemper & Bershon, 1984). Children can become more capable of self-directed learning after continuous involvement with, and subsequent internalisation of, classroom instruction (Vygotsky 1934; Rohrkemper & Bershon, 1984). Also, specific teacher behaviours can encourage self-talk development, including direct instruction and modelling of appropriate, successful mastery strategies (Bandura, 2001) and coping skills (Meichenbaum, 1977). Thus, children's self-talk can benefit from instruction in problem-solving (task-related) strategies and in coping (self-related) techniques (Rohrkemper & Bershon, 1984).

4.8.2.4 Classmates

Girbau (2002) proposed that in the presence of classmates, for example during group work, children adapted their self-talk to regulate their activity in line with peer expectations and behaviours. Also, children's negative self-talk has associated positively with negative statements made by other children (Burnett & McCrindle, 1999). Reducing the number of negative statements made to children by peers may be pivotal in promoting adaptive self-talk development in classrooms (Burnett, 1995; Burnett & McCrindle, 1999).

4.8.3 Environmental Factors

In several studies, task difficulty, and task type, impacted children's self-talk in classrooms (Lee & McDonough, 2015; Rohrkemper & Bershon, 1984; Lodge et al., 1998). In Rohrkemper (1986), students in low-task difficulty conditions reported more positive affect statements, ability attribution statements, effort statements, and self-talk statements in general, than students in high-task difficulty conditions. The difficulty level of the two maths problems to be solved by the children in either the high-task difficulty or low-task difficulty

condition, was determined by the teacher. Also, Matuga (2003) found that children engaged in make-believe drawing tasks used more subtypes of private speech (labelling, planning, evaluating, and inaudible muttering) than they did while they were drawing real pictures (i.e., copying another image). Both studies suggest that highly structured, challenging, logic-based tasks (e.g., replicating a real object in art, solving a complex math problem) might demand more from children's executive functions, meaning that children have less capacity to consciously talk to themselves about the task. Alternatively, children might have been more momentarily engaged in the creativity inducing tasks because they found them more enjoyable than the highly structured tasks—therefore experiencing a dynamic interchange between their curiosity, task involvement, and self-talk (Authors, 2021).

5. Discussion

What is known about children's self-talk in naturalistic classroom settings in middle childhood?

In this systematic review we synthesised the methods, theoretical and conceptual perspectives, and key findings, from 24 published studies of children's self-talk in classroom settings. In response to the overarching research question of 'what is known about children's self-talk in naturalistic classroom settings in middle childhood', the review identified key information. First, self-talk was typically conceptualised in the studies using Vygotsky's (1986) sociocultural theory or Bronson's (2000) cognitive self-regulation perspective. Second, the studies used various quantitative and qualitative methods to study self-talk, with findings generated by those methods pointing to similar uses of self-talk for self-regulatory purposes regardless of whether the methods interrupted children's self-talk in progress (e.g., a think aloud) or asked children to give retrospective accounts of their self-talk (e.g., a post-task interview). Third, a variety of tasks and situations in which self-talk arose were considered by the studies. Most of the tasks were mathematics problems and fewer were

language or creative arts related. Fourth, the types of self-talk observed in studies were typically classified into positive versus negative categories, with some more detailed coding systems fitting within the broader categories of task-oriented self-talk, self-oriented self-talk, and environment-oriented self-talk. Finally, the factors influencing self-talk fell into intrapersonal (e.g., cognitive ability, age, anxiety, attention, gender) intrapersonal (e.g., teacher expectations, teacher feedback, teacher modelling, classmates) and environmental (e.g., classroom tasks) domains. Overall, the findings of this review demonstrate that children's self-talk is an important tool for social, emotional, personal, and academic functioning; and following this, that self-talk is closely tied to children's development in sociocultural context. We discuss the findings of each of our research questions in turn.

5.1 Theoretical and Conceptual Perspectives

Two main types of theoretical perspective were used across the studies: Vygotsky's (1986) sociocultural theory of cognitive development, and Bronson's (2000) model of cognitive self-regulation. Although Vygotsky's (1986) perspective emphasises the interaction between the developing child and the environment, and Bronson's (2000) perspective focuses on intentional self-control, these two perspectives are not necessarily at odds with one another. Drawing on triadic reciprocal causation (Bandura, 2001), a clear pathway to integrating the perspectives is through agency, given that environmental factors such as those found in this review—teacher expectations, feedback and modelling, classmates, and the nature of classroom tasks—impact individual's control over themselves, shaping individual behaviour that impacts the environment. In the context of children's self-talk in classrooms, enabling children to metacognitively engage in forethought and reflection can promote the use of self-talk to guide their behaviours in classroom settings.

5.2 Methods of Studying Self-Talk

As stated in the introduction, measuring ‘inner’ self-talk is problematic, given that it occurs silently while children are engaged in classroom tasks (Brinthaupt et al., 2015). The reviewed studies addressed this challenge by using a variety of methods to capture internal self-talk, each method presenting a different advantage and limitation. For example, structured questionnaires, journal activities, and thought listing, given after tasks, elicited memories of self-talk. These methods created data more distanced from the moment in which self-talk occurred (the limitation) but did not bias children’s momentary cognitive functioning by interrupting the task (Azevedo, 2015) unlike the experience sampling method (the advantage). Other studies used the think aloud method, which prompted children to speak their thoughts that would otherwise be said silently in their mind. Although this changes the expression of self-talk from internal to external (the limitation), the think aloud method used in middle childhood might still be a close approximation of reality given that self-talk is only becoming primarily internalised during this developmental period (Fahy, 2014) (the advantage). Despite the variety of methods employed, our synthesis of study findings demonstrated strong patterns of results (e.g., children using self-talk to regulate their task engagement), suggesting that the multifaceted picture painted by the studies was reasonably valid.

5.3. Tasks and Situations which Elicited Self-Talk

The kind of tasks or situations which produce children’s self-talk in the classroom are vast and varied. Research on tasks and situations can point to factors which influence self-talk and the mechanisms through which it is produced and harnessed. The executive functioning, working memory, and attention requirements of the tasks could be documented as well as the language and verbal reasoning skills of the students engaging in such tasks. It is also worth considering whether the tasks are designed by researchers or whether they are tasks that are occurring naturally in classrooms. Children’s aggregated self-talk over time and

a multiplicity of tasks could be studied in order to reflect the real-life classroom context. In considering the tasks, situations and contexts which elicit self-talk in classrooms, the potential impact of adult scaffolding and previous teaching and interactions should also be considered. It would be interesting to investigate the self-talk that children internalise through these influential interactions and how social speech becomes private speech in classrooms. This seems fundamental to uncovering how educators promote or fail to promote self-talk in classrooms. What self-talk do educators nurture during their teaching and their interactions with their students? Self-talk could be a resource for learning, motivation and regulation that is waiting to be harnessed.

5.4 Types and Functions of Self-Talk

Our synthesis of the types and functions of self-talk found that, across studies, children mainly engaged in self-talk that was task-related (academic) and/or self-related (personal). Although broad brush categories of positive/negative/neutral were used by several studies, the more refined categories (e.g., self-direction, self-corrective, coping) were more useful for understanding the circumstances and mechanisms of children's self-talk. Mostly, children used self-talk to self-regulate their task engagement and to manage the social and emotional demands of the classroom. This emphasises that self-talk has the potential to impact children's academic learning and the coping skills. A dual focus perspective in education, focussing on both self-regulatory and academic competencies, seems imperative to learning yet is still not apparent in much curriculum development (Diamond, 2010). Although harnessing self-talk could assist educational and psychological professionals help children become more effective self-regulators who can cope with learning challenges, current application of fundamental self-talk research into teaching practice is limited.

5.5 Factors Influencing Self-Talk

We were able to clearly differentiate factors observed by the studies to influence children's self-talk, into intrapersonal and interpersonal types. Intrapersonal factors included cognitive ability, developmental stage (e.g., age, maturity), self-evaluations, anxiety, and gender. Interpersonal factors included the task, classmates, and teacher expectations, feedback, and modelling. Within a developmental framework, it seems that these findings collectively illustrate the need for psychologists and educators to be cognisant of person-environment fit. Person-environment fit theory focuses on the interaction between characteristics of the individual (the child) and the environment (the classroom), whereby the individual influences their environment, and the environment influences the individual (Holmbeck et al., 2008). The adequacy of this fit between a person and their environment, can impact the person's motivation, behaviour, and overall mental health and well-being (Holmbeck et al., 2008). Accordingly, educators and psychologists might aim to maximize the fit between the child's intrapersonal characteristics (i.e., their personal albeit socialised needs) and the child's interpersonal influences (i.e., the classroom relational and academic climate) to promote adaptive self-talk that facilitates children's task engagement and resilience in classroom contexts.

5.6 Limitations

The current review is not without its limitations. It incorporates weaknesses of any narrative synthesis such as the inability for complete transparency and reliance on subjective judgements to identify and synthesise key information (Dixon-Woods et al. 2005). Although the literature review was approached systematically, it is possible that some crucial information has been missed or rejected based on our qualitative judgements. Additionally, some papers were included although they had a low weight of evidence. However, given the scarcity of research on children's self-talk in naturalistic classroom contexts, including the maximum number of papers spanning a wider range of quality can be justified.

6. Conclusion

Through a systematic search, we found only a small number of studies capturing children's self-talk in naturalistic classroom contexts in middle childhood. This contrasts with the utility of self-talk for facilitating children's academic and social functioning as well as the amount of self-talk based intervention that is happening in education. This review encourages a "bottom-up" approach to self-talk intervention in education which is informed by the voices of children. In the review studies, researchers examined children's self-talk with respect to mathematics tasks, Lego tasks, drawing, and other types of classroom experience. Self-talk emerged in the studies as a useful tool that children used to help make sense of their experiences, problem solve, and to motivate themselves. These results should hopefully inform intervention design, so that experiments manipulating self-talk can incorporate broader domains of self-talk, to impact on key areas of importance to children including self-talk for rationalising, calming, supporting, and normalising experience. Through a sociocultural lens, future research and intervention could focus more on the match between children's individual differences, the classroom context and the task demands, in investigating the antecedents, forms, and impacts, of self-talk. This may inform possible self-talk interventions that are not necessarily universal interventions or therapeutic programmes, but instead are focused on promoting positive self-talk development through relationships/interactions that are naturally occurring in classrooms as well as aspects of the classroom environment and academic work. By considering how children use self-talk to regulate their learning and the social demands of the classroom, teachers and psychologists could come to better understand the centrality of their practice as well as children's momentary learning in context. This will enable them to more effectively assist children to develop adaptive motivational strategies, coping and resilience.

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Table 1.

Summary of Included Studies

Author & Year	Study title	Location	Sample	Age range or grade level	Method to measure self-talk	Task or situation which elicited self-talk	Theoretical and conceptual perspectives	WoE A	WoE C
Berk. 1986	Relationship of elementary school children's private speech to behavioral accompaniment to task, attention, and task performance	USA	N = 75, females n = 34, males n = 41	1 st - 3 rd grade	Observation, a time sampling approach	Math seatwork in the naturalistic setting of the classroom.	Vygotsky's sociocultural theory of cognitive development 1934/1987 & Kohlberg et al., 1968 on self-talk development	7; medium	5; high
Berk & Potts 1991	Development and functional significance of private speech among attention-deficit hyperactivity disordered and normal boys	USA	N = 38, males n = 38	7 - 12 years	Observation	Math seatwork requiring individualised practice in arithmetic concepts and skills, which was preceded by a short period of didactic instruction.	Vygotsky's sociocultural theory of cognitive development 1934/1987, Pressley (1979) on the attentional system & Kohlberg et al., 1968 on self-talk development	9; high	5; high
Burnett 1995	Children's' self-talk and significant others' positive and negative statements.	Australia	N = 675, females n = 337, males n = 338	3 rd - 7 th grade. 7 to 13 years	The Self Talk Inventory (Burnett, 1996)	The Self Talk Inventory was completed in the classroom and the influence of significant others' positive and negative statements was considered.	Early cognitive behavioural theory	7.5; medium	5; high
Burnett 1999	Children's self-talk and academic self-concepts: The impact of teachers' statements.	Australia	N = 269, females n = 125, males n = 144	3 rd - 7 th grade. M = 9 years, 8 months	The Self Talk Inventory (Burnett, 1996)	The Self Talk Inventory was completed in the classroom and the influence of negative statements made by teachers and students was considered.	Blote's (1995) model of classroom interaction	7.5; medium	4; medium
Burnett 2003	The impact of teacher feedback on student self-talk and self-	New South Wales, Australia	N = 747, females n = 351 males n = 396	3 rd - 6 th grade. 7 - 12 years.	The Self Talk Inventory (Burnett, 1996)	The Self Talk Inventory was completed in the classroom and the influence of teacher feedback on self-talk in the	Blote's (1995) model of classroom interaction	8.5; medium	4; medium

	concept in reading and mathematics					context of reading and mathematics was considered.			
Burnett and McCrindle 1999	The relationship between significant others' positive and negative statements, self-talk and self-esteem	Australia	N = 269, females n = 125, males n = 144	3 rd - 7 th grade. M = 9 years, 8 months.	The Self Talk Inventory (Burnett, 1996)	The Self Talk Inventory was completed in the classroom and the influence of positive and negative statements made by significant others on self-talk was considered.	None explicitly mentioned	6; medium	2; low
Cunniff 1999	Sixth grade student self-talk: individual thought, collective mind	USA	N = 24, females n = 17, males n = 6	6 th grade. 11 - 13 years	Journaling	Regular maths class activity involving listening to the teacher, taking a test, or working independently.	A collective group-dynamics theoretical framework and Meichenbaum (1977) cognitive behaviour modification theory.	5; medium	5; high
Girbau 2002	A sequential analysis of private and social speech in children's dyadic communication.	Spain	N = 64, females n = 32, males n = 32	3 rd - 5 th grade. 8 - 11 years	Observation	A dyadic situation involving a Lego construction task.	Piaget and Vygotsky's theories of cognitive development	9; high	5; high
Lee 2011	Exploring seven-to eight-year-olds' use of self-talk strategies	New Zealand	N = 28, females n = 18 males n = 10	7 - 8 years	Reflective journals & follow-up interviews	Children elaborated on the statement: 'I talk to myself when ...'. The children provided their own insights on when they use self-talk.	Vygotsky's social development theory 1934/1987	9; high	5; high
Lee et al., 2014	Investigating eight-to nine-year-olds' self-regulatory self-talk in the context of their classroom tasks.	Australia	N = 8, females n = 5 males n = 3	8 - 9 years	Questionnaire, individual interviews	General self-talk use enquiry occurred in the context of the classroom.	Vygotsky's social development theory and Bronson's (2000) concept of cognitive self-regulation.	9.5; high	5; high

Lee & McDonough 2015	The relationship of eight-to-nine-year-olds' self-regulatory self-talk strategies with their classroom self-regulatory behaviour and mathematical achievement	Australia	N = 154, females n = 75, males n = 79	8 - 9 years	Self-talk questionnaire (STQ) and interview	Self-regulatory self-talk in the context of mathematical and problem-solving tasks in the classroom.	Vygotsky's social development theory and Bronson's (2000) concept of cognitive self-regulation.	9.5; high	5; high
Lidstone et al., 2010	The roles of private speech and inner speech in planning during middle childhood: Evidence from a dual task paradigm	North East England	Experiment 1: N = 30, females n = 17, males n = 13 Experiment 2: N = 30, females n = 14, males n = 16	7 - 10 years <i>M</i> = 9 years 1 month	Articulatory suppression & the dual task paradigm	The Tower of London task (adapted from the Tower of Hanoi task) was used. It consisted of three different coloured disks arranged on three pegs that could hold one, two, and three disks, respectively. The task was to transform one configuration into another by moving one disk at a time.	Vygotsky's sociocultural theory of cognitive development 1934/1987	9; high	4; medium
Lodge et al., 1998	Children's self-talk under conditions of mild anxiety	New Zealand	Study 1: N = 27, females n = 14, males n = 13. Study 2: N = 39, males n = 14, females n = 25)	8 - 11 years <i>M</i> = 9 years, 11 months.	Think aloud and thought listing	Math problems and a puzzle to be completed within a limited period. The puzzle was design number nine from the block design subtest of the Wechsler Adult Intelligence Scale-Revised (Wechsler, 1981). This task required the children to arrange nine coloured blocks to match the design shown on a coloured card.	Cognitive models of psychopathology	9; high	6; high
Manning, 1990	A categorical analysis of children's self-talk during independent school assignments.	South Eastern USA	N = 94, females, n = 52, males n = 42.	2 nd - 5 th grade	The experience sampling method/ self-talk log via a random sampling technique.	Independent seatwork during regular activities of the school day.	Cognitive behavioural theories and theories on metacognition & learning	6; medium	5; high

Matuga 2003	Children's private speech during algorithmic and heuristic drawing tasks.	USA	N = 108	1 st - 5 th grade	Observation	Drawing tasks were completed where children drew three real and three make-believe pictures.	Gardner (1988) and Boden's (1991) creativity theories	9.5; high	5; high
Prins and Hanewald 1997	Self-statements of test-anxious children: Thought-listing and questionnaire approaches	The Netherlands	N = 286, females n = 255, males n = 131	5 th - 6 th grade. 10 - 12 years M = 11 years, 6 months	Thought listing	The children worked on maths problems under high-threat low-threat conditions.	Cognitive processing, psychopathology & the states of mind (SOM) model (Schwarz & Garamoni, 1989).	9; high	4; medium
Prins and Hanewald 1999	Coping self-talk and cognitive interference in anxious children	The Netherlands	N = 286, females n = 255, males n = 131	5 th - 6 th grade 10 - 12 years M = 11 years 6 months.	Childrens Cognitive Assessment Questionnaire (CCAQ; Zatz & Chassin, 1983)	The children did a maths task under naturalistic test-taking conditions of high-threat or low-threat.	None explicitly mentioned	9; high	4; medium
Rohrkemper, 1986	The functions of inner speech in elementary school students' problem solving behaviour	USA	N = 84	3 rd - 6 th grade	Thought matching questionnaire developed by Ames (1984)	Children participated in maths tasks involving cooperative teams.	Vygotsky's sociocultural theory of cognitive development 1934/1987	8; medium	5; high
Rohrkemper & Bershon, 1984	Elementary school students' reports of the causes and effects of problem difficulty in mathematics	USA	N = 66	3 rd - 6 th grade	Interview	Maths problems of low and high difficulty were attempted by the children.	Cognitive and social development theories (Bandura, 1977/2001; Luria, 1976; Vygotsky 1934/1962)	7.5; medium	5; high
Segal-Andrews, 1994	Understanding student behavior in one fifth-grade classroom as contextually defined.	USA	N = 24, females n = 13, males n = 11	9 - 11 years M = 10 years 6 months.	Observation & vignette Interviews	Vignettes about social situations elicited children's self-talk.	Vygotsky's sociocultural theory of cognitive development 1934/1987	8.5; medium	5; high
Stefanek et al., 1987	Self-statements in aggressive, withdrawn, and popular children.	USA	N = 240	4 th grade	Role play & the Socialization Self-Statement Test (SSST)	Self-talk was elicited by stories about social situations which included a peer not returning a game as promised (conflict) and a peer walking	Cognitive processing and Mechenbaum et al's (1981) model of social competence.	8; medium	5; high

						in the playground playing with a ball (initiate).			
Vanleuvan & Wang 1997	An analysis of students' self-monitoring in first-and second-grade classrooms.	USA	N = 56	1 st – 2 nd grade	Observation and audio recording of children's utterances	Verbalisations were noted as children worked on regular classroom activities.	Hypothesis of mediation deficiency (Kendler, Kendler & Wells, 1960), hypothesis of production deficiency (Flavell, 1976), and sociocultural theory of the self-regulatory function of private-speech (Vygotsky, 1962).	7; medium	5; high
Zahner & Moschkovich 2010	Talking while computing in groups: The not-so-private functions of computational private speech in mathematical discussions	USA	N = unknown	middle school	Observation	Verbalisations were noted during group work in mathematics classrooms.	Cognitive developmental theory and theories regarding sociolinguistics, and distributed cognition.	6.5; medium	5; high
Zatz & Chassin 1985	Cognitions of test-anxious children under naturalistic test-taking conditions	USA	N = 366, females n = 209, males n = 157	5 th – 6 th grade	Childrens Cognitive Assessment Questionnaire (CCAQ; Zatz & Chassin, 1983)	A naturalistic test-taking situation which was mathematical in nature.	None explicitly mentioned	7; medium	3; medium

Table 2.

Categories of Self-Talk

Theme	Categories	Studies
Basic valence categories		
	Positive and negative self-statements	Burnett & McCrindle, 1999; Burnett, 1995, 1999, 2003; Lodge et al., 1998; Manning, 1990; Prins & Hanewald, 1997, 1999; Rohrkemper, 1986; Zatz & Chassin 1985
	On and off task thoughts	Prins & Hanewald, 1997, 1999; Zatz & Chassin 1985
	Neutral self-statements	Lodge et al., 1998
	Task irrelevant statements	Berk, 1986; Berk & Potts 1991; Girbau, 2002
Task-oriented		
	Self-direction / self-management statements	Lee et al., 2014; Lodge et al., 1998; Matuga, 2003; Segal-Andrews, 1994; Weng Fai Lee 2011
	Cognitive monitoring statements	Lee et al., 2014; Matuga, 2003; Vanleuvan & Wang 1997
	Motivational statements e.g., self-reward, persevering, facilitating action	Berk, 1986; Berk & Potts 1991; Lee et al., 2014;; Stefanek et al., 1987 Weng Fai Lee 2011
	Efficacy statements	Rohrkemper & Bershon, 1984; Weng Fai Lee 2011
	Affective reaction statements	Rohrkemper & Bershon, 1984
	Self-corrective statements	Lee et al., 2014
	Self-reprimand statements	Weng Fai Lee 2011
	Self-inhibition statements	Stefanek et al., 1987
	Reflective statements	Segal-Andrews, 1994
	Questioning statements	Lodge et al., 1998
	Higher order thinking / analytical statements	Cunniff 1999; Lodge et al., 1998; Rohrkemper & Bershon, 1984; Weng Fai Lee 2011
	Creativity statements	Weng Fai Lee 2011
Self-oriented		
	Coping strategy statement	Prins & Hanewald, 1997, 1999; Zatz & Chassin 1985
	Social and emotional challenge statements e.g., social status, task anxiety	Cunniff 1999; Weng Fai Lee 2011
	Attribution statements	Rohrkemper & Bershon, 1984
Environment oriented		
	Internal vs. external statements	Manning, 1990
	Teacher performance statements	Cunniff 1999

Figures

Figure 1.

Study theoretical perspective by locale

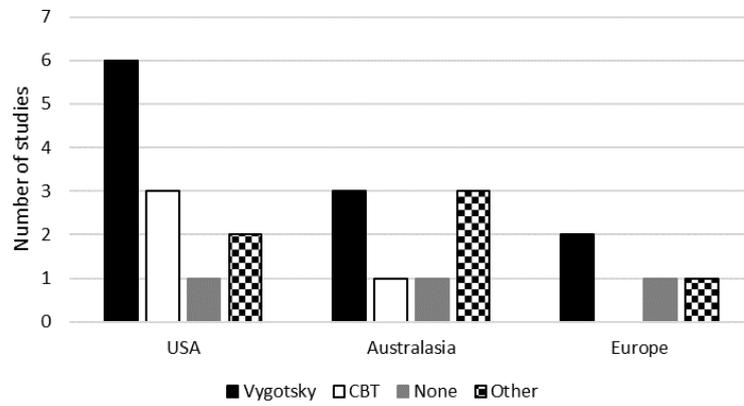


Figure 2.

Study methods by locale

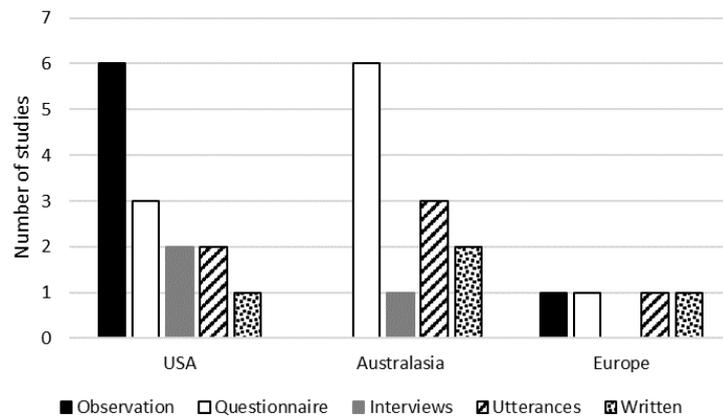


Figure 3.

Study methods by study theoretical perspective

