Shyness and Students' In-Class Participation:

Exploring Facilitating Factors and Individual Differences

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Abstract

Shyness and students' in-class participation – that does not seem to go well together. In fact, as students' in-class participation is often included in the final course grade, many classroom situations are both public and evaluative, which is precisely what shy people fear the most. In such socio-evaluative situations, shy people usually respond with silence and passivity. Coincidentally, teachers tend to interpret shy students' passive behavior as a lack of interest or incompetence. Poor oral grades are, however, not the only problem that arises for shy students because of their passivity. Given the important role oral participation plays in student learning, shy students miss out on important learning opportunities. At the same time, shy students report that they would like to participate more. However, not much is known in practice or research about how to support shy students in their in-class participation. Therefore, Chapters 2–4 of this dissertation include three empirical studies that examine facilitative factors as well as individual differences in the in-class participation of shy students.

In Study 1 (Chapter 2), we found that the teaching method named "Think-Pair-Share" can reduce state anxiety and increase hand raising in students in general. Shy students raised their hands less frequently than their non-shy peers but also benefited from "Think-Pair-Share". Furthermore, they reported socio-evaluative concerns and self-consciousness as the main reasons why they did not raise their hands. In Study 2 (Chapter 3), we found that student-teacher relationship and warm calling faciliate hand raising of shy students when compared to their non-shy peers, but also that they less likely raise their hands the better their peer relationship. These findings raised the question of whether shy students sometimes should be allowed to remain silent to stay cognitively and emotionally engaged. Therefore, in Study 3 (Chapter 4), we tested whether different subtypes of shyness and sociability differ in their oral and silent in-class participation and found that individuals of both shyness subtypes (i.e., avoidant-shy and conflicted-shy) participate less orally as well as less silently when compared to individuals of both sociable subtypes (i.e., unsociable and sociable). Overall, the findings of this dissertation

contribute to a better understanding of why, when, which, and how shy middle school students engage in in-class participation, as well as how teachers can promote this.

Zusammenfassung

Schüchternheit und mündliche Mitarbeit im Unterricht - das scheint nicht gut zusammen zu passen. Da die mündliche Mitarbeit von Schüler*innen in ihre Zeugnisnote einfließt, sind viele Unterrichtssituationen sowohl öffentlicher als auch bewertender Natur und damit genau derart, wie sie schüchterne Menschen am meisten fürchten. In solchen sozial-evaluativen Situationen reagieren sie meist mit Schweigen und Passivität. Hinzu kommt, dass Lehrkräfte oftmals dazu neigen, das passive Verhalten schüchterner Schüler*innen als mangelndes Interesse oder Inkompetenz zu interpretieren. Schlechte mündliche Noten sind jedoch nicht das einzige Problem, das sich für schüchterne Schüler*innen in der Folge aus ihrer Passivität ergibt. Angesichts der wichtigen Rolle, die die mündliche Mitarbeit für das schulische Lernen spielt, verpassen schüchterne Schüler*innen wichtige Lerngelegenheiten. Gleichzeitig geben schüchterne Schüler*innen an, dass sie sich gerne mehr beteiligen würden. In der Praxis und in der Forschung ist jedoch nicht viel darüber bekannt, wie schüchterne Schüler*innen in ihrer mündlichen Mitarbeit unterstützt werden können. Daher werden in den Kapiteln 2 bis 4 dieser Dissertation drei empirische Studien berichtet, die sowohl förderliche Faktoren als auch individuelle Unterschiede bei der mündlichen Mitarbeit schüchterner Schüler*innen untersuchten.

In Studie 1 (Kapitel 2) fanden wir heraus, dass die Unterrichtsmethode „Think-Pair-Share“ die Ängstlichkeit reduzieren und das Melden bei Schüler*innen im Allgemeinen erhöhen kann. Schüchterne Schüler*innen meldeten sich zwar weniger als nicht nichtschüchternen Mitschüler*innen, profitierten aber auch von „Think-Pair-Share“. Darüber hinaus gaben sie soziale Bewertungsängste und Selbstbezogenheit als Hauptgründe an, wenn sie sich nicht meldeten. In Studie 2 (Kapitel 3) fanden wir heraus, dass die Schüler-Lehrer-Beziehung und das Aufrufen von Schülern, die sich melden (im Gegensatz zu Aufrufen von Schülern, die sich nicht melden) die Meldungen bei schüchternen Schülern im Vergleich zu

ihren nicht-schüchternen Mitschülern erhöht, aber auch, dass sie sich umso seltener melden, je besser die Beziehung zu den Mitschülern ist.

Diese Ergebnisse warfen die Frage auf, ob Lehrkräfte schüchternen Schüler*innen manchmal erlauben sollten zu schweigen, damit sie im Unterricht kognitiv und emotional beteiligt bleiben. Daher testeten wir in Studie 3 (Kapitel 4), ob sich verschiedene Subtypen von Schüchternheit und Geselligkeit in ihrer mündlichen und stillen Beteiligung am Unterricht unterscheiden, und stellten fest, dass sich Personen beider Subtypen von Schüchternheit (namentlich vermeidend-schüchtern und konflikthaft-schüchtern) im Vergleich zu Personen beider geselliger Subtypen (namentlich ungesellig und gesellig) sowohl weniger mündlich beteiligen als auch nonverbal weniger aufmerksam sind. Insgesamt tragen die Ergebnisse dieser Dissertation damit zu einem besseren Verständnis der Frage bei, warum, wann, welche und wie sich schüchterne Schüler*innen der Mittelstufe am Unterricht beteiligen und wie Lehrkräfte dies fördern könnten.

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Dedication

In loving memory of my grandma Hildegard (1934-2022), for whom I have always been the “professor,” but who unfortunately did not live to see the submission of this dissertation.

Table of Contents

List of Abbreviations

α: Cronbach's alpha

ANOVA: analyses of variance

AS: avoidant-shy; avoidant shyness

b: unstandardized regression weight

β: standardized regression weight (beta)

χ^2: chi-square

CS: conflicted-shy; conflicted shyness

d*:* Cohen's d effect size

F: F-test statistic

ICC: intraclass correlation

κ: Kappa

M: mean

N: total sample size

n: sample size

p: p-value

r: Pearson correlation coefficient

SAP: social approach motivation

SAV: social avoidance motivation

SD*:* standard deviation

SE: standard error

SO: sociable; sociability

t: t-test statistic

UN: unsociable; unsociability

z: *z*-score

List of Figures

Chapter 1: General Introduction

Imagine a scene in any classroom across the globe. The following are three typical example situations in the course of a lesson: (1) The lesson starts, and the teacher asks who wants to read out their homework. (2) During the lesson, a certain topic is discussed among the students and the teacher. (3) After individual work, the teacher asks who would like to present their result. These three situations have one thing in common all around the world: students are supposed to raise their hands before the teacher calls on them to read out their homework, contribute to the discussion, or present their results (Dixon et al., 2009).

As natural as these situations appear, they are very uncomfortable for some students, particularly the shy ones, who usually respond with silence and passivity in such socio-evaluative situations (e.g., Archbell & Coplan, 2021; Jones & Gerig, 1994). However, although empirical evidence has long been accumulated that there are several negative consequences for shy students in school, for example, and most notably, poorer academic performance (see Coplan & Rudasill, 2016; Kalutskaya et al., 2015, for overviews), the trait has been little studied in school psychology research when compared to externalizing problems (Stöckli, 2004).

As outlined in the examples above, one particularly interesting topic on which there has been little empirical research is the in-class participation of shy students, that is, their interaction with teachers and peers by in-class talk. Given the important role of in-class participation within student learning and achievement (Rocca, 2010), the silent and passive in-class behavior of shy students causes them to miss important learning opportunities and may explain their poorer school attainments, even though they are no less intelligent (Hughes & Coplan, 2010). Importantly, and in contrast to purely introverted students, who are generally comfortable with their silent role (Poole & Schmidt, 2020), shy students report that they would like to participate more verbally but are reluctant to do so (Russell & Topham, 2012). However, not much is

known among either practitioners or researchers about how to help shy students participate orally (Nyborg et al., 2020). This was the starting point for this dissertation.

By exploring facilitative factors and interindividual differences in shy students' in-class participation, this dissertation has three main objectives. First, this dissertation aims to develop a better understanding of why and when shy students engage in in-class participation, as well as how teachers can promote it. Second, although research suggests that some subtypes of shyness peak in adolescence (Cheek et al., 1986; Schmidt & Poole, 2019), many studies to date have focused on shyness in kindergarten or elementary school. Therefore, this dissertation aims to extend the research on shyness in school by focusing on older students, that is, middle school students. A third objective that has developed throughout this dissertation addresses the question of whether there are different subtypes, and thus individual differences in shy students' in-class participation.

In this introduction, I will first present the theoretical background and key studies on which this dissertation is built. This is followed by a brief overview of the central research questions that this dissertation aims to answer and a description of its methodological approaches. Chapters 2, 3, and 4 contain summaries of the three core studies of this dissertation, while the original manuscripts of the three core studies can be found in the Appendix. Finally, in Chapter 5, I summarize the main findings of this dissertation, discuss some limitations and possible future directions, and close with some conclusions.

In-Class Participation, Learning, and Academic Achievement

Research on in-class participation traces back to 1925, when researchers were already interested in the advantages of active participation in the classroom (see Mello, 2010). Over the last hundred years, researchers and theorists from various perspectives (e.g., socio-constructive and cognitive-constructive) have consistently emphasized that when learners are actively engaged in their own learning process, learning improves, or in some cases, only begins

(Bernstein, 2018; Chi, 2009; Ginsburg & Opper, 1988; Hatano, 1993; Vygotsky, 1978). Consistently, there are many studies showing that students with higher levels of in-class engagement and participation not only learn more than students with lower levels (see Rocca, 2010, for review), but they are also more successful in the long run both academically and professionally (Finn & Zimmer, 2012; Ladd & Dinella, 2009).

Although the terms "participation" and "engagement" are not equivalent, they are often used interchangeably in practice and in the research literature (Frymier & Houser, 2016). In fact, school engagement is rather a multi-dimensional "meta-construct" or "cross-cutting construct," which refers to all engaging student activities both inside and outside of school, including in-class behaviors, but also sports, school band, and student government (see Reschly & Christenson, 2012, for an overview). The present dissertation focuses on all activities *in* the classroom during class time. Therefore, following one of the most prominent conceptualizations of school engagement, these engaging in-class activities can be divided into the following three dimensions (Fredricks et al., 2004): *Cognitive engagement* refers to the psychological "investment," that is, the thoughtfulness and willingness to learn, understand, and acquire knowledge, as well as students' information processing. *Emotional engagement* includes affective responses such as interest, boredom, confidence, and fear towards teachers, classmates, and learning. Finally, *behavioral engagement* includes all visible forms of student in-class behavior, such as asking and answering questions as well as taking notes or completing worksheets.

Accordingly, in-class participation can be done silently in all three engagement dimensions. For instance, passive nonverbal attentiveness is a form of student in-class participation that, in some conceptualizations, has been attributed to cognitive engagement (e.g., as being related to information processing), emotional engagement (e.g., as being related to interest), or behavioral engagement (e.g., in the form of facial expressions and gestures; see Christenson et al., 2012, for several conceptualizations). Therefore, this dissertation follows a

conceptualization of nonverbal attentiveness as a mixture of all three engagement dimensions. Importantly, nonverbal attentiveness is considered to play a central role in student learning, as it is thought to be the minimum threshold of in-class participation (Chi, 2009; Chi & Wylie, 2014).

That being said, the more students move from passive nonverbal attention to active, oral in-class participation, the greater the assumed learning success. More precisely, in their *ICAP* framework, Chi and Wylie (2014) categorize students' in-class participation into four distinct modes (i.e., interactive, constructive, active, and passive) and operationalize them as a proxy for students' engagement in the current learning process. According to the framework, learning improves from *passive* (i.e., attentive but non-observable engagement; e.g., listening, reading, or observing without doing anything else) to *active* (i.e., some form of overt motoric action; e.g., rehearsing or taking verbatim notes) to *constructive* (i.e., producing additional externalized outputs beyond what was provided; e.g., taking notes in own words or asking and answering teacher questions) to *interactive* mode of in-class participation (i.e., dialoguing; e.g., arguing a position with one or more partners within a small group discussion).

As the examples in brackets illustrate, higher-level learning is often characterized by student talk (see also Mercer & Dawes, 2014). Consistently, there is strong empirical evidence linking in-class *oral participation* to student learning and academic achievement (see Howe & Abedin, 2013; Rocca, 2010, for reviews). This strong link can be explained by the various functions that oral participation fulfills for classroom learning: First, as oral participation is immediately observable, it provides teachers with important insights into the learning progress of their students (e.g., Skinner & Belmont, 1993). Second, oral participation enables teachers to interact with their students, for example, by praising students' accomplishments or revising errors, which enhances their influence on the learning process (Hennessy et al., 2021; Mello, 2010). Third, oral participation allows students to elaborate on their ideas, which has been shown in numerous studies to enhance learning (Cazden, 1988; Fassinger, 1995; Howard et al.,

1996; Wang & Eccles, 2012). But students who talk more not only learn more and more deeply, they are also more motivated (Junn, 1994), report on developments in their character (Kuh & Umbach, 2004), and have improved communication skills (Berdine, 1986), critical thinking skills (Garside, 1996), as well as social skills (Armstrong & Boud, 1983).

However, recent research indicates that in-class participation that has a positive impact on learning is not necessarily limited to oral participation. That is, before contributing orally, students around the globe are asked to raise their hands to indicate their willingness to participate (Dixon et al., 2009). Some authors have therefore argued that students' *hand raising* must be preceded by their cognitive and emotional engagement, thus making it "an important gateway to create … learning opportunities in classrooms" (Böheim, Knogler, et al., 2020, p. 2). Consistent with this notion, Böheim and colleagues were able to show that hand raising is associated with student motivation, elaboration, and academic achievement (Böheim, Knogler, et al., 2020; Böheim, Urdan, et al., 2020). Furthermore, in a study by Decristan et al. (2020), students' hand raising predicted their posttest achievement, but the authors found no differences in learning outcomes when they compared students with raised hands who were called to students who raised their hands but were not called.

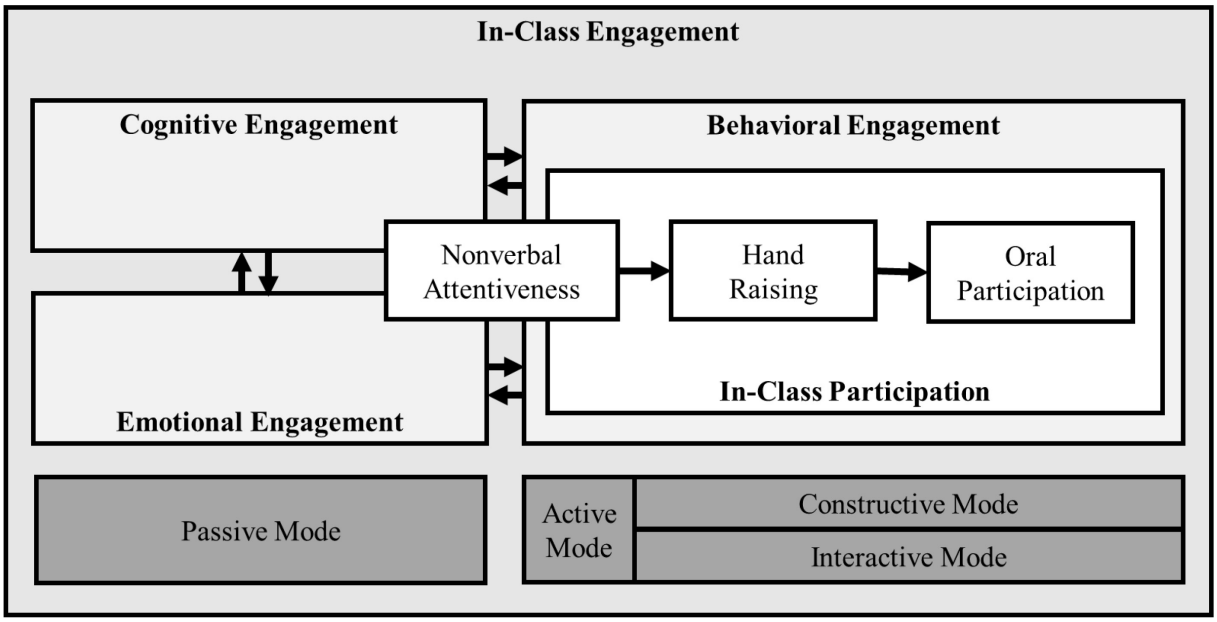
In summary, nonverbal attentiveness is a partly unobservable and partly observable form of in-class participation and thought to be the minimum prerequisite for student in-class learning. Nonverbal attentiveness precedes both hand raising and oral participation, which both are observable indicators of in-class participation and strong predictors of student learning and academic achievement (see also Böheim, 2020; Frymier & Houser, 2016). Figure 1 illustrates these different concepts and relationships of in-class engagement, in-class participation, and modes of learning, which build the conceptual framework for the present dissertation.

The benefits of oral participation are seen by both teachers and students (Fassinger, 1995; Fritschner, 2000). However, although many students report that they would like to participate more (Wade, 1994), research shows that only a handful of students participate orally on a

regular basis (Decristan et al., 2020; Howard & Henney, 1998; S. Kelly, 2007; Nunn, 1996; Schnitzler et al., 2020). For instance, both Jones (1990), who studied oral participation, and Sacher (1995), who studied hand raising, found that nearly a third of all students observed remained completely silent (i.e., did not participate orally at all or never raised their hands, respectively). Several reasons for students' silence have been discussed, including being tired, bored, or unprepared (Reda, 2009); cultural reasons (Chen, 2019); and language barriers (Tatar, 2005). However, consistent evidence shows that one of the main reasons for students' in-class silence is their trait shyness (see Kalutskaya et al., 2015, for a review). The following chapters address this personality trait and its role in the classroom and in terms of in-class participation.

Figure 1

Conceptual Framework of the Present Dissertation.



Note. In their ICAP framework, Chi et al. focused on observable in-class behaviors (Chi, 2009; Chi & Wylie, 2014). Therefore, for clarity, I have grouped the forms of active, constructive, and interactive participation under the umbrella term of "behavioral engagement." However, this does not preclude students who learn in these modes from also being cognitively and/or emotionally engaged. Moreover, nonverbal attentiveness, hand raising, and oral participation are not the only forms of in-class participation (take, for example, completing worksheets), but they are the forms that were examined in this dissertation.

Shyness in the Classroom

Shyness has been researched extensively for a very long time. No less a figure than Charles Darwin (1872) explored shyness as early as 150 years ago. Since then, much research has been conducted on this personality trait (for recent editorials see Schmidt & Buss, 2010; Schmidt & Poole, 2020). While Darwin described shy people primarily by referring to their *external appearance*, stating that "Shyness is … chiefly recognized by the face reddening, by the eyes being averted or cast down, and by awkward, nervous movements of the body" (1872, p. 330), modern definitions characterize shy people by an *inner conflict*: in contrast to unsociable individuals (also known as pure introverts), who are not interested in social contact and instead often find their solitude pleasurable (Nestler et al., 2011), shy people do want to approach others but at the same time are afraid of humiliation, personal failure, or rejection (Asendorpf, 1990, 1991). This inner conflict between the shy person's desire for social interaction (i.e., social-approach motivation) and the simultaneous anxiety of social interaction (i.e., social-avoidance motivation) causes stress in shy people and makes them prone to self-consciousness and embarrassment in the face of social publicity or perceived social evaluations (Coplan & Arbeau, 2008; Crozier, 1995; Rubin et al., 2009). Shyness is thus regarded a risk factor in the psychosocial development of children and adolescents, and has been linked to a variety of short-, medium-, and long-term adjustment difficulties, such as lower self-esteem, poorer academic performances, peer rejection, exclusion, and victimization at school, as well as a higher risk of developing a social anxiety disorder or other internalizing disorders (see Rubin et al., 2009, for a review).

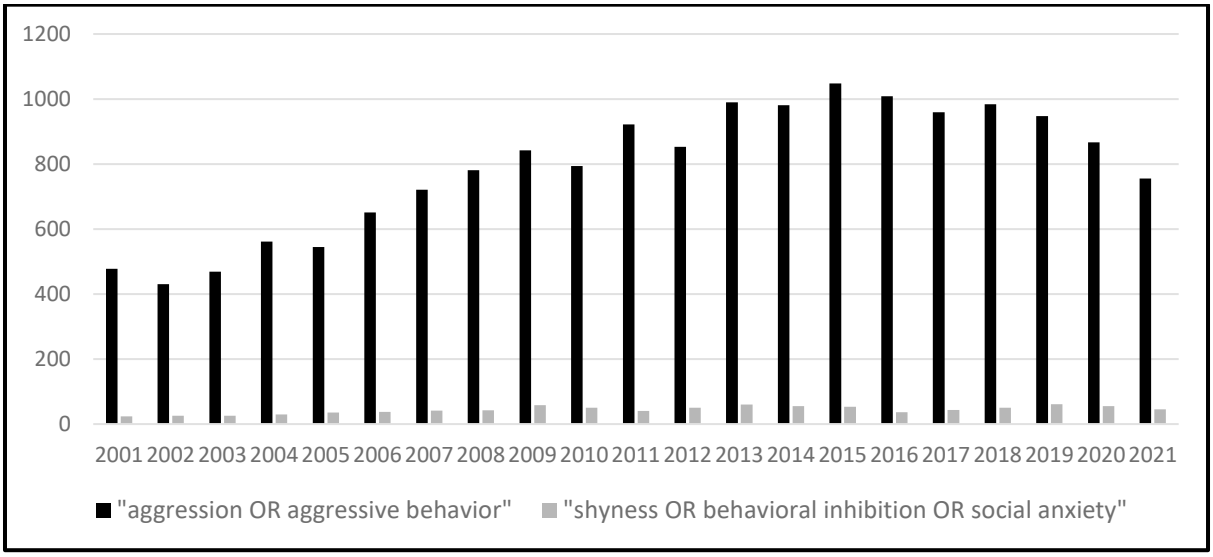
Importantly, while the exact proportion of shy students in the classroom may vary across age groups and cultural contexts, many studies have revealed that shyness affects a wide range of students (see Stöckli, 2007, for an overview). For instance, in his famous surveys on shyness in various cultures and occupational groups in the 1970s, Zimbardo found the majority of respondents had experienced shyness at some point in their lives (e.g., 82% in Germany and

73% in the United States), and most of them had seen it as a personal problem (Zimbardo, 1977, 1986). Other studies with different age groups, both cross-sectionally and longitudinally across the lifespan, found that shyness remains relatively stable from childhood to adulthood, but with an increase during adolescence and a slight decrease in (early) adulthood (Brook & Schmidt, 2022; Tang et al., 2017; Van Zalk et al., 2017). For instance, in a survey of 396 elementary school children, 38% described themselves as being shy, 59% responded that they would prefer to be less shy, and 46% considered shyness a personal problem (Lazarus, 1982), while in a more recent survey among college students, 50% to 60% labelled themselves as shy (Henderson et al., 2014). In addition, since shyness is traditionally considered a positive characteristic in Eastern cultures (Chen, 2019), the proportion of shy people in samples from these cultures tends to be even higher (Zimbardo, 1977, 1986).

Despite the large number of people affected, shyness in school has been little studied when compared to externalizing behavior. For instance, Stöckli (2004) searched the database PsycINFO for articles published between 1981 and 2001 that refer to the expressions "shyness," "behavioral inhibition," and "social anxiety," and compared their amount to the number of articles that include the expressions "aggression" and "aggressive behavior." He found an overwhelming majority of publications on these latter externalizing behaviors. I replicated this database search for the years 2001 to 2021, adding the expression "school," and focused on peer-reviewed articles. Compared to 24 articles in 2001, the absolute number of studies on shyness and related behaviors has increased to 45 in 2021 but is still relatively underrepresented when compared to studies on externalizing behaviors (see Figure 2). This discrepancy not only warrants a more in-depth study of shyness in school in general, but given the important role that in-class participation plays in student learning and achievement, it also calls for more studies of the relationship between shyness and in-class participation (Crozier, 2020).

Figure 2

Peer-Reviewed Articles Found in PsycArticles for the Expressions "School" and "Aggression OR Aggressive Behavior" vs. "Shyness OR Behavioral Inhibition OR Social Anxiety".



Note. Date of query: September 2022.

Shy Students' In-Class Participation

Among the empirical studies that explicitly address shy students' in-class participation, the study of Jones and Gerig (1994) is of particular interest for this dissertation. In four sixth-grade classes with 101 students, Jones and Gerig (1994) recorded student-teacher interactions and identified 32 silent students (i.e., students with an overall mean of fewer than one initiated interaction for the 14 classes observed). Interactions were either student hand raisings or student responses without waiting for the teacher to call them. Results indicated that these silent students did not significantly differ from other students with respect to gender, race, or achievement on a standardized test. However, in the subsequent interviews, 72% of these students mentioned shyness as the main reason for their in-class silence.

In this context, three mechanisms are problematic for such shy students. First, given the important role oral participation generally plays in student learning and achievement, shy students miss out on important learning opportunities through their silence. In line are studies linking student shyness to, for example, lower scores in expressive and receptive tests (see

Crozier, 2020; Evans, 2010, for reviews). Second, in-class participation, and in particular oral participation, is often included as part of the final grade (e.g., Crosthwaite et al., 2015; Krieger, 2003; Rogers, 2011, for teacher surveys in Asia, Germany, and USA, respectively). In Germany, in-class participation can be weighted at as much as 70% of the final grade point average (Krieger, 2003). Although shyness is not related to performance under optimal test conditions (Crozier & Hostettler, 2003), the in-class silence of shy students can thus have a negative impact on their overall grade. This fits with surveys of teachers who found it challenging to accommodate shy students in general (Bosacki et al., 2011) and, more specifically, in terms of their in-class participation, as they often do not come to the attention of teachers until they have to grade their oral participation (Krieger, 2003).

But teachers not only often forget or overlook shy children (Keogh, 2003), but also suspect a lack of interest, insufficient motivation, and even lower intelligence behind their passive attitude and poor oral participation (Coplan et al., 2011; Coplan et al., 2004; Deng et al., 2017). In fact, when exploring the association between shyness, oral participation, and academic attainment in 125 9- to 13-year-old students, Hughes and Coplan (2010) found that oral participation was not only negatively linked to shyness, but also partially mediated the relationship between shyness and *teacher-rated* math and reading skills, while it was unrelated to *standardized* test scores. As a result, and third, shy students' lower oral participation is problematic because it appears to affect teachers' perceptions of their academic abilities (Maldonado-Carreño & Votruba-Drzal, 2011).

All three mechanisms may interact to explain the poorer academic performance of shy students (see Crozier, 2020; Evans, 2010, for reviews). In this context, Good (1981; Good et al., 1987) proposed and successfully tested a *student passivity model*. According to this model, some students learn over time to become orally passive in class because teachers call students perceived to be low achievers less often (Good et al., 1987) and wait less time for their responses, which for shy students coincides with the finding that they have a longer latency

period before they speak (Crozier & Perkins, 2002). In addition, when they answer incorrectly, the model assumes that teachers give them the correct answer instead of trying to help them improve their responses, and teachers are less likely to praise their successes (Good et al., 1987). This is thought to initiate a self-fulfilling prophecy in which teachers' expectations further negatively influence shy children's self-evaluations (Stöckli, 1999), which in turn triggers a downward spiral in their emotional engagement, in-class participation, and academic performance (Kalutskaya et al., 2015; Stöckli, 2007). In fact, in a recent study with university students, communication with the instructor partly mediated the relationship between social anxiety (as a more extreme form of shyness) and student engagement (Archbell & Coplan, 2021). Moreover, a longitudinal study with 4th through 7th graders indicates that students with low in-class participation lose their enjoyment of learning over time and become increasingly bored, anxious, and frustrated, which, in turn, decreases their behavioral engagement (Skinner et al., 2008).

Importantly, in contrast to purely introverted students, who are generally comfortable with their silent role (Poole & Schmidt, 2020), shy students report that they would like to participate more orally but are reluctant to do so because of their socio-evaluative concerns, self-consciousness, and state anxiety (Russell & Topham, 2012). Moreover, they are assumed to be concerned not only about the likelihood and consequences of public *failure*, but also about the social costs of *correct* responses (e.g., standing out as a nerd or geek) (Crozier, 2020). However, while few studies have investigated factors that promote all students' behavioral engagement (e.g., Ing et al., 2015), not much is known among either educators or researchers about how to help shy students participate orally (Nyborg et al., 2020). This is especially true for adolescent students, an age group where some subtypes of shyness reach their peak (Cheek et al., 1986; Schmidt & Poole, 2019). In fact, there have been many studies on elementary school teachers and their students (see Coplan & Rudasill, 2016; Nyborg et al., 2022, for overviews), and there are evaluated programs that are designed to enhance the socio-emotional

development of younger shy children, for example the *Play Skills* program for pre-school children (Coplan et al., 2010) and the *INSIGHTS* program for first-grade children (O'Connor et al., 2014), but none of them are designed for adolescents. Thus, there is a dearth of studies on shy *adolescent* students.

In addition, these programs are time-consuming, costly, and require special training for teachers. While the literature also provides some helpful advice for teachers that can be integrated into the classroom routine (Coplan & Rudasill, 2016; Evans, 2010), these have rarely been empirically tested (see Archbell & Coplan, 2021, for a study on socially anxious university students). Therefore, as "students' active verbal participation is a key element of the teaching and learning process, … factors that impede this participation ought to be addressed in research into classroom management" (Crozier, 2020, p. 156). The present dissertation follows this call for more empirical research on shy adolescent students' in-class participation.

Overview of this Dissertation

Building on these empirical findings and conceptual considerations, the purpose of this dissertation is to develop a better understanding of why, when, and how shy middle school students engage in in-class participation, as well as how teachers can promote this. In a series of three studies, we used a multi-measure, multi-method approach that included cross-sectional as well as experimental and observational longitudinal study designs and integrated self-reports, observational, and technical methodologies to explore shy students' in-class participation.

More specifically, different teaching methods and several contextual factors have been proposed, but not yet empirically tested, to encourage shy students to participate orally (Coplan & Rudasill, 2016; Evans, 2010). Therefore, with Study 1 and Study 2, we tested some of these recommendations. Furthermore, because the question arose during work on this dissertation as to whether there are different subtypes of shy students and whether they also play different roles in relation to in-class participation, we tested a model of different subtypes of shyness and

sociability in relation to oral and silent participation, among other outcomes, in Study 3. The theoretical and empirical underpinnings of the three studies are outlined in more detail below.

The Facilitative Potential of Different Teaching Methods (Study 1)

Many authors and studies emphasize the role of teachers and their choice of teaching methods within student school engagement in general (see Lam et al., 2012; Pianta et al., 2012, for reviews), as well as in-class participation (see Rocca, 2010, for a review) and oral participation in particular (see Berry, 2006, for an overview). For instance, in a study with elementary school students, Ing et al. (2015) found no direct effect of teacher support of students' oral participation on standardized test scores, but they found that students' oral participation mediated this relationship. More specifically, when teachers' practices to promote their students' oral participation increased students' oral participation, this increase was positively related to students' achievement outcomes. Therefore, teaching methods and practices appear to be a promising way to also promote shy students' in-class participation and improve their school achievements. Study 1 examined one such teaching method, called "Think-Pair-Share," and its impact on hand raising among shy students.

As indicated in the student passivity model (Good, 1981), one problematic and, at the same time, potenitally facilitating factor for shy students' oral participation is the wait time between a teacher's question and calling a student with a raised hand. In fact, studies revealed that the average time between a teacher's question and calling on the first student with a raised hand ranges between less than 1.0 and 2.5 s (Heinze & Erhard, 2006; Rowe, 1986; Tobin, 1987), which offers little time for students to elaborate on their initial thoughts, formulate their answer, and, finally, decide whether to raise their hand. This lack of time seems particularly problematic for shy students who may have good ideas to share but hesitate to raise their hands (Crozier & Perkins, 2002; Evans, 1987; Jacobs & Chase, 1992). Therefore, it was suggested that teachers should extend the waiting time for students to help the shy ones overcome their hesitation and reduce their anxiety (Coplan & Rudasill, 2016).

At the same time, there is some empirical evidence that shy students' oral participation depends on the group setting they are in. For instance, when Jones and Gerig (1994) asked the silent students in their study, "When at school do you feel the most comfortable?" 41% of the silent students preferred to work in small groups with friends. Therefore, it was suggested that before making an oral contribution, students should have the opportunity to discuss their ideas or validate their answers with their seatmate or in a small group to increase their confidence (Coplan & Rudasill, 2016). This also fits well with the idea on which the evaluated programs for younger children mentioned above (i.e., the Play Skills program and INSIGHTS) are based, namely graduated exposure (Coplan et al., 2010; O'Connor et al., 2014). More specifically, by talking to a seatmate or a small group, shy students can gradually face their fears, develop more confidence, and thus increase their oral participation (Coplan & Rudasill, 2016).

Both approaches, that is, giving students more time to think and allowing them to talk to a few other students before addressing the whole class, are combined in the "Think-Pair-Share" teaching method (i.e., students first think for themselves on a given question, then validate their thoughts with their seatmate, and then share their ideas with the class). This teaching method derives from cooperative learning (Johnson & Johnson, 1987; Lyman, 1981) and has been proposed as potentially helpful strategy to increase shy students' oral participation (Coplan & Rudasill, 2016).

In Study 1 (Chapter 2), we tested whether "Think-Pair-Share" could reduce state anxiety in students in general, and in shy students in particular, and increase their hand-raising when compared to two other teaching methods (i.e., "Think-Share" and "Share"). Moreover, students reported on their motives for (non-)hand raising to further explore the underlying mechanisms of shy students' in-class participation. "Think-Share" (i.e., students are first given time to think for themselves before being asked to participate orally) was chosen to test whether wait time alone has a positive effect on shy students' hand raising. "Share" (i.e., students were asked to raise their hand to answer a teacher question directly, without additional time to think or check

their answer with a partner) resembles a typical classroom interaction (Mercer & Dawes, 2014), and thus was chosen to test "Think-Pair-Share" and "Think-Share" against a control condition.

The Facilitative Potential of Different Contextual Factors (Study 2)

Despite teachers' positive attitudes toward cooperative learning techniques such as "Think-Pair-Share," they rarely use them (Abrami et al., 2004; Völlinger et al., 2018). Moreover, teachers report difficulty devoting the time needed for cooperative learning (Buchs et al., 2017) or preparing their students for collaboration (Abramczyk & Jurkowski, 2020). Thus, teachers still dedicate a large portion of class time to teacher-centered classroom discussion (e.g., Alexander, 2008; Hiebert et al., 2003). Therefore, in search of conditions under which shy students raise their hands more in phases of teacher-centered classroom discussions, in Study 2 (Chapter 3), we examined two potential social relatedness factors (i.e., peer relationship and student-teacher relationship) and four potential instructional context factors (i.e., average warm calling, average wait time, class size, and school subject). Given that reducing shy students' anxiety and increasing their safety should be the main goals of teachers in enhancing shy students' oral participation (Crozier, 2020; Nyborg et al., 2020), these factors were thought to reduce shy students' anxiety, self-consciousness, and socio-evaluative concerns in classroom situations involving oral participation, and in turn, increase shy students' hand raising.

The Role of Different Subtypes of Shyness (Study 3)

The findings of Study 2 raised the question of whether shy students sometimes should be allowed to remain silent to stay cognitively and emotionally engaged. Moreover, during the course of work on this dissertation, scholarly discourse has developed about how many subtypes of shyness exist (see, e.g., Schmidt & Poole, 2019) and how they are related to various positive and negative outcomes (Coplan & Bowker, 2021; Poole & Schmidt, 2020).

In fact, although much research has been conducted on shyness since the end of the 1970s, shyness is still considered a "fuzzy concept" both then and now (Xu et al., 2020, p. 221;

Zimbardo, 1977, p. 133). For instance, Xu et al. (2020) found 14 different variants of construct definition in their review. In Study 1 and Study 2, we adopted a widely accepted conceptualization of shyness (Asendorpf, 1990, 1991; Coplan & Bowker, 2021), which assumes that the inner conflict between the shy person's desire for social interaction (i.e., high social-approach motivation) and the simultaneous anxiety of social interaction (i.e., high social-avoidance motivation) is the core characteristic of shy individuals. However, there are other leading researchers in the field (e.g., Poole & Schmidt, 2020) who suggest that individuals with low social approach motivation but high social avoidance motivation also constitute a group of shy individuals, the so-called "avoidant-shy" individuals, while calling individuals of the other subtype with high levels in both social motivations "conflicted-shy" individuals. Therefore, in Study 3 (Chapter 4), we tested whether these two subtypes of shyness differ in their oral and silent participation. Moreover, the theoretical framework (Asendorpf, 1986, 1990) also contains two subtypes of sociability (i.e., sociable individuals with high social approach motivation and low social avoidance motivation, as well as unsociable individuals with low levels in both social motivations). To date, this framework has not been examined using *both* adequate measures *and* appropriate statistical approaches. Therefore, with Study 3, we (a) reviewed existing literature on the model, (b) outlined limitations of previous approaches, (c) presented methodological suggestions on how to adequately test the model, (d) provided initial support for a revised measure (i.e., the Social Motivational Tendencies Scale), and (e) tested the model via a proposed statistical approach from the perfectionism literature (Gaudreau, 2012).

Research Questions

Taken together, the present dissertation addresses the following six research questions:

(1a) Does the teaching method "Think-Pair-Share" increase shy students' hand raising when compared to the typical in-class participation procedure (called "Share" in Study 1),

including initiation (teacher question), wait time, and student response (hand raising and oral participation)?

(1b) Does the teaching method "Think-Share" increase the hand raising of shy students when compared to the "Share" procedure?

(1c) Why do shy students (not) participate within these three conditions (i.e., "Think-Pair-Share," "Think-Share," and "Share")?

(2) Does peer relationship, student-teacher relationships, average warm calling, the average wait time after a teacher question, the class size, and/or the school subject influence shy students' hand raising?

(3a) Are there different subtypes, and thus individual differences, among shy students?

(3b) Are these subtypes differently related to in-class nonverbal attentiveness and in-class oral participation?

Methodology

The present dissertation was embedded in two larger research projects. Study 1 was embedded in the *TKKG* project (i.e., "Transaktive Kommunikation in kooperativer Gruppenarbeit" [Transactive communication in cooperative group work]). This project was supported by a research grant from the German Federal Ministry of Education and Research (BMBF; Grant No. 03VP03601). Studies 2 and 3 were embedded in the *SUMMA* project (i.e., "Stress, Unterrichtsgeschehen und mündliche Mitarbeit" [Stress, Class Events, and Oral Participation]). This project was supported by a research grant for young researchers from the University of Erfurt and approved by the ethics committee of the University of Erfurt.

I embrace the values of openness and transparency in science (Schönbrodt et al., 2015). Therefore, both research projects were preregistered in the Open Science Framework; see https://osf.io/32gcu for the first research project (Study 1) and https://osf.io/bt84w for the second research project (Studies 2 and 3).

Samples

All three studies in this dissertation were conducted with students from German middle schools ranging from 11 to 16 years ($N_{\text{Study 1}} = 393$; $N_{\text{Study 2}} = 204$; $N_{\text{Study 3}} = 226$). This age group was chosen as research has suggested that some types of shyness peak in this period of life (Cheek et al., 1986; Schmidt & Poole, 2019), and shyness in this age group appears to be associated with a higher risk of internalizing and social problems than shyness in childhood, underscoring the importance of further studies with adolescents (MacGowan & Schmidt, 2022). In addition, and particularly with regard to in-class participation, students at this age have been found to be more self-conscious (concerned about what others think about them) than younger or older students and therefore more reluctant to reveal themselves to an audience (i.e., imaginary audience phenomenon; see, e.g., Elkind & Bowen, 1979; Ryan & Kuczkowski, 1994). As this phenomenon is associated with social anxiety (K. M. Kelly et al., 2002), shy students seem to be particularly affected, contributing to their desire to stay out of the spotlight at this age in classroom situations (Levine & George, 1992).

Study Designs

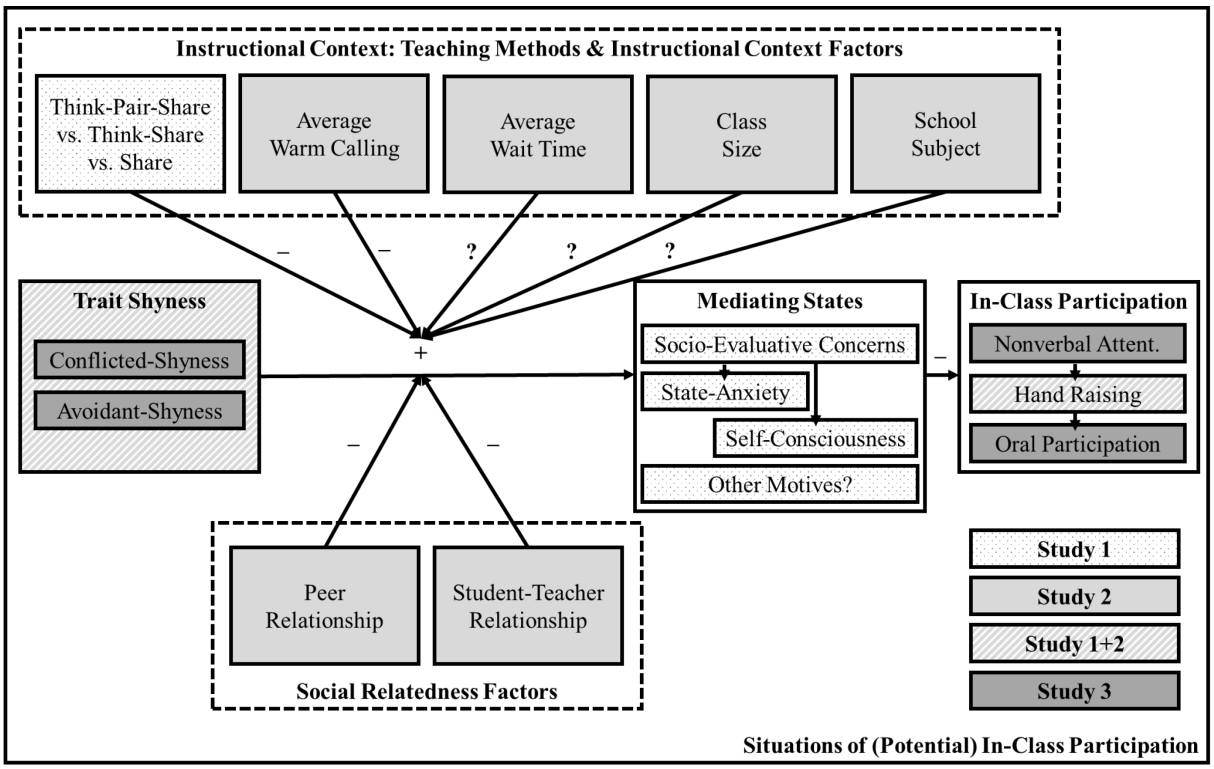
Study 1 was an experimental longitudinal study that employed a within-subjects controlled crossover design in which participants ran through three rounds representing the three conditions (i.e., three different teaching methods). Data sources were observations and students' self-reports. Study 2 was an observational longitudinal field study, which was composed of students' self-reports as well as observations and behavioral measurements during a regular school week (i.e., in total, 116 lessons in 7 different subjects were observed). Study 3 employed a cross-sectional design and was based on students' self-reports.

In all three studies, at least one form of in-class participation (i.e., nonverbal attentiveness, hand raising, and/or oral participation) served as a dependent variable, and trait shyness was one of the independent variables. In Study 3, trait shyness was statistically divided into two subtypes (i.e., conflicted-shyness and avoidant-shyness) as within-person combinations of high

social avoidance motivation and low or high social approach motivation, respectively. In addition, in Study 1, three different teaching methods served as further independent variables, students' motives for (non-)hand raising as further dependent variable, and state anxiety as both a further dependent variable and a potential mediating variable. In Study 2, two social relatedness factors (i.e., peer relationship and student-teacher relationship) and four instructional context factors (i.e., average warm calling, average wait time, class size, and school subject) served as further independent variables. Figure 3 provides an overview of all these variables in this dissertation and their assumed relationships.

Figure 3

Overview of Variables of This Dissertation and Their Assumed Relationships.



Note. Attent. = Attentiveness. The colorings indicate which variables were assessed in which studies. A plus (+) indicates a positive relationship, a minus (–) indicates a negative relationship. The negative relationships of some of the moderators indicate an assumed decrease in the (maladaptive) mediating states and thus an increase in the in-class participation.

Measures

In-class participation as the key dependent variable. Studies of student engagement are typically based on student self-reports or teacher reports (Fredricks et al., 2019). In Studies 1 and 3, three forms of student in-class engagement — hand raising, oral participation, and nonverbal attentiveness — were measured based on such self-reported student behavior. Other research has shown that students' self-reports should be an economic and reliable method of measuring behavioral engagement (see, e.g., Krohn et al., 2011). Although we made attempts to confirm the validity of this measurement, the validity of self-reports can never be guaranteed with absolute certainty. Thus, there has been a strong call for increased implementation of behavioral measures within engagement research (Fredricks et al., 2019). Therefore, for Study 2, I collaborated with the Bodymonitor company to develop a gadget to measure student hand raises in real time using accelerometry (the Bodymonitor Hand Raising Gadget; https://bodymonitor.de/elektronische-stimmkarte). The gadget logs, processes, and analyzes hand-raising events every tenth of a second; an algorithm uses moving averages and thresholds to determine whether the gadget is raised. Due to the novelty of the gadget, we checked its validity in three ways. All three ways convinced us that accelerometer technology can be used to capture not only a wide range of activities, such as everyday activities of adults (Bao & Intille, 2004) and physical activities of children (e.g., Roscoe et al., 2019), but also student hand raising. Such technical coverage of hand raising is entirely new in the engagement literature and is just one of several ways in which this dissertation makes a significant contribution to the study of in-class participation.

Self-reported independent variables. For almost all self-reported independent variables, we employed validated, commonly used instruments. The only exception was the instrument we used to measure the two social motivation tendencies (i.e., social approach and social avoidance motivation) in Study 3. To our knowledge, there has been no questionnaire explicitly developed to assess the two social motivational tendencies. However, Coplan and

colleagues (Coplan et al., 2016; Coplan et al., 2013) developed an instrument to capture social approach motivation (Child Social Preference Questionnaire, CSPQ), and they repurposed a common instrument used to measure shyness to capture social avoidance motivation (Children's Shyness Questionnaire, CSQ, Crozier, 1995). For Study 3, we further developed these measures into a new instrument, the *Social Motivational Tendencies Scale* (SMTS), and initially validated this new instrument.

Observed independent variables. In Study 2, trained assistants observed all lessons and logged pre-defined events via a mobile time-tracking app, resulting in time series data with timestamps of various classroom events. These observations were used to define both the relevant phases of in-class participation and to identify the possible facilitating factors of shy students' oral participation (i.e., class size, school subject, waiting time, and warm calling). Our coding scheme was based on the system of classroom categories developed by Seidel (2005).

Statistical Analyses

All statistical analyses were performed using a version of *R* (R Core Team, 2021) and several *R* packages (see the respective Methods sections of the three studies).

Given the multilevel structure of the data in Studies 1 and 2 (hand raising nested in the participants, which were nested in dyads, classes, and schools in Study 1 and in classes in Study 2, respectively), we ran linear mixed models (LMM) with random effects to account for variability across the levels. We ensured that the entered data fulfilled the assumptions of the used statistical procedure, that is, no collinearity and no overdispersion existed, and level-one residuals were distributed approximately normally (Field et al., 2012; Tabachnick & Fidell, 2013). Because the data on hand raising in Study 2 were not normally distributed, we followed Böheim, Urdan, et al. (2020) and used a logarithmic transformation on this variable (i.e., log10(sum of hand raisings + 1)). Furthermore, variables were centered following the guidelines of Enders and Tofighi (2007). For the control variables, we followed the guidelines

of Ranganathan et al. (2017). Mediation models in Study 1 were calculated following the guidelines in Tingley et al. (2014).

To test the new Social Motivational Tendencies Scale in Study 3, principal factor analysis (PFA; with oblique rotation) was conducted with randomly selected data that equaled half of the sample. With the other half of the sample, a confirmatory factor analysis (CFA; based on a correlation matrix) was conducted. The data in Study 3 had no multilevel structure. Therefore, to compare outcomes associated with the four subtypes of shyness and sociability, hierarchical regression analyses were conducted in Study 3 using the guidelines presented by Gaudreau et al. (Gaudreau, 2012; Gaudreau & Thompson, 2010).

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Chapter 2: “Think-Pair-Share” for Increasing Shy Students’ Hand Raising (Study 1)

Mundelsee, L., & Jurkowski, S. (2021). Think and pair before share: Effects of collaboration on students’ in-class participation. *Learning and Individual Differences, 88*, 102015. https://doi.org/10.1016/j.lindif.2021.102015

Abstract

“Think-Pair-Share” (TPS) is a teaching method thought to increase in-class participation, especially with shy students. After thinking for themselves, students talk to their seatmate to exchange ideas and finally show their willingness to participate in class by raising their hand. In the present field study, we tested TPS with 393 ninth-grade students against two variations: “Think-Share” (TS; first think, then raise hand) and “Share” (S; directly raise hand). Students reported on their shyness as well as their hand raising, state anxiety, and reasons for (non-)hand raising in each condition. Analyses revealed that TPS led to more hand raising compared to the S condition. Lower levels of hand raising in TS were fully mediated by state anxiety. Shyness was associated with the report of social evaluation concerns, and less frequent hand raising. These results indicate the importance of peer collaboration for in-class participation.

The following is a brief summary of the original manuscript. A copy of the full article can be found in the appendix (see Supplement A1).

Brief Summary

Introduction

Before contributing orally, students across the globe are advised to raise their hands. Consequently, hand raising represents an important gateway for learning. However, students’ chances for hand raising are not equal. According to research, the average time between a teacher’s question and calling on the first student who raises their hand is less than 2.5 seconds

(Heinze & Erhard, 2006). This offers little time for students to elaborate on their initial thoughts, formulate their answer, and, finally, decide whether to raise their hand. This seems particularly problematic for shy students who may have good ideas to share but hesitate to raise their hands.

“Think-Pair-Share” (TPS) is a teaching method from cooperative learning that may increase shy students’ chances of raising their hand (Coplan & Rudasill, 2016). Therefore, students first *think* about a question posed by their teacher individually. Then, they are grouped into *pairs* to exchange and discuss their ideas. Finally, they *share* their validated and maybe extended ideas with the whole class. Thus, TPS may provide students with the opportunity to elaborate on their ideas and heighten confidence through peer support. In turn, TPS should reduce anxiety and, thus, increase hand raising, particularly in shy students.

In an experimental field study, we tested these hypothesized effects of TPS against two other teaching strategies on students’ hand raising.

Material and Methods

Data collection was part of a larger project in which we gave two-day communication trainings for 23 ninth-grade classes. The final sample of the present study consisted of 393 participants (213 females, 177 males, and 3 unspecified; M_{age} = 14.36, SD_{age} = 0.60).

The experiment took place at the beginning of the training. First, the students completed a questionnaire about trait shyness and other items. Next, in three consecutive rounds, students were asked how two keywords (e.g., round 1: natural disasters and wars) could relate to worldwide hunger (i.e., the main topic of the training). Using a within-subjects controlled crossover design, participants then ran through the following three conditions (class by class in counterbalanced order): (1) a complete TPS condition; (2) a condition with a think phase to elaborate on own ideas but no collaborative pair phase (“Think-Share” = TS), and (3) a condition in which students were asked to raise their hands to share their thoughts with class immediately without thinking or pairing beforehand (“Share” = S).

In each *think phase,* students were given one minute to think individually on the question and take notes. In the two-minute *pair phase*, the dyads exchanged and discussed their ideas. Each *share phase* started with the trainer repeating the question. Then, the trainer waited for 10 seconds during which students could raise their hands. Participants were asked to complete a short state questionnaire on their hand raising, motivations for (non-)hand raising, and anxiety level before calling on several students. Hand raising and the motives served as dependent variables in the latter analyses, with state anxiety as a potential mediator, while the teaching method, trait shyness, and their interaction served as independent variables. In addition, we collected and rated students’ notes from the two *think phases,* and assistants counted the number of students with their hands raised in each round. With both, we confirmed the validity of the self-reported hand raising.

Results

In the main analyses, contrasts revealed a significant difference in hand raising in TPS compared to S and no significant differences for the other two contrasts. This pattern remained stable when shyness was entered into the model, but no interaction effect with shyness was found.

Analyses of the chosen motives for (non-)hand raising showed that shy students chose the non-hand raising motives “I was unsure of my answer” and “I didn’t want to be the center of attention” more often than their less-shy peers. Moreover, they agreed less frequently to the motive “I wanted to share my ideas” in TPS than in TS and S.

Regarding a possible mediation of state anxiety, analyses showed that state anxiety significantly negatively predicted hand raising and significantly lower levels of state anxiety in TPS when compared to TS, but no significant differences for the other two contrasts. A multilevel mediation analysis revealed a significant indirect effect for TPS when checked against TS and a marginal indirect effect when comparing TPS to S, indicating that the positive

effect of TPS on hand raising was mediated via lower levels of state anxiety. TS and S did not differ in terms of the mediating effect of state anxiety.

Discussion

This study indicates that TPS can increase the rate of hand raising compared to the traditional teaching approach, wherein teachers ask a question and wait for the students to directly raise their hands and share their answers. We found this positive relationship only for TPS and not for TS, suggesting that exchanging ideas with a partner can foster the elaboration of ideas and confidence in sharing them in class. A mediation analysis indicates that the lower levels of hand raising in TS can be partially attributed to higher levels of state anxiety in this condition. Furthermore, our results do not support the hypothesis that students with higher levels of shyness particularly benefit from TPS. Social evaluative concerns were the leading motive for these students, resulting in relatively low levels of hand raising, pointing to the relevance of social processes in class. Nevertheless, they benefit from TPS to the same extent as their less-shy peers. The importance of TPS as a teaching strategy becomes clearer with the result that hand raising was mediated by lower levels of state anxiety in TPS. We think that the present study highlights the benefits of the Think-Pair-Share strategy and provides insights into a deeper understanding of the processes involved in hand raising of (shy) students.

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Heinze, A., & Erhard, M. (2006). How much time do students have to think about teacher questions? An investigation of the quick succession of teacher questions and student responses in the German mathematics classroom. *ZDM, 38*, 388-398. https://doi.org/10.1007/bf02652800

Chapter 3: Contextual Factors Influencing Shy Students' Hand Raising (Study 2)

Mundelsee, L., & Jurkowski, S. (in press). Opening the gateway to oral participation: Exploring facilitative contextual factors in the association between student shyness and hand raising. *American Educational Research Journal.* https://doi.org/10.3102/00028312241278585

Abstract

This field study examined factors that might influence the hand raising in students with high levels of shyness. Data were assessed using student self-reports of shyness and social relatedness factors (student-teacher relationship and peer relationship), observations of instructional factors (wait time, warm calling, class size, and school subject), and behavioral measures of hand raising among 204 middle school students during a school week. Multilevel analyses show that student-teacher relationship and warm calling faciliate hand raising of highly shy students, but also that they less likely raise their hands the better their peer relationship. Thus, the results suggest that both social relatedness and instructional factors can promote hand raising in highly shy students, opening the gateway to their oral participation.

The manuscript is accepted for publication in the *American Education Research Journal*. The following is a brief summary of the original manuscript. A copy of the full manuscript can be found in the appendix (see Supplement A2).

Brief Summary

Introduction

Although many students report that they would like to participate more (Wade, 1994), only a handful of students participate regularly (e.g., Kelly, 2007). One reason for this pattern is shyness among students (Evans, 2010). However, not much is known among either practitioners or researchers about how to help shy students participate orally (Nyborg et al.,

2020). Therefore, the present study sought to find factors that promote shy students' hand raising as the central gateway to their oral in-class participation.

Taken together with findings and suggestions from literature, we expected higher levels of shy students' hand raising to be associated with several contextual factors (i.e., peer relationship, student-teacher relationships, warm calling, teacher wait time, class size, and school subject).

Material and Methods

We used three major data sources to test these expectations in a sample of 204 students (54 % girls; M_{age} = 11.85, SD_{age} = 1.05): (1) Student self-reports (i.e., trait shyness, peer relationship, and student-teacher relationships) were collected using validated, commonly used instruments; (2) during a regular school week, teachers' wait time and use of cold calling were measured through observations; and (3) student hand raising was assessed through behavioral measurements using an accelerometry gadget. In total, 116 lessons in 7 different subjects were observed, resulting in a sample of 1833 lessons distributed over all students.

Results

Generalized linear mixed models revealed that average warm calling and average wait time positively and class size negatively predicted hand raising in all students (i.e., significant main effects). Moreover, all students raised their hands more in the natural sciences. Shy students particularly benefit from better student-teacher relationships and more warm calling (i.e., significant interaction effects). Surprisingly, we discovered a negative interaction effect for peer relationship, which means that shy students were less likely to raise their hands as the peer relationship improved. All models accounted for nested data structures (i.e., lessons nested in students).

Discussion

In the present study, shy students raised their hands less than their non-shy classmates, but we found some factors that may encourage shy students to participate in class more often.

For example, and in line with our assumptions, shy students were more likely to raise their hands as their student-teacher relationship improved and their teachers used the warm calling strategy frequently. Both findings underscore how important it is for teachers to create a warm and safe atmosphere in which shy students feel secure and gain confidence to raise their hands in a self-directed, non-forced manner.

Interestingly, peer relationship had a negative interaction effect with shyness on hand raising, yet it reveals interesting references to other findings. For example, students who are well-liked and popular in their class engage less behaviorally (Engels et al., 2016), which may be particularly the case for silent students who may not want to stand out as overachievers and risk their peer status (Schnitzler et al., 2021). Thus, it is possible that shy students in classes with a warm climate are accepted by their classmates in their role as quiet students and therefore raise their hands less. This assumption calls into question whether shy students in classes with warm climates must necessarily have high oral participation rates. By contrast, peer acceptance and a positive teacher-student relationship may buffer the negative consequences of shy students' lower oral participation rates, turning them into silent but cognitively and emotionally engaged students (e.g., Schnitzler et al., 2021).

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Chapter 4: Oral and Silent Participation of Shy vs. Sociable Students (Study 3)

Mundelsee, L., & Jurkowski, S. (2024). The 2 × 2 model of shyness and sociability: A methodological review and suggestions tested in an example study. *Personality and Individual Differences, 221*, 112545. https://doi.org/10.1016/j.paid.2024.112545

Abstract

The 2 × 2 model of shyness and sociability is a widely accepted theoretical framework, but to date has not been examined using *both* adequate measures *and* appropriate statistical approaches. Therefore, we first review existing literature on the model, outline limitations of previous approaches, and present methodological suggestions on how to adequately test it. Second, by means of an example study with 206 adolescents, we provide support for a revised measure assessing social approach and social avoidance motivation as the two main dimensions of the model. Moreover, when testing the model with hierarchical regression analyses, we could partially replicate previous findings, but also found conflicting results. For instance, when compared to the avoidant-shy subtype (AS; i.e., the combination of low approach and high avoidance), the sociable subtype (SO; i.e., high approach and low avoidance) turned out to be more adaptive in all outcomes (i.e., positive and negative affect, emotional problems, peer problems, conduct problems, oral participation) except for prosocial behavior and nonverbal attentiveness. Furthermore, the comparison of SO to the conflicted-shy subtype (CS; i.e., both high approach and avoidance) and unsociable subtype (UN; i.e., both low approach and avoidance) illustrates that which subtype is more adaptive depends on the outcome.

The following is a brief summary of the original manuscript. A copy of the full article can be found in the appendix (see Supplement A3).

Brief Summary

Introduction

The 2 × 2 model of shyness and sociability is a widely accepted conceptualization that has been used repeatedly in the past 30 years as a theoretical and sometimes analytic framework (Asendorpf, 1990; Coplan & Bowker, 2021). It is assumed that the combination of high and low social approach motivation (SAP) as well as high and low social avoidance (SAV) would distinguish between four subtypes of shyness and sociability (i.e., a sociable subtype (SO) with a combination of high SAP and low SAV, an unsociable subtype (UN) with low SAP and low SAV, a conflicted-shy subtype (CS) with high SAP and high SAV as well as an avoidance-shy (AS) subtype with low SAP and high SAV).

Despite their prevalence, the measurement of the models' main dimensions (i.e., SAP and SAV) and the statistical analyses used are limited in that they partially neglect some of the key assumptions or allow only limited conclusions for all four subtypes. Therefore, with this article, we (a) present methodological suggestions on how to adequately test the model and, by means of an example study, we (b) provide initial support for a revised measure, and (c) test the model by statistically contrasting the four subtypes in relation to silent and oral participation, positive and negative affect, as well as socioemotional strengths and difficulties.

Material and Methods

The study employed a cross-sectional design and was based on the self-reports of 226 adolescent students (122 girls, 106 boys, and 4 others) from six classes of a German middle school, ranging in age from 11 to 16 years of age (M_{age} = 13.83; SD_{age} = 1.51).

An online questionnaire was employed and contained a newly developed instrument to assess the two social motivational tendencies as well as validated, commonly used scales to capture positive and negative affect (PANAS-C-SF, Ebesutani et al., 2012), socioemotional strengths and difficulties (SDQ-Deu-S; Lohbeck et al., 2015), and oral as well as silent in-class participation (both adopted from Frymier & Houser, 2016).

We developed the new instrument on the basis of several common scales that assess shyness but not SAP and SAV, which are, however, the two key dimensions of the 2 × 2 model of shyness and sociability. In an initial validation of the new measure, we were able to extract two factors that were consistent with theory. All of the scales used, including these two, demonstrated satisfactory psychometric properties.

Using the two subscales of the new instrument as independent variables and all outcome variables (i.e., silent and oral participation, general positive and negative affect, as well as socioemotional strengths and difficulties) as dependent variables, we tested whether the four subtypes of shyness and sociability show distinct patterns of adjustment or maladjustment on these outcomes. As a result, we used a statistical strategy proposed in the perfectionism literature several years ago to test the then emerging 2 × 2 model of perfectionism (Gaudreau & Thompson, 2010). More precisely, multiple hierarchical regression analyses and planned contrasts were performed with estimated marginal means at high and low levels (+/- 1 SD above/below the mean, respectively) of SAP as well as SAV representing the four subtypes.

Results

These analyses yielded a diverse picture across the various outcome variables. More specifically, in all but one outcome (i.e., prosocial behavior), at least three subtypes differed significantly with small to large effect sizes. The outcome with all contrasts being significant was emotional problems, with SO as the most adaptive subtype, followed by UN and CS, and with AS as the most maladaptive subtype. Furthermore, while we found that the SO and AS subtypes differed in most outcomes, the opposite was true for the AS and CS subtypes, which differed in only two outcomes (i.e., emotional problems and peer problems), with individuals of the AS subtype having more problems than individuals of the CS subtype. By contrast, the UN subtype appears to be a "relatively benign subtype of social withdrawal" (Coplan & Bowker, 2021). In terms of in-class participation, both SO and UN were associated with higher levels of oral participation than CS and AS. Furthermore, the UN subtype revealed higher levels

of nonverbal attentiveness when compared to AS and CS, while the SO subtype showed only higher levels when compared to CS.

Discussion

Our findings partially replicate those of other studies from the 2 × 2 framework research (Coplan et al., 2021; Coplan et al., 2018; Coplan et al., 2013; Coplan & Weeks, 2010). For example, the AS subtype was associated with more negative, maladaptive outcomes, whereas the SO subtype was more associated with adaptive, positive outcomes compared to the other three subtypes. In addition, shyness was associated with low oral participation, consistent with previous research.

But our findings also yielded some opposing results, which may be attributed to the differences in the measures and statistical approach used and/or to differences in the age studied. For example, while none of the subtypes in the study of Coplan and Weeks (2010) differed in terms of emotional problems, all subtypes differed significantly in our study.

Furthermore, this study also extends previous research. For instance, the results suggest that shy students (i.e., individuals of the CS and AS subtypes) not only rarely participate orally, but also, in contrast to UN students, have problems with their nonverbal attentiveness. Moreover, prosocial behavior has not been tested in terms of the four subtypes. Interestingly, while SO and the two shyness subtypes did not differ, SO and UN strongly differed, with SO being associated with more prosocial behavior than UN.

Finally, if these results are viewed as a whole, interesting conclusions can also be drawn about the overall model. For example, our findings call into question the assumption that, regardless of the studied outcomes, there is a single most adaptive or single most maladaptive subtype (Coplan & Bowker, 2021; Coplan et al., 2015) and highlight the potential that the 2 × 2 model still has thirty years after its publication.

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Chapter 5: General Discussion

The aim of this dissertation was to develop a better understanding of why, when, and how shy middle school students engage in in-class participation, as well as how teachers can promote this. In a series of three studies, we used a multi-measure, multi-method approach that included cross-sectional as well as experimental and observational longitudinal study designs and integrated self-reports, observational, and technical methodologies to explore shy students' in-class participation. In the following discussion, I will first summarize the key findings of this dissertation, derive some practical implications, discuss limitations and possible future directions, and finally end with some conclusions.

Summary of Key Findings

The results of this dissertation provide some new and important insights into the everyday experiences of shy students. First and foremost, throughout all three studies, shyness was significantly negatively associated with the form of in-class participation studied (i.e., $r = -.13$ for hand raising in Study 1, $r = -.16$ for hand raising in Study 2, as well as $r = -.43$ and $r = -.17$ for oral participation and nonverbal attentiveness, respectively, in Study 3), supporting previous research conducted mostly with younger age groups (see Crozier, 2020; Evans, 2010, for reviews), and underscoring the relevance of this issue in the middle school age group. Second, based on the findings in Study 3, this pattern seems to be true regardless of the studied shyness subtypes (i.e., conflicted-shy and avoidant-shy) as well as the studied form of in-class participation. That is, individuals of both shyness subtypes report that they not only participate less orally, but they also seem to have problems with their nonverbal attentiveness (Mundelsee & Jurkowski, 2024)[1]. Third, the good news from the findings of Studies 1 and 2 is: teachers

[1] It should be noted that Study 3 also revealed associations between the two shyness subtypes and several other outcomes of adjustment and maladjustment (e.g., positive and negative affect). However, since this dissertation focuses on students' in-class participation, I report and discuss only the findings on this outcome here.

seem to have some options for facilitating oral participation for shy students (Mundelsee & Jurkowski, 2021, in press). In the following section, I describe these findings in more detail.

Why do shy students not participate in class?

At the time I started this dissertation, little was known regarding the reasons for the low oral participation of shy students. Until then, a few studies had asked students about their reasons for participating or not participating in class, but these were studies with no particular reference to shyness or with qualitative design (Abdullah et al., 2012; Böheim et al., 2020; Fassinger, 1996; Howard & Henney, 1998). In Study 1, we therefore asked all students, after the three conditions (i.e., "Think-Pair-Share," "Think-Share," "Share"), why they did or did not raise their hands and gave them several reasons to choose from. Moreover, we also assessed their trait shyness and state anxiety. This allowed us to quantitatively analyze the reasons in which shy students differ from their non-shy peers (Mundelsee & Jurkowski, 2021).

These results indicate three main reasons for shy students' in-class silence: First, shy students reported that they did not want to attract the attention of others in the classroom, that is, teachers and peers. Second, they showed higher levels of state anxiety in all three conditions, coinciding with reported concerns about their answers and the possible reactions of others to them. In particular, they did not want to embarrass themselves when they had no extra time to think or talk with a partner beforehand. Third, after sharing their ideas with a partner, shy students reported being less inclined to share their ideas with the whole class, and we speculated that shy students may have reached their need to talk in the partner exchange (Mundelsee & Jurkowski, 2021).

Most conceptualizations and definitions of shyness mention shy people being prone to self-consciousness, embarrassment, and anxiety in the face of social publicity or perceived social evaluations (see Xu et al., 2020, for an overview). In summary, the findings of this dissertation support the expectations deriving from these conceptualizations for in-class situations of oral participation and they also support the assumptions of Crozier (2020), who

suggests that shy students weigh the costs, benefits, and probabilities of their in-class participation and may not participate even if they know the correct answer. Moreover, the findings underscore that, in addition to student knowledge, peer-related as well as teacher-related factors in the classroom play an important role in shy students' silence (Archbell & Coplan, 2021; Roorda et al., 2017). Therefore, these findings also imply that peer-related factors, such as social relations, and teacher-related factors, such as instructions and teaching methods, are possible keys to opening the gateway to shy students' in-class participation. With Studies 1 and 2, we attempted to find evidence to support this assumption.

When do shy students participate in class?

Many social relatedness factors and instructional context factors have been found to influence all students' oral participation (see Rocca, 2010, for a review). This dissertation contributes to and expands this research by focusing on shy students and potential facilitators for them.

Study 2 examined both categories of factors (i.e., social relatedness factors and instructional context factors), and their potential facilitation of shy students' hand raising in teacher-centered class phases. Study 1 focused on the instructional context only and examined whether shy students participate more when they are given more time to think (i.e., "Think-Share") or when they have both more time to think and the opportunity to validate their answer with their seatmate (i.e., "Think-Pair-Share"), when compared to a rather typical class situation without extra time or validation opportunity (i.e., "Share").

When the results of both studies are taken together, shy students benefit more than their non-shy peers from better student-teacher relationships, high levels of warm calling by their teachers (i.e., students usually only call when they raise their hand), and lower peer relationships (i.e., all significant interaction effects). We also found significant main effects for the "Think-Pair-Share" teaching method, smaller classes, and when teachers waited longer after their question before calling the first student (i.e., wait time). Therefore, shy students should benefit

from these factors to the same extent as their non-shy peers (Mundelsee & Jurkowski, 2021, in press).

Some of these findings support previous results and recommendations in literature for younger children. For example, Evans (2001) suggested in her review for teachers "to establish a personal relationship and trust, providing a chance for one-to-one work with the teacher" (p. 167). This recommendation has recently been empirically confirmed for shy children in kindergarten (Wu et al., 2022) as well as socially anxious university students (Archbell & Coplan, 2021), and through the present dissertation, now also for shy adolescents (Mundelsee & Jurkowski, in press). Similarly, Coplan and Rudasill (2016), advised teachers against using cold calling (calling students without raising their hands) because "pushing shy children to speak up … appears to only have the effect of increasing their reluctance to speak" (p. 58). Consistently, the opposite warm calling strategy has been reported as one of the most common methods used by teachers to decrease the anxiety of shy students (Nyborg et al., 2022). Through the results of this dissertation, we now know that the predominant use of warm calling may not only reduce the anxiety of shy students but also positively affect their hand raising. Nevertheless, the results of Study 2 also indicate that it might be helpful for teachers to sometimes also cold-call shy students, especially when they have a good relationship with them (Mundelsee & Jurkowski, in press).

Contrary to recommendations (Coplan & Rudasill, 2016), we did not find a particularly beneficial effect of the "Think-Pair-Share" method for shy middle school students in Study 1 and discussed several possible explanations for this. For example, (a) shy students may have reached their need to talk in the partner exchange; (b) the time to become accustomed to the likely new teaching method was too short; (c) or because students in this study were randomly assigned to each other, whereas shy students may need to work with a friend to fully benefit from collaboration (J. Chen et al., 2021). Whether the peer-oriented strategies (i.e., involving a classmate in problem solving) reported by many elementary school teachers to support their

shy students are particularly helpful for the oral participation of shy students in middle school thus remains questionable (Bosacki et al., 2014; Coplan et al., 2011; Deng et al., 2017). But since we found main effects for the "Think-Pair-Share" method (when compared to the "Share" condition), it can be assumed that shy students benefit from this teaching method to a similar extent as their non-shy peers (Mundelsee & Jurkowski, 2021).

Similarly, we found significant main effects for class size and average wait time in Study 2. Again, it can be assumed that shy students benefit from these factors to a similar degree as their non-shy peers (Mundelsee & Jurkowski, in press). In terms of average wait time, the results of Studies 1 and 2 fit well together. In Study 1, we found no beneficial effect of the extra think phase for shy students' hand raising (i.e., "Think-Share" contrasted to "Share"), and we attributed these results to a possible mediating effect of state anxiety. More specifically, the longer the wait time, the more shy students may ruminate on their initial thoughts and believe that teachers expect more detailed answers, which in turn increases their uncertainty about their answer, making them less likely to raise their hands. The same effect may explain why we found only a main effect for wait time in Study 2. Therefore, some shy students, like all students, may benefit similarly from longer wait times, while others may suffer (Mundelsee & Jurkowski, 2021, in press).

Findings from Study 2 also extend previous findings regarding in-class participation in different school subjects. While non-shy students were generally more likely to raise their hands in natural science subjects than in social science subjects, there was a reverse tendency for shy students in Study 2: they were slightly more likely to raise their hands in social science subjects. These results underscore the relevance of considering shyness as an important mediator in analyzing student hand raising.

Regarding class size, as with the cold calling strategy, the increased likelihood of being called and the reduced chance of hiding can be problematic for shy students in smaller classes. Simultaneously, smaller classes reduce the number of listeners, and as a result, the public

pressure to say something incorrect (Abdullah et al., 2012; Smith, 1992). Both effects may counteract each other for shy students and have led to the significant main effect but non-significant interaction effect in Study 2. However, other recent findings on shy students' in-class participation show increased levels of shy students' oral participation in small group discussions, but only when grouped with peers whom they identify as their best friends (J. Chen et al., 2021). As a result, it appears that the composition of the group or class in which shy students are, in addition to its size, is critical to their oral participation.

Accordingly, it has been suggested that teachers should create a warm and supportive class climate to increase shy students' oral participation (Coplan & Rudasill, 2016; Evans, 2001), and elementary school teachers report doing so to reduce shy students' anxiety (Bosacki et al., 2014; Nyborg et al., 2020). Surprisingly, better peer relationships predicted lower levels of hand raising in shy students in Study 2. Again, we can only speculate about this finding. For example, shy students have been found to be more sensitive to the class climate as a common indicator of peer relationships than their non-shy peers (Gazelle, 2006). As a result, they may be more extreme in their assessment of their peer relationships, making differences in hand raising statistically more likely to emerge for them. Moreover, there are some recent findings that lead us to believe that it has something to do with the social status of these students in the classroom. As research shows, students who are well-liked and popular in their class engage less behaviorally (Engels et al., 2016). Schnitzler and colleagues (2021) argued that this may be particularly the case for well-liked silent students who may not want to stand out as overachievers and risk their peer status. Thus, it is possible that shy students in warm climate classes are accepted by their classmates in their role as quiet students and may not or rarely participate orally (Mundelsee & Jurkowski, in press). At the same time, shy students in cold climate classes may be more afraid of negative evaluation. According to a recent study on shy students' classroom performance, this fear of negative evaluation may "stimulate their attention in class, urging them to concentrate [and] listen carefully" (Y. Chen et al., 2022, p. 8), and, thus,

may also be responsible for the increased hand raising when having low peer relationships in Study 2. Despite this assumed positive effect on in-class participation, it remains an open research question whether this does not lead to even greater internalization problems in shy children in the long run (Kalutskaya et al., 2015).

The latter finding therefore raises the question of whether shy students, if they are in classes where they have good relationships with their peers, must necessarily have high levels of oral participation (Mundelsee & Jurkowski, in press). In fact, peer acceptance and a warm class climate may buffer the negative consequences of shy students' lower oral participation rates, turning them into silent but cognitively and emotionally engaged students, that is, nonverbal attentive students (Schnitzler et al., 2021; Sedova & Navratilova, 2020; Shi & Tan, 2020), who perform well academically (Zhang et al., 2017). This draws attention to the question of whether there are differences in how shy students participate in the classroom.

Which and how do shy students participate in class?

During the course of work on this dissertation, scholarly discourse has developed about how many subtypes of shyness exist (see, e.g., Schmidt & Poole, 2019) and how they are related to various positive and negative outcomes (Coplan & Bowker, 2021; Poole & Schmidt, 2020). With Study 3, we tested the 2 × 2 model of shyness and sociability, which has been a widely accepted theoretical framework for over 30 years (Asendorpf, 1986, 1990; Poole & Schmidt, 2020), but has not been examined using both adequate measures and appropriate statistical approaches. By means of an example study with 206 adolescents, we initially validated a new measure that assesses the two key dimensions of the 2 × 2 model (i.e., social approach motivation and social avoidance motivation) and sought to find support for the model (Mundelsee & Jurkowski, 2024). In particular, building upon the findings of Study 2, we investigated whether the two shyness subtypes (i.e., CS, "conflicted-shyness," combining high levels of social approach and social avoidance, and AS, "avoidant-shyness," combining low

levels of social approach and high levels of social avoidance) show lower levels of oral participation but no differences or even higher levels of nonverbal attentiveness.

In line with our assumptions, both sociability (SO; the combination of high social approach and low social avoidance) and unsociability (UN; the combination of high social avoidance and low social approach) were associated with higher levels of oral participation than CS and AS. Furthermore, and in contrast to our assumptions, the UN subtype revealed higher levels of nonverbal attentiveness when compared to AS and CS, while the SO subtype showed higher levels when compared to CS. Therefore, when it comes to social withdrawal personality traits, silence and also inattentiveness in the classroom clearly emanates much more from shyness than from unsociability (Mundelsee & Jurkowski, 2024).

These results are also interesting in relation to the results of Studies 1 and 2 in this dissertation. When comparing the results of all three studies of this dissertation, it is important to note that in Studies 1 and 2, we employed the Children's Shyness Questionnaire (CSQ; Crozier, 1995), while in Study 3, we used our newly developed measure. However, according to Coplan et al. (2013; 2016), the CSQ can be seen as an indicator of social avoidance motivation. Thus, the findings of Studies 1 and 2 can be attributed to the 2 × 2 model subtypes CS and AS, which both are characterized by high levels of social avoidance motivation.

Taken together, the results of Study 3 thus support the findings of Studies 1 and 2, linking lower oral participation to shyness, but they also extend these findings to the fact that unsociable individuals seem to be less affected by this. Moreover, and this is important, students of both shyness subtypes also report lower levels of nonverbal attentiveness. Shy students, thus, seem to have problems not only with their oral participation but also with their nonverbal participation in class (Mundelsee & Jurkowski, 2024).

To explain these findings, we speculated whether situations of in-class participation are generally threatening for shy students of both subtypes (Mundelsee & Jurkowski, 2024; see also Poole & Schmidt, 2019). In turn, they may divert their attention from relevant cues (e.g., a

teacher question) to the anxiety stimulus (e.g., not to attract the attention of the teacher; Downing et al., 2020; Wenzel & Holt, 2003), which then may impair their ability to concentrate, suppressing their nonverbal attentiveness (Russell & Topham, 2012; Shi & Tan, 2020). The link between this so-called attention bias to threat has so far been demonstrated for anxious and socially withdrawn adolescents (Pérez-Edgar et al., 2010; Roy et al., 2008). Within the 2 × 2 model, socially withdrawal refers to the subtypes UN, CS, and AS. Therefore, this dissertation contributes to these studies but challenge them to the extent that only shy but not unsociable individuals seem to have heightened levels of attention bias to threat.

Although this finding has yet to be empirically validated, it could explain the detrimental effect of high levels of cold calling on shy students' in-class participation in Study 2. As a recent micro-analytic study of the impact of cold calling on fifth graders found, it seems to depend on how successfully teachers establish their students as fellow thinkers before cold calling them (Morek et al., 2022). However, given their lower nonverbal attentiveness, fellow thinking can be assumed to be problematic for shy students as well. When they are then cold called, they are unlikely to have an answer ready. Thus, cold calling would reinforce shy students' negative self-evaluation (Stöckli, 1999), and enhance the downward spiral which gradually reduces their emotional engagement, in-class participation, and academic performance (Kalutskaya et al., 2015; Stöckli, 2007).

Practical Implications

Although replications of our findings are needed, this dissertation provides some important implications for school practice. First, this dissertation confirmed the link between shyness and low in-class participation and expanded it both for middle school students and for different forms of in-class participation, that is, oral and nonverbal participation, as well as for other outcomes of psychosocial functioning (e.g., emotional problems) (Mundelsee &

Jurkowski, 2021, 2024, in press). To this extent, this dissertation suggests that schools and particularly teachers should pay more attention to shy students in this age group as well.

Second, this dissertation identifies ways teachers can support shy students in terms of their in-class participation (Mundelsee & Jurkowski, 2021, in press). In general, teachers may establish a close (but perhaps not too close) student-teacher relationship (see also M. Chen et al., 2019), which may include immediacy behaviors such as knowing student names outside of class conversations and approachability (see also Archbell & Coplan, 2021). For phases of teacher-centered classroom talk and whole-class discussion, teachers may ask open-ended questions (see also Ing et al., 2015) as well as create a warm atmosphere in which shy students feel safe and gain the confidence to speak up on their own without coercion rather than cold call students (see also Nyborg et al., 2022; Nyborg et al., 2020). In particular when a teacher is new in class, it may more promising when shy students are allowed to remain silent to stay cognitively and emotionally engaged (see also Frymier & Houser, 2016; Meyer, 2009; Schnitzler et al., 2021; Shi & Tan, 2020). However, as this strategy in the long term "runs the risks of reinforcing the child's reticence and having the child miss out on the positive feelings of self-confidence that can ensue from a contribution that is praised by the teacher or appreciated by peers" (Nyborg et al., 2022, p. 19), it might be helpful also for shy students to being cold call from time to time, for example, for simple questions where they definitely know the answer, so that they can gain confidence in their answers and start raising their hands on their own. Importantly, as the results of Study 2 indicate, a good student-teacher relationship is a prerequisite for achieving this.

Third, together with recent findings that speaking in front of the whole class is not necessarily important for academic achievement but to simply have the opportunity to talk (Sedova et al., 2019), the present dissertation also supports the notion that shy students benefit from small group discussions, probably in particular, when working with friends (Mundelsee & Jurkowski, 2021; see also J. Chen et al., 2021). Therefore, teachers may assess students'

needs when making seating and grouping arrangements (Nyborg et al., 2022), before integrating "Think-Pair-Share" and other teaching methods from cooperative learning (e.g., Jigsaw, Round Robin, and Inside-Outside Circles; see, e.g., Kagan & Kagan, 1994) to further increase shy students' oral participation. It might be an idea to assess students' oral participation in such small-group and partner discussions so that they do not have to limit oral participation to whole-class discussions. Furthermore, self- and peer-assessment can supplement teacher evaluation while relieving the pressure on shy students created by standard assessment (Mello, 2010).

Finally, the results of this dissertation suggest that shy students also have problems with their nonverbal attentiveness, which may be driven by their concerns and fears in socio-evaluative situations as well as an attentional bias to threat in them (Mundelsee & Jurkowski, 2024). Counseling and therapy for shy students have been shown to have a good chance of success in overcoming some of these common concerns and fears (Henderson et al., 2014; Mundelsee, 2022), and attention modification programs have been developed to decrease attention bias to threat, for example, in patients with generalized anxiety disorder (e.g., Amir et al., 2009). Such programs may also help shy students, particularly with their nonverbal attentiveness. At the same time, research indicates a high willingness in shy students to seek help through school psychological counseling (Lazarus, 1982). However, this requires well-trained teachers who recognize shy students as such and offer them support. Since shyness is difficult to identify both for teachers and even parents (Spooner et al., 2005), our own Social Motivational Tendencies Scale, developed in Study 3, may therefore help to detect shy students (Mundelsee & Jurkowski, 2024). More precisely, high scores on the social avoidance motivation subscale indicate that the student may belong to one of the two shyness subtypes (i.e., avoidant-shy or conflicted-shy).

Limitations and Future Directions

The present dissertation is not without limitations. First, the proposed process model on which the present dissertation is based assumes that the factors studied will reduce shy students' state anxiety, self-consciousness, and socio-evaluative concerns and, thus, increase their hand raising (see Figure 3 in Chapter 1). However, the mediating effect of the mentioned emotions has only been tested in Study 1 in terms of state anxiety. Against the background of some of the findings in Study 2 (e.g., the significant interaction effects of average warm calling and student-teacher relationship), it seems plausible that these emotions did also play a role in the other findings of the present dissertation and either increased or reduced shy students' in-class participation. Nevertheless, future studies should incorporate emotional measures such as psychophysiological arousal (Hofmann et al., 2006) to further test the proposed process model as well as some of the speculated interactions of behavioral, emotional, and cognitive engagement of shy students (Skinner & Pitzer, 2012).

Second, the chosen sample of this study limits the generalizability of the findings. For instance, while in Western, individualistic contexts shyness tends to be viewed as an unfavorable, maladaptive trait, Eastern, collectivistic countries view shyness as a positive, adaptive characteristic (M. Chen et al., 2019; Nurmi, 2012). Therefore, I am curious whether future research in other samples (e.g., other cultures and age groups) will yield similar results.

Third, we employed various measures of students' trait shyness. More specifically, in Studies 1 and 2, we employed the Children's Shyness Questionnaire (CSQ; Crozier, 1995), which is a commonly used and validated measure in the research on shyness. However, for the objectives of Study 3, it was necessary to develop an own measure assessing the two key dimensions of the 2 × 2 model of shyness and sociability (i.e., social approach motivation and social avoidance motivation). According to Coplan et al. (2013; 2016), the CSQ can be used to assess social avoidance motivation. Thus, the findings of Studies 1 and 2 can be attributed to the 2 × 2 model subtypes with high levels of social avoidance motivation, namely conflicted-

shyness and avoidant-shyness. However, because we did not assess social approach motivation, which is required to differentiate the two shyness subtypes, the results of Studies 1 and 2 cannot be interpreted in terms of the 2 × 2 model, that is, no separate conclusions can be drawn about the two shyness subtypes or sociability and unsociality. Although this reduces the comparability of the results of the three studies, they provide a coherent picture of the in-class participation of shy students. Nevertheless, future studies could use our new measure together with our proposed analysis strategy in Study 3 to examine whether the two shyness subtypes differ with respect to other indicators of in-class participation that were not captured in Study 3, such as hand raising.

Fourth, we used different measures of student in-class participation in all three studies. In Study 1, hand-raising events were assessed based on self-reported student behavior, and in Study 3, general oral participation and general nonverbal attentiveness were measured based on student self-reports. Other research has shown that students' self-reports should be an economic and reliable method of measuring behavioral engagement (see, e.g., Krohn et al., 2011). Although we made attempts to confirm the validity of this measurement, the validity of self-reports can never be guaranteed with absolute certainty. In Study 2, we employed a new gadget for measuring hand raising in real time using accelerometry. Due to the novelty of the gadget, we checked its validity in several ways, which yielded satisfactory results. Yet, these different measures may limit the comparability of the findings across studies. Moreover, future work should further examine the validity of this new gadget.

Finally, there are several other open research questions remaining from this dissertation. For instance, future studies should (a) confirm our speculation regarding open-ended questions as a process variable for shy students' participation in social science subjects, (b) test the effects of other cooperative learning strategies on shy students' in-class participation, (c) confirm the result that better peer relationships lead to less hand raising among shy students, (d) find out

the effects of different group sizes on shy students' in-class participation, and (e) further investigate why shy students also have lower levels of nonverbal attentiveness.

Contributions and Conclusions

Despite these limitations, this dissertation addressed several gaps in the field. First, this dissertation developed a better understanding of why and when shy students engage in in-class participation, as well as how teachers can promote it. It thus contributes to filling the existing research gap on shyness in the school context in general and on its relationship to in-class participation as an important learning variable in particular (Crozier, 2020).

Second, although research suggests that some subtypes of shyness peak in adolescence (Cheek et al., 1986; Schmidt & Poole, 2019), many studies to date have focused on shyness in kindergarten or elementary school. Therefore, this dissertation expanded the research by focusing on middle school students.

Third, this dissertation answered the question of whether there are different subtypes, and thus individual differences, in several general outcomes of adjustment and maladjustment of shy and sociable students as well as regarding their in-class participation. As a result, it adds to the growing body of research demonstrating distinct behavioral, psychophysiological, and psychiatric correlates and outcomes for the four subtypes of shyness and sociability (see Schmidt & Poole, 2019, for a review), but to the best of my knowledge, it is the first study to compare and contrast the four subtypes at the same time.

Finally, by technically assessing hand raising in real time in Study 2 and recommending how to test the 2 × 2 model in Study 3, this dissertation also made important methodological contributions to research on in-class participation and shyness, respectively. In conclusion, this dissertation may assist researchers in furthering their research on shyness and in-class participation, teachers in overcoming shy students' greatest challenges, and ultimately shy students themselves in their academic functioning and achievement.

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Declaration of Academic Achievement

This dissertation consists of three studies peer-reviewed and published in scientific journals (Study 1 in Chapter 2, Study 2 in Chapter 3, Study 3 in Chapter 4). The author of this dissertation is the primary author, and his first supervisor, Susanne Jurkowski (University of Erfurt), is the co-author on all manuscripts. The contributions of each author in each study are outlined below.

Study 1 (Chapter 2 and Supplement A1) is a reprint of the following published peer-reviewed journal article:

Mundelsee, L., & Jurkowski, S. (2021). Think and pair before share: Effects of collaboration on students' in-class participation. *Learning and Individual Differences, 88*, 102015. https://doi.org/10.1016/j.lindif.2021.102015

This experimental field study examined whether the teaching strategy named "Think-Pair-Share" can increase hand raising of students in general and of shy students in particular. Furthermore, the study explored emotional and motivational processes associated with hand raising.

Lukas Mundelsee, the primary author, formulated the research question, conceptualized the experimental design, supervised the conduct of the study, performed data analyses, and wrote the manuscript (65%). Susanne Jurkowski, the co-author, was responsible for formulating the research question, conceptualization of the study design, and guided the development of the manuscript with critical reviews (35%).

Study 2 (Chapter 3 and Supplement A2) is a peer-reviewed journal article accepted for publication in the *American Education Research Journal*:

Mundelsee, L., & Jurkowski, S. (in press). Opening the gateway to oral participation: Exploring facilitative contextual factors in the association between student shyness and hand raising. *American Educational Research Journal.* https://doi.org/10.3102/00028312241278585

This field study explored several contextual factors (i.e., peer relationship, student-teacher relationship, average warm calling, average wait time, class size, and school subject) that were thought to support shy students' hand raising using three main data sources (i.e., students' self-reports, observations, and behavioral measures during one regular school week).

Lukas Mundelsee, the primary author, conceptualized the research and experimental design, conducted the study, performed data analyses, and wrote the manuscript (85%). Susanne Jurkowski, the co-author, contributed to the conceptualization of the study design and provided feedback on drafts of the manuscript (15%).

Study 3 (Chapter 4 and Supplement A3) is a reprint of the following published peer-reviewed journal article:

Mundelsee, L., & Jurkowski, S. (2024). The 2 × 2 model of shyness and sociability: A methodological review and suggestions tested in an example study. *Personality and Individual Differences, 221*, 112545. https://doi.org/10.1016/j.paid.2024.112545

This cross-sectional self-report study tested the so-called 2 × 2 model of shyness and sociability, which is a widely accepted theoretical framework but, to date, has not been examined using *both* adequate measures *and* appropriate statistical approaches. Using a sample study, we tested the model to answer the question of whether there are different subtypes of shyness associated with students' oral and silent participation.

Lukas Mundelsee, the primary author, conceptualized the research and experimental design, conducted the study, performed data analyses, and wrote the manuscript (90%). Susanne Jurkowski, the co-author, provided feedback on drafts of the manuscript (10%).

Ehrenwörtliche Erklärung

Ich erkläre hiermit ehrenwörtlich, dass ich den vorliegenden Manteltext sowie die eingebundenen Kernmanuskripte ohne unzulässige Hilfe Dritter und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe; die aus fremden Quellen direkt oder indirekt übernommenen Gedanken sind als solche kenntlich gemacht. Bei der Auswahl und Auswertung des Materials sowie bei der Herstellung der Kernmanuskripte habe ich Unterstützungsleistung von den folgenden Personen erhalten: Susanne Jurkowski. Unsere jeweiligen individuellen Leistungsbeiträge zu den Kernmanuskripten sind im Kapitel „Declaration of Academic Achievement“ detailliert aufgeführt.

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Erfurt, 17. Januar 2023

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Appendix A: Core Studies of this Dissertation

Supplement A1: Core Study 1

Mundelsee, L. & Jurkowski, S. (2021). Think and pair before share: Effects of collaboration on students' in-class participation. *Learning and Individual Differences, 88*, 102015. https://doi.org/10.1016/j.lindif.2021.102015

Supplement A2: Core Study 2

Mundelsee, L., & Jurkowski, S. (in press). Opening the gateway to oral participation: Exploring facilitative contextual factors in the association between student shyness and hand raising. *American Educational Research Journal.* https://doi.org/10.3102/00028312241278585

Supplement A3: Core Study 3

Mundelsee, L., & Jurkowski, S. (2024). The 2 × 2 model of shyness and sociability: A methodological review and suggestions tested in an example study. *Personality and Individual Differences, 221*, 112545. https://doi.org/10.1016/j.paid.2024.112545

Note: For copyright reasons, supplements are not included in this publication of the dissertation.

Appendix B: Supplemental Peer-Reviewed Studies

Supplement B1: Supplemental Study 1

Jurkowski, S., Mundelsee, L., Jüngst, C., & Hänze, M. (2022). Messung gemeinsamer Wissenskonstruktion: Ein Vergleich von hoch-inferenter Beobachtung, niedrig-inferenter Codierung und Selbsteinschätzung der transaktiven Kommunikation. *Zeitschrift für Erziehungswissenschaft*. https://doi.org/10.1007/s11618-022-01124-w

Supplement B2: Supplemental Study 2

Römer, C., & Mundelsee, L. (2021). Einstellung gegenüber Online-Beratung: Eine Umfrage unter Berater:innen, Coaches und Therapeut:innen. *Coaching | Theorie & Praxis, 7*, 173-184. https://doi.org/10.1365/s40896-021-00061-5

Note: For copyright reasons, supplements are not included in this publication of the dissertation.

Appendix C: Supplemental Articles of Research-Practice Transfer

Supplement C1: Supplemental Article 1

Mundelsee, L. (2022). Psychosoziale Beratung im Coachingspace: Chancen und Risiken methodengestützter Distanz-Beratung am Beispiel schüchterner Kinder und Jugendlicher. In F. Piegsda, K. Bianchy, P.-C. Link, C. Steinert, & S. Jurkowski (Hrsg.), *Diagnostik und pädagogisches Handeln zusammendenken*. Schneider Verlag Hohengehren.

Supplement C2: Supplemental Article 2

Mundelsee, L., Sawatzki, D., Hänze, M., & Jurkowski, S. (2020). Kommunikation üben. Wie sich Gruppenarbeit von Schülerinnen und Schülern gezielt verbessern lässt. *Pädagogik, 2/20*, 15-20.

Note: For copyright reasons, supplements are not included in this publication of the dissertation.