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ORIGINAL CONTRIBUTION

Fears and fear-related cognitions in children with selective mutism

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Abstract
Selective mutism (SM) is classified under the category of anxiety disorders in DSM-5 [1], although concrete fears that underlie the condition are not specified contrary to all other anxiety disorders. Given the lack of studies systematically investigating fears in SM, content and frequency of concrete fears as well as related cognitions have remained unclear so far. One hundred and twenty-four participants [$M = 13.25$ years (SD = 3.24), range 8–18 years] with SM ($n = 65$), social phobia (SP $n = 18$) or with typical development (TD $n = 51$) took part in an online survey. Participants with SM ($n = 65$) answered an open-ended question concerning fears that might cause the consistent failure to speak in select situations. Additionally, participants with SM, SP and TD completed a survey containing 34 fear-related cognitions that might occur in speech-demanding situations. Open text answers were systematically evaluated by extracting higher-order categories using a Qualitative Content Analysis. Single item scores of the survey were compared between the three groups. 59% of all spontaneously reported fears were assigned to the cluster of *social fears*. Other reported fears represented the categories *fear of mistakes* (28%), *language-related fears* (8%) and *voice-related fears* (5%). The SM- and SP group only differed regarding the cognition that one's *own voice might sound funny* (SM > SP). Social fears and the fear of mistakes account for the majority of fears in SM. Therefore, future interventions should consider specifically targeting these types of fears.

Keywords Selective mutism · Social phobia · Social anxiety · Fear · Self-focused attention · Perfectionism

Introduction

Selective mutism (SM) is a mental disorder which is characterized by the consistent failure to speak in certain social situations (e.g., in school), while speech production in other situations (e.g., at home) is unaffected [1]. The disorder adversely affects every day life functioning of children and adolescents [2] and goes along with communicative and mental problems in adulthood [3–5]. SM usually has its onset around 2–5 years [3–6] and lasts in a substantial proportion of patients for multiple years [3–5]. Although symptoms usually decline with increasing age, many former patients still suffer from psychosocial impairments and higher rates of mental disorders [4, 5].

In contrast to previous editions, in DSM-5 SM is categorized as an anxiety disorder [1], which is justified by a phenomenological and etiological overlap between SM and other anxiety disorders such as generalized anxiety disorder (GAD) [7] or especially social phobia (SP) [3]. The closeness between SP and SM is indicated by a comorbidity rate of SP in children with SM between 61 and 100% [8–12], a common genetic etiology [13] as well as an association of both disorders with the temperament of behavioral inhibition [14, 15]. Similarities between both disorders led to the assumption that SM might belong to the same entity as SP [16, 17]. Hence, it is implied that (social) anxiety underlies the symptomatology of SM, which in turn leads to the assumption that circumscribed fears and fear-related cognitions should be present in children and adolescents with SM. However, and in contrast to all other anxiety disorders, SM is the only anxiety disorder in DSM-5 for which concrete fears have not been specified so far [1]. This leaves the cause and, therefore, the target of particularly cognitive interventions of SM symptomatology open. Although

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Cognitive–Behavioral Therapy (CBT) is the most recommended approach for treating children and adolescents with SM [18], most of the treatments of SM focus on behavioral strategies (e.g., contingency management or shaping) rather than cognitive strategies such as cognitive restructuring [19, 20]. Despite the better feasibility of cognitive restructuring in older children [20] and the early onset of SM [3], the neglect of cognitive strategies in SM therapy might be caused by a lack of knowledge of potential fear-related cognitions in children with SM. However, the identification of maladaptive thoughts is an important part of the approach of cognitive restructuring [21] and cognitive restructuring is an essential feature of the treatment of childhood anxiety in general [22]. Although the issue seems highly relevant, to our knowledge, studies investigating the explicit content of fears and fear-related cognitions in SM are lacking.

Nevertheless, indirect conclusions about potential fears in SM can be drawn by past research. In the first place, social anxiety is known to be a core element of SM [3].While in younger children social anxiety is associated with shyness in contact with strangers and unfamiliar persons [23], for older children concrete fears are described in literature [24]. Social anxiety generally consists of the *fear of being evaluated by others* in social situations [25] and emerges if the likelihood of being scrutinized is perceived as high and if consequences of social evaluation are expected to be extensive [26]. Phenomenologically, social anxiety comprises three subdimensions of fear that are performance, interaction and observation [27]. Thus, social anxiety includes the *fear to perform in front of others* (e.g., giving a speech), the *fear to interact with other persons* (e.g., strangers) and/or the *fear of getting observed by others* (e.g., while writing). Additionally, the *fear of showing anxiety symptoms to others* seems to belong to the spectrum of social anxiety as well and is present in about a half of the patients with SP [28]. Evidence for the relevance of social anxiety in SM is provided by elevated scores on standardized measures in affected children [8, 29–31]. Although quantitative data show that children with SM lie on the upper end of the spectrum of social anxiety, past research has not addressed the content of this anxiety nor any other systematically so far. Clinical observations [32] provide indications that children with SM especially fear social interactions (e.g., speaking to strangers) and have less problems with structured performant situations (e.g., answering yes or no to a question of a teacher).

Besides fears referring to the spectrum of social anxiety, past research also indicates fears connected to other fields. A number of studies, for example, showed that over and above social anxiety, a large proportion of children with SM are characterized by speech or language impairments [8, 17, 30]. In accordance with these findings is the consideration of Omdal and Galloway [33], who assume based on an exploratory study that SM might be a phobia of expressive speech rather than the fear of being evaluated. Therefore, linguistic and/or speech aspects might be a content of fear of children with SM independently of social anxiety. Furthermore, there are indications of the sound of their own voice to be a content of fear for some children with SM. Here, reports of affected children of a funny or strange sounding voice [34, 35] as well as findings that some individuals show aberrations in neurological auditory processes and hence suffer from an altered perception of their own voice [36] contribute to this consideration. In addition, more potential fears of SM can be derived from several single case studies. Here, the *fear to say something wrong* [37], the *fear to perform imperfectly* [38], the *fear of the unexpected* [37], and the *fear of losing control over a situation* [38] are mentioned. Recent findings from a latent class analysis suggest that the level of anxiety can vary between different subtypes of SM and that the symptom domains of oppositional behavior and inattention can be relevant as well [39]. Even though anxiety lies at the heart of SM, in some cases additional features can occur.

In sum, indirect conclusions about potential fears can be drawn from past research results on SM. However, the relevance of specific fear contents as well as their frequency of occurrence is still unknown, and to our knowledge, no study has addressed fear content or fear-related cognitions in children and adolescents with SM directly so far. Considering the tremendous importance of the knowledge about fear content for the treatment of SM, namely interventions of cognitive restructuring and selection of stimuli in the context of exposition hierarchies, the current study was designed to close this gap. Furthermore, the identification of important fears and fear-related cognitions in SM might contribute to the still unanswered question if and how SM and SP build two distinct entities. To investigate fear contents in SM, we first asked children and adolescents with SM in an open-ended question to write down which fears are involved in their failure to speak. In addition, children with SM, SP or TD rated a number of items containing different potentially fear-related cognitions (e.g., "I don't speak, because I think that others could laugh at me.").

Due to the results of past research regarding the high importance of social anxiety in SM, we expected social fears to be reported most frequently in the open-ended question. We further expected children and adolescents with SM to report fears that are non-social in nature such as language- and voice-related fears, the fear to say something wrong, the fear to perform imperfectly, the fear to lose control as well as the fear of the unexpected.

Methods

Participants

One hundred and twenty-four children and adolescents (range 8–18 years) participated in the study. Sixty-five

out of 124 participants ($n = 45$ females, $M = 12.91$ years, SD = 3.75) exceeded the cut-off value for SM (six points) of the diagnostic scale (DS) of the Frankfurt Scale of Selective Mutism (FSSM), a parent-reported questionnaire. These subjects (65 out of 124) answered the open-ended question regarding fears. Participants had a mean DS score of $M = 8.83$ (SD = 1.02) which is equal to reported mean scores of a sample with SM, diagnosed by a clinical interview [40].

One hundred and ten out of 124 subjects ($n = 51$ with SM) conducted the survey regarding fear-related cognitions, whereas 14 subjects with SM quit the online study after answering the open-ended question. Both samples of children with SM ($n = 65$ vs. $n = 51$) did not differ regarding age, distribution of gender or scores of the DS and Severity Scale (SS) of the FSSM. Out of 110 subjects, a number of 18 subjects (SP) exceeded the clinical cut-off for SP (20 points) of the social phobia and anxiety inventory for children (SPAIC) but did not exceed the cut-off of the DS of the FSSM. Forty-one subjects (TD) exceeded neither the cut-off of the SPAIC nor the cut-off of the FSSM. Sample characteristics for the three groups are displayed in Table 1.

Recruitment and procedure

The current study was part of a larger online study which contained separate parts for children and their parents. The link to the online survey was made public nationwide via different channels as, for example, psychotherapists, psychiatric institutions, pediatricians, kindergartens, schools as well as newspapers and online forums. Parents and children were supposed to participate consecutively and independently in the online study which was based on the survey tool Unipark. At first, information about the study such as procedure, goals and background as well as anonymous handling of data were provided to subjects and their parents. Informed consent was obtained by button press. Subsequently, one parent was requested to complete the FSSM, which was used to screen SM among our sample. Then, children and adolescents were supposed to answer an open-ended question as well as a self-designed survey both concerning fears that are involved in their failure to speak in social situations. Finally, subjects were requested to complete the SPAI-C, which was used to screen SP among the participants. Participants had the opportunity to participate in a draw of 10 vouchers worth 25€ each. The study was approved by the local ethics committee of the Department of Psychology of the University of Giessen.

Materials

Open-ended question regarding fears

All children and adolescents were presented with an open-ended question to which subjects could answer in a text field without a word limitation. The question was preceded by a short description about a child with fear of heights for the purpose of illustrating the concept of fear. We explicitly noted that in the example the child's content of fear is height. Subsequently, we asked for the content of fears that exist in situations in which the participants fail to speak ("What is the content of your fear in situations in which you are expected but are not able to speak?"). Children and adolescents could report as many fears as they deemed to be important.

Survey on potential fear-related cognitions

Additionally, we presented 35 items concerning different potential fear-related cognitions that might be involved in the child's failure of speaking. The items mainly concerned different aspects of social anxiety. Especially, cognitions concerning the subdimensions of social anxiety were addressed: (a) interaction ("I don't speak because I think that I don't know how the conversation will evolve"), (b) performance ("I don't speak because I think that others might think that I can't assert myself") and (c) observational situations (e.g., "I don't speak because I think that others might observe me") as well as (d) an introspective attentional focus or the fear of showing anxiety symptoms to others ("In the presence of others I'm permanently concentrated on how internally tense I am"). Additionally, cognitions regarding language/

Table 1 Sample characteristics

	SM	SP	TD	*p*	Post-hoc
n	51	18	41		
Age	13.10 (3.54)	14.78 (3.06)	12.90 (2.82)	0.091	–
Gender (f/m)	39/12	16/2	29/12	0.319	–
FSSM—DS	8.71 (1.06)	4.06 (1.70)	0.95 (1.48)	< 0.000	SM > SP > TD
FSSM—SS	0.44 (0.15)	0.25 (0.12)	0.07 (0.10)	< 0.000	SM > SP > TD
SPAIK sum score	34.45 (9.74)	30.43 (5.74)	7.38 (5.60)	< 0.000	SM = SP > TD

SM selective mutism, *SP* social phobia, *TD* typically developing, *FSSM* Frankfurt Scale of Selective Mutism, *DS* Diagnostic Scale, *SS* Severity Scale, *SPAIK* social phobia and anxiety inventory for children

speech ("I don't speak because I think that I can't formulate things that I want to say adequately."), regarding voice ("I don't speak because I think that my voice sounds funny."), regarding a wrong or an imperfect answer (e.g., "I don't speak because I don't want to give an incorrect answer.") as well as cognitions regarding a loss of control while speaking ("The silence gives me a little bit more security in many situations") were taken into account. All items were developed by the authors based on indications in literature and clinical expertise. Items concerning an introspective attentional focus were also inspired by the Self-focused Attention Scale [41]; items concerning fears concerning incorrect answers by the Frost Multidimensional Perfectionism Scale [42]. Participants were supposed to rate each item on a 4-point Likert scale (0—not true at all, 1—partially true, 2—rather true, 3—true).

Frankfurt Scale of Selective Mutism [40]

The FSSM is a standardized and validated parent-rated measure of SM symptomatology in children and adolescents aged 3–18 years. Three different development-adapted versions exist, which are designed for (1) children aged 3–7 years attending kindergarten, (2) for children aged 6–11 years attending primary school and (3) for adolescents aged 12–18 years. In the current study, the latter two versions were adopted. The FSSM includes the DS including ten items concerning the child's general speaking pattern (e.g., "Does your child not speak in certain situations and/or with certain persons, even though he/she is expected to?") and a Severity Scale (SS) with 42 items. In the current study, the DS was used to determine SM status. The scale has a dichotomous answer format (yes–no) and thus, the sum score ranges from 0–10. For the development-adapted versions, we used recommended cut-off values. Therefore, all children who had a DS score of 7 or higher (FSSM 6-11), or 6 or higher (FSSM 12–18) were assigned to the SM group. The DS of both versions show good internal consistencies of Cronbach's Alpha > 0.90 [40].

Social phobia and anxiety inventory for children [43]

We conducted the German version of the SPAI-C. This questionnaire measures self-reported symptoms of social anxiety, using 26 items concerning different social situations. Each item is rated on a 3-point Likert scale leading to a score range of 0–52. The recommended cut-off value of 20 is able to identify clinical relevant SP. In the current study, all children who reached a score of 20 and higher without meeting the criteria for SM in the FSSM were assigned to the SP group. Both reliability (Cronbach's Alpha = 0.92) and validity are satisfying according to user manual and past research [43, 44].

Data analysis

Open-ended question

We used an inductive approach of Qualitative content analysis (QCA) [45] to evaluate the answers of the open-ended question of all $n = 65$ children and adolescents. The QCA, in general, is a commonly accepted method in health research to analyze qualitative data such as open text answers [46]. The aim of this approach is to extract meanings of text passages and to reduce data to broader overarching categories [47]. An inductive analysis is appropriate if a phenomenon has not been addressed in research yet or if knowledge regarding the phenomenon is not coherent [47–49]. In procedure of data analysis, we followed a common approach of inductive QCA, which is described similarly in literature by different authors [47, 49]: (1) we read all answers of participants to gain an overall impression of our data. While reading through data, it stuck out that a remarkable number of answers contained no explicit description of fears but other fear-related aspects that were reported as causative for silence (for instance, an attentional focus on bodily anxiety symptoms). Thus, we decided to analyze these fear-related aspects as well. (2) We read the answers again and highlighted all passages that contained a description of an explicit fear or a fear-related aspect involved in the failure of speaking. While reading, we took notes, formulated headings for text passages, and thus created first categories by grouping similar content. (3) Subsequently, we grouped headings to meaningful higher-order categories. In this context, we formulated a description of the particular phenomenon that is concerned in a certain higher-order category. (4) We assigned the answers of participants to the extracted categories to create a distribution of the frequency of present fears and fear-related aspects in SM. Due to the circumstance that participants could report as many fears as they wanted to, we used two different methods of calculating frequencies: (a) to find out in how many cases a specific fear category or fear-related aspect is present, we calculated percentages of participants per category (e.g., in how many participants are social fears present?), (b) to find out how often a specific fear was reported among all participants, we calculated the percentage of a specific fear category in relation to all reported fears (e.g., how many of the reported fears are social fears?). (5) Finally, an independent and blind researcher assigned answers to the previously created higher-order categories for the purpose of testing inter-rater reliability. Prototypical citations will be used to demonstrate the meaning of categories and to provide trustworthiness of our QCA [47–49].

Fear-related cognitions

The statistical package for the social sciences (SPSS 24) was used to calculate means and standard deviations of each item per group (SM, SP, TD). Subsequently, we conducted a MANOVA with Post hoc tests and Bonferroni correction to compare scores of each item between the three groups. Additionally, we calculated for each item the percentage of participants who rated the item as true (3) or rather true (2).

Results

Open-ended question

The number of reported fears and/or fear-related aspects varied widely among children and adolescents within the sample. Answers of 22 participants were too unspecific (e.g., "I'm afraid of speaking") or illustrated an unawareness of occurring fears (e.g., "I don't know") and, therefore, contained no codable units. Given the fact that some subjects reported several fears and/or fear-related aspects, we extracted 84 codable units from the remaining 43 participants. Twenty participants reported one, 7 two and 16 three or more (to a maximum of 6) different fears and/or fear-related aspects as reasons of their failure to speak. Codable units (84) partially yielded explicit fears (62) and partially other fear-related aspects (22) involved in the difficulty of speaking.

Fear content

We extracted eight different categories of fears from the answers. Five of them (fear of negative reaction, fear of social evaluation, observational fears, interactional fears, fear of showing anxiety symptoms) were clustered to the broader category of "social fears". Table 2 shows an overview of categories of fears that were present in our sample. In Table 2, we additionally displayed the percentages of all $n=43$ subjects who gave a codable answer per category as well as percentages of the specific fear categories in relation to all reported explicit fears (62).

In sum, at least one social fear was present in 67% of all $n=43$ participants who gave a codable answer. Answers that were assigned to the subcategory of *fear of negative reaction* (present in 35% of all $n=43$ participants who gave a codable answer) mostly concern the fear that others might laugh at them ("I'm afraid, other people might laugh."). This subcategory also includes fears regarding negative reactions such as anger of the counterpart or being excluded from others. Answers of the subcategory *Fears of social evaluation* (present in 23%) mostly contain a general fear that

Table 2 Categories of reported fears with descriptions and frequencies

Category	Description	Percentage of participants who reported this specific fear (%)	Percentage of reported fears compared to all reported fears (%)
Social fears	Fears that conceptually belong to the spectrum of social anxiety	In sum 67	In sum 59
Fear of negative reaction	Fear that others react negatively to the individual's spoken words	35	24
Fear of social evaluation	Fear that others evaluate the individual because of his/her spoken words	23	16
Interactional fears	Fear of social interactions, especially with strangers or authority persons	12	8
Observational fears	Fear of getting attention from others while speaking	12	8
Fear of showing anxiety symptoms	Fear that others might notice individual's anxiety symptoms (e.g., heart beat)	5	3
Fear of mistakes	Fear to give an incorrect answer / to say something wrong in a content-related way / to deviate from expectations	40	28
Language-related fears	Fears that are related to the individual's language such as pronunciation, grammatical correctness etc. of spoken words	12	8
Voice-related fears	Fears that are related to the sound of the individual's voice	7	5

We displayed (a) the percentage of $n=43$ participants who reported a specific fear out of a specific category and (b) the percentage of each reported fear in relation to all reported units containing explicit fears (62) of $n=43$ participants

others might form a negative opinion of them ("I am afraid that other people will think badly about me and about what I have said"). *Interactional fears* (present in 12%) concern fears related to take part in a conversation, meeting unknown people or dealing with authority persons ("It's because I have respect for someone, e.g., the headmaster"). *Observational fears* (present in 12%) comprise fears of getting attention from surrounding people in case the individual starts to speak ("It's embarrassing because everyone is looking at me then"). The *fear of showing anxiety symptoms* (present in 5%) to others was always reported together with a description of bodily anxiety symptoms ("It feels like everyone can see the beat of my heart").

The category *fear of mistakes* (present in 40% of all $n=43$ participants who gave a codable answer) includes fears of giving an incorrect answer ("Fear that the answer might be incorrect"), of doing something wrong or of deviating from expectations ("fear not to be perfect"). *Language-related fears* (present in 12%) contain several fears that concern articulation and language production. Examples for this category are the fear of coming to a halt during speaking ("I fear that I will not find the right words and then just stop") or the fear of poor articulation. The category *voice-related fears* (present in 7% of all $n=43$ participants who gave a codable answer) comprises fears that are related to the sound of the individual's voice, basically that it could sound funny or odd ("I think my voice sounds funny").

Fear-related aspects

Participants reported four different categories of fear-related aspects that underlie the failure to speak. The *attentional focus on bodily anxiety symptoms* (present in 21% of all $n=43$ participants who gave a codable answer) usually comprises a number of different bodily symptoms that become salient during a social situation, such as accelerated heartbeat, palpitations, elevated bodily tension, short breathing, lump in throat ("In such situations, I'm strained throughout my body and cannot simply relax my muscles. I'm beginning to breathe very shallowly, and sometimes I sweat"). The category of *attentional focus on thoughts* (present in 12%) contains descriptions of thought contents that occur in a social situation. Mental employment of planned speech ("My head is so full… I always think, which words should I say and which not and in what order?"), but also rumination processes ("Additionally, I put myself under pressure by thinking about the reasons for failing to speak in this specific situation") are included in this category. In sum, 30% described at least one attentional focus (either on bodily symptoms or on thoughts) that is present during social situations. The phenomenon of *overwhelming anxiety* (present in 7%) was described as a feeling of a paralyzing anxiety and/or an emptiness of mind that prevent the individual from speaking ("Sometimes I cannot speak because the fear is blocking me and I have an emptiness in my head"). Answers of the category *avoidance mechanism* (present in 4%) contained descriptions that are related to the function of silence. Participants described silence as a mechanism to gain control in situations characterized by perceived uncertainty or to prevent negative consequences ("If it comes too close to me, I usually remain silent because I'm afraid to lose control").

Inter-rater Reliability agreement between both raters across all ratings was high, indicated by a Kappa coefficient of $\kappa=0.92$, which is almost perfect according to McHugh [50].

Closed items regarding fear-related cognitions

We displayed means and standard deviations of all 34 items for each group as well as the percentages of participants who rated each item as true or rather true in Table 3. Using Pillai's trace, there was a significant effect of group on the score of the items regarding fear-related cognitions [$V=1.35$, F (2, 33) $=2.65$, $p<0.001$]. Post hoc tests reveal that all items differed significantly between the TD group and the SM group as well as between the TD group and the SP group. Interestingly, only the item: "I don't speak because I think that my voice sounds funny" differed significantly between the SM group and the SP group ($p=0.019$). The remaining 33 items did not differ between the SM- and the SP group.

Discussion

The purpose of the present study was to examine the content of fears as well as fear-related cognitions that are involved in the failure of speaking during social situations in children and adolescents with SM. Results of QCA confirm our assumption that predominantly social fears are present in affected children. Thus, our results support the common view that social anxiety displays a central underlying dimension of SM [3, 51]. So far, research has consistently shown that children with SM have clinically relevant scores of social anxiety, measured by standardized questionnaires [8, 29–31] or rated by clinicians during social tasks [16]. Over and above, this further implies that social fears lie at the heart of SM. While children with SM and GAD also seem to have a similar profile of symptoms of anxiety and internalizing problems [7], our study clearly underlines the relatedness between SM and SP. Even if there is still a debate whether or not SM should be seen as a form of SP [17], our results directly indicate that social anxiety and ,thus, social fears are at least one and probably the most important aspect of SM [3, 51]. Especially, the fear concerning negative reactions of others in social situations was frequently reported. Thus, many children with SM might

Table 3 Survey of fear-related cognitions that might occur in situations with an expectation to speak

	Item	SM			SP			TD		
		M	SD	True or rather true (%)	*M*	SD	True or rather true (*n*) (%)	*M*	SD	True or rather true (%)
1	I don't speak, because I don't want to give an incorrect answer.	2.10	1.13	76.5	1.94	1.056	66.7	0.68	0.934	26.6
2	I don't speak, because I'm not sure about the correct answer.	1.92	1.07	70.6	1.89	1.132	66.7	0.68	0.850	24.4
3	I don't speak, because I think that others might observe me.	1.90	1.10	66.7	1.72	0.895	55.5	0.20	0.558	7.3
4	I don't speak, because I think that I can't formulate things that I want to say adequately.	1.86	0.98	68.6	2.22	0.943	88.8	0.54	0.840	17
5	I don't speak, because I think that I can't respond spontaneously.	1.82	1.09	66.6	1.83	0.985	66.7	0.49	0.711	12.2
6	I don't speak, because I don't know what to answer.	1.82	1.05	70.6	1.94	1.056	77.8	0.76	0.994	29.3
7	I don't speak, because I think that I couldn't answer perfectly.	1.75	1.27	60.8	1.83	1.043	61.1	0.34	0.617	7.3
8	In the presence of others I'm permanently concentrated on how internally tense I am.	1.73	1.13	58.8	2.06	1.162	72.2	0.22	0.525	4.9
9	I don't speak, because I think that I have to speak about uncomfortable topics.	1.71	1.18	64.7	1.94	0.802	77.8	0.44	0.709	12.2
10	I don't speak, because I think that others might not understand me and I have to repeat what I have said.	1.67	1.07	60.8	1.33	1.283	55.5	0.24	0.582	7.3
11	I don't speak, because I think that others could laugh at me.	1.65	1.18	58.8	1.83	1.098	66.7	0.32	0.610	7.3
12	I don't speak, because I think that others could react unfriendly.	1.63	1.13	54.9	1.33	1.138	38.9	0.44	0.776	17.1
13	I think I am a failure if I don't answer correctly.	1.61	1.21	54.9	1.44	1.199	55.5	0.37	0.799	14.6
14	In the presence of others I'm permanently concentrated on if I look tense.	1.55	1.18	56.9	1.61	1.243	55.6	0.32	0.687	12.2
15	The silence gives me a little bit more security in many situations.	1.55	1.24	56.9	1.72	0.958	61.1	0.44	0.743	14.6
16	I don't speak, because I think that I might stumble while speaking.	1.53	1.19	55.0	1.56	1.149	50.0	0.37	0.662	9.8
17	In the presence of others I'm permanently concentrated on if I blush, tremble or sweat.	1.51	1.27	54.9	1.72	1.127	66.7	0.29	0.750	12.2
18	I don't speak, because I think that I don't know how the conversation will evolve.	1.49	1.22	49.0	1.67	1.085	66.7	0.44	0.709	12.2
19	I don't speak, because I think that others might think I'm stupid.	1.49	1.15	51.0	1.33	1.138	50.0	0.22	0.525	4.9
20	I don't speak, because I think that I might say something awkward.	1.45	1.23	49.0	1.78	1.215	61.1	0.37	0.698	12.2
21	In the presence of others I'm permanently concentrated on if I'm cramped.	1.43	1.13	51.0	1.50	1.200	61.1	0.20	0.511	4.9
22	I don't speak, because I think that I will be upset about my answer.	1.41	1.09	52.9	1.83	0.924	72.2	0.32	0.650	9.8
23	I don't speak, because I think that others might speak badly about me.	1.41	1.23	49.0	1.89	1.079	72.2	0.37	0.662	9.8
24	I don't speak, because I think that I have to talk about personal things.	1.39	1.25	46.1	1.78	0.943	66.7	0.37	0.698	12.2
25	I don't speak, because I think that my voice sounds funny.	1.39	1.18	49.0	0.78	0.943	22.2	0.17	0.495	4.9
26	I don't speak, because I think that I can control the situation by remaining silent.	1.35	1.27	43.1	1.44	1.199	55.6	0.34	0.762	12.1
27	I don't speak, because I think that others might think that I'm boring.	1.33	1.22	45.1	1.50	1.150	55.6	0.17	0.442	2.4
28	I don't speak, because I think that others might think that I am afraid.	1.31	1.08	53.1	1.39	1.243	44.4	0.15	0.478	4.9
29	I don't speak, because I have an uncomfortable feeling or pain in my throat.	1.25	1.18	45.1	1.28	1.179	38.9	0.17	0.543	7.3
30	I don't speak, because I think that others might not like me anymore then.	1.25	1.26	33.1	1.61	1.145	55.5	0.27	0.593	7.3
31	In the presence of others I'm permanently concentrated on if I can control my breathing.	1.22	1.18	39.2	0.89	1.132	33.3	0.17	0.629	7.3
32	I don't speak, because I think that others might think that I can't assert myself.	1.10	1.22	39.2	1.11	0.900	33.3	0.12	0.400	2.4
33	I don't speak, because I think that I might look funny while speaking.	0.90	1.08	33.3	0.72	1.018	27.8	0.05	0.312	2.4

Table 3 (continued)

	Item	SM			SP			TD		
		M	SD	True or rather true (%)	*M*	SD	True or rather true (*n*) (%)	*M*	SD	True or rather true (%)
34	I don't speak, because I think that I might be impolite.	0.69	0.90	21.5	0.89	0.963	27.8	0.32	0.650	9.8

We displayed all 34 items of our self-developed survey of fear-related cognitions. The items were developed based on clinical expertise and relevance of related constructs such as social anxiety. Items were rated on a 4-point Likert scale (0—not true at all, 1—partially true, 2—rather true, 3—true). Thus, score range of each item was 0—3. We further displayed the mean scores of each item for each group (SM: $n = 51$; SP: $n = 18$; TD: $n = 41$) and the percentage of participants of each group who rated the item as rather true (2) or true (2). The items are ranked according to the mean-score of children with SM

fear the reaction of others (in most cases that others might laugh) and hence remain silent. In contrast to interactional fears, performant fears, such as giving a speech in front of the class [27], could not have been identified in the current study, supporting clinical observations by Johnson and Wintgens [32] that rather interactional than performant fears are difficult for affected children. To our knowledge, this is the first empirical study that yields evidence for the high importance of interactional social fears in children with SM. Our findings could also have implications for the discussion regarding the etiological relevance of Behavioral Inhibition (BI) as a predisposing factor of SM. Gensthaler et al. [15] found that children with SM are characterized by an even higher level of infant BI than children with SP, especially within social interactions. Based on these findings as well as on findings [52] that a high level of BI is stronger related to interactional than to performant social fears, Gensthaler et al. [15] assumed that the form and level of infant BI might contribute to phenomenological differences between SM and SP. However, the authors emphasized that evidences for the special importance of interactional social fears in children with SM are lacking. Thus, with our study, we can provide first evidence. Nevertheless, further research if and how BI and the emergence of interactional social fears are linked to each other is needed.

Furthermore, observational fears have been reported within the open-ended question, suggesting that the fear of gaining attention from others while speaking seems to be relevant in SM. Additionally, the item "I don't speak because I think that others might observe me" was rated highly in the survey regarding fear-related cognitions (66.7% of children with SM rated the item as "true" or "rather true"). Therefore, the attentional focus might be an important aspect that could be promising to consider in treatment of SM. In the beginning of the therapeutic process, the defocusing of attention (e.g., sitting beside rather than in front of the child) might be appropriate to reduce anxiety which is also recommended in literature [53].

The fear of mistakes was spontaneously reported by a remarkably high proportion of children and adolescents with SM in the current study (40%). Additionally, the two highest rated items of participants with SM in the survey both concern the possibility to give an incorrect answer (over 70% of children and adolescents with SM rated these two items as "true" or "rather true"). In spite of these findings, it is noteworthy that, to our knowledge, there is only one case report in literature that mentioned this fear before [37]. Moreover, our finding indicates the importance of the associated psychological construct of *perfectionism* in SM. Perfectionism has been defined as a tendency to set unattainably high standards and to be overcritical of one's own mistakes [54]. Furthermore, the common multi-dimensional construct of perfectionism of Frost, Marten, Lahart, and

Rosenblate [55] contains the subdimension *concern over own mistakes*, which is conceptually similar to our category *fear of mistakes*. Interestingly, the construct of perfectionism is included in different important cognitive–behavioral models of SP [56, 57] and particularly the subdimension concerns of one's own mistakes is able to predict social anxiety [58–60]. Due to a substantial overlap with social anxiety, it is important to note that the distinctness of the category *fear of mistakes* within the QCA of the current study might be to some extent artificial. Given a potential socially anxious motive of the *fear of mistakes* (e.g., the fear of a social evaluation due to an incorrect answer), it might be considered as a social fear as well. Nevertheless, in contrast with interactional, performant, observational fears, the fear of mistakes is not part of the DSM-5 criteria of social anxiety disorder [1]. Hence, it might be considered as a fear that is related but does not belong to the construct of social anxiety. Thus, we decided to classify the fear of mistakes separately. According to SP, concerns of one's own mistakes and perhaps even the whole construct of perfectionism might be a significant, however, not disorder-specific dimension of SM. Further research should examine the role and relative importance of perfectionism and its subdimension in SM and in comparison to SP. Additionally, it would be of high interest to learn to which extent the fear of mistakes in SM is independent of social fears and if it also occurs within non-social contexts. Past research has shown that perfectionism has an impact on treatment outcome in children with different anxiety disorders [61]. Thus, it might be worth to address perfectionism in treatment of SM as well. According to first evidence regarding the effectiveness of CBT on reducing perfectionism in children and adolescents, the combination of restructuring of dysfunctional perfectionistic cognitions and teaching coping skills might be worth to include in therapy of SM [62, 63].

Additionally, language- and voice-related fears could exist in a subgroup of affected children, as indicated by literature [8, 33, 36]. However, both types of fears were reported sparsely in the current study. Manassis et al. [30] suggest that language deficits could lead to fears concerning an imperfect speech in social situations. The authors built their argumentation on findings of a prospective study by Beitchman et al. [64], who showed that early language impairment in children increases the likelihood to develop an anxiety disorder. With this in mind, our findings correspond with studies indicating that clinically relevant communication disorder is present in some of the children with SM, ranging between 11 and 50% of affected children [65, 66]. Therefore, in a subset of children with SM, the presence of language impairments could lead to concrete fears regarding language. Similarly, the small proportion of children that reported voice-related fears in the current study might correspond with a subgroup of children with SM described in literature regarding a subjective perception of a funny or strange sounding voice [34, 35]. Muris and Ollendick [3] argue that an altered subjective perception of one's own voice might not be sufficient as a major cause of SM, might, however, be causative in combination with other etiological factors, such as social anxiety.

Regardless of our intended evaluation of concrete fear contents, we additionally identified further fear-related aspects that were reported as reasons of silence. In this context, especially an attentional focus on aspects of one's self, namely bodily anxiety symptoms and own thoughts, seems to be important in SM. Additionally, the item "In the presence of others I'm permanently concentrated on how internally tense I am" was rated as "true" or "rather true" of 58.8% of participants with SM within the survey. To our knowledge, this phenomenon has never been described in SM literature. In contrast, it is described as self-focused attention (SFA) in SP literature, where it is implemented in different cognitive–behavioral models of SP [26, 56, 67]. SFA is defined as the focus of attention on internal processes [68] such as physiological arousal, behavior, thoughts, emotions or the one's own appearance while being in a social situation [69]. Directing attention internally is considered to result in the activation of negative mental representations of the self, an enhanced perception of physiological anxiety symptoms [70] and lower capacity for processing external information [56, 71]. A number of studies have already shown the importance of SFA for children and adolescents with SP [43, 72]. The potential link between SM and SFA might also have clinical implications. Training in which children learn to allocate their attentional focus has been proven to be effective in children with mixed anxiety disorders [73] and could also be promising in children with SM. For the purpose of an attentional training, web-based and/or mobile-based interventions seem to be promising in children and adolescents with SM. For example, a web-based CBT program has already been used to train children with SM how to detect and manage physiological fear arousal in speech-demanding situations [74]. Besides the aspect of an elevated self-focus during social situations, our data provide some indications for two additional explanations of the phenomenology of SM. On the one hand, some subjects reported that they are overwhelmed by an intense anxiety during social situations, which corresponds with the theory of SM as an extreme form of SP [17]. On the other hand, reports of gaining control by being mute might indicate an avoidance mechanism, which is in line with findings from a psychophysiological study [16]. Therefore, our results might suggest that mechanisms underlying mutism might not be homogenous among all children with SM, respectively, that there are distinct subgroups with contrary levels of anxiety and arousal in situations with speech demands and failure to speak. Interestingly and in line with

this assumption, children with SM showed high variance regarding their amount of physiological fear arousal during speech demanding tasks in the study of Young et al. [16]. The assumption of different subgroups of children with SM with different levels of fear-arousal in social situations is also in line with recent findings that the level of anxiety can vary among children with SM and that other features such as oppositional behavior might also be relevant in some cases [39]. Alternatively, the subjects of our study described different single phases of their course of anxiety and the *combination* of an overwhelming anxiety and a subsequent avoidance of the fear-inducing situation might underlie the symptomatology of SM.

The survey regarding fear-related cognitions yielded no differences between children with SM and children with SP except for the item concerning a funny-sounding voice. As described before, the concern over a funny-sounding voice seems to be present in a subset of children with SM and might be caused by an altered perception of one's own voice. Despite this, it seems that children and adolescents with SM and children and adolescents with SP at the age between 8 and 18 years have similar cognitions that occur in situations in which they are expected to speak. Due to the strong relation between SM and SP [3] and findings that cognitive interventions are essential in treatment of older children and adolescents with anxiety disorders [22] including SP [75], it seems promising to focus on maladaptive cognitions in treatment of SM as well. The restructuring of cognitions concerning the fear of social evaluation as well as the fear of imperfect answers might be a promising aspect for intervention in SM, especially in older children and adolescents. The few existing evaluated psychotherapeutic treatment programs for SM are mainly addressed to younger children (e.g., studies evaluating the integrated behavioral therapy of Bergman et al. [12] include children aged 4–8 years) and mainly focus on behavioral techniques such as exposure, reinforcement or shaping [3, 76]. Programs additionally addressing older children and adolescents with SM are scarce and mainly consist of behavioral techniques as well [77]. Given the importance of dysfunctional cognitions in older children and adolescents with SM suggested by our results, treatment programs for SM might benefit from adding cognitive techniques such as recognizing and clarifying dysfunctional cognitions ("e.g., I don't speak, because I think that others could laugh at me."). Due to our findings that cognitions regarding social situations do not differ essentially between the clinical groups of SM and SP, it is likely that similar techniques addressing these cognitions that are effective in subjects with SP also work for SM. Leigh and Clark recently demonstrated evidence for the importance of cognitive variables for the maintenance of SP in adolescence and provided an overview of effective CBT techniques that are used for SP [78]. Examples for strategies targeting dysfunctional cognitions are behavioral experiments to test the patients' predictions of social situations or video feedback to correct the patients' negative self-images of how anxious they look during social situations [78, 79]. Accordingly, these techniques might also be beneficial to address common fearful predictions (e.g., "I don't speak, because I think that others could react unfriendly") and negative self-images regarding the appearance in social situations (e.g., "In the presence of others I'm permanently concentrated on if I look tense.") in SM. Over and above the use of behavioral techniques (e.g., shaping) aiming at increasing the use of speech [3], cognitive techniques might improve effectiveness of interventions in SM, especially in older children and adolescents. However, research regarding their efficacy in children and adolescence with SM is needed.

Our findings may also have clinical implications for the use of internet- and mobile-based interventions (IMIs) in therapy of SM. It is central to IMIs to target emotions, cognitions and behavior within concrete situations, even in settings in which a personal interaction between patient and therapist is difficult to realize [80]. Given that many of the subjects of our study described explicit fears and fear-related cognitions as occurring in situations in which they fail to speak, it seems promising to assess and target these fears and cognitions within the concrete situations in everyday life. However, SM symptomatology most frequently occurs in school [5] and generalization of improvements to different settings outside the therapy can be critical in treatment of SM [81]. Therefore, IMIs could help to assess and directly target occurring fears and cognitions in concrete situations, e.g., by providing daily exercises per app during school.

It should be acknowledged that the current study has a number of limitations. Firstly, our findings are based on a nation-wide anonymous online-based survey, which is associated with several methodical implications. Subjects were supposed to write their answer to the open-ended question within a text field. On the one hand, this enabled us to gain comprehensive information from a rare patient group that is naturally difficult to interview due to its core symptomatology. On the other hand, we could not ask further questions in response to the subjects' answers, in case of uncertainties. Thus, specificity of answers varied and we had to exclude a number of cases, in which answers were not codable. However, high Kappa coefficient indicates good clarity of the remaining codable answers. Due to the online-based study design, SM diagnoses and SP diagnoses were based on parent-rated (SM) and self-rated (SP) diagnostic questionnaires rather than conducting a clinical interview. Even though we used questionnaires with high-quality criteria and high concordance with clinical interviews for the assignment of subjects to the clinical groups, we cannot confirm clinical manifestations using the gold standard method. However, the anonymous and

nationwide online-based study design has a number of advantages compared to studies conducted in a laboratory setting. The anonymity facilitates the participation for subjects with SM and/or SP due to their elevated level of social anxiety, which is likely to result in a more representative sample. Additionally, we were able to reach participants all over the country and thus identify a large sample of SM, which is considered to be a rare clinical condition. Secondly, we merely included children and adolescents from the age of 8 due to the use of self-report, so that we are not able to transfer results to younger children with SM. In this context, we cannot conclude whether or not fears have already emerged during the typical preschool age of onset and/or in early phases of SM. Thirdly, even though we instructed our subjects for the open-ended question to report all relevant fears, it is possible that they missed important fears in some cases due to free recall. Hence, the lack of a certain fear in the subjects' answer is not equal to an actual absence of this certain fear and, thus, we might have underestimated the frequency of fears.

In conclusion, there are a number of different explicit fears that are reported by children and adolescents with SM. In most, albeit not all cases, at least one typical social fear was reported spontaneously as reason of the failure of speaking. However, this implies that there is a not negligible part of children with SM, in whom social fears might not be in the center of SM symptomatology. Especially, the fear of mistakes seems to be a remarkable fear content in SM. Therefore, clinicians should target not only direct speaking behavior in affected children but also fears, cognitions and processes related to social fears, especially within social interactions. Here, cognitive techniques that are already used in SP therapy as well as IMIs are promising features to include in intervention programs for SM. Our findings further suggest the presence of a heightened attentional self-focus that might contribute to silence during social situations in some cases. In this context, our qualitative findings may also have heuristic value, so that future studies might focus on these promising fears and mechanisms in regards of pathogenesis and maintenance of SM symptomatology. Given that reported fears and fear-related constructs (e.g., SFA) of the current study are crucial for children with SP as well, future research should compare children with SM and children with SP regarding the importance of these specific fears and fear-related constructs. This might gain new insights regarding the question how SM and SP are related to each other.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The study was approved by the local ethics committee of the Deparmtent of Psychology of the University of Giessen and therefore has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All persons who were included in this study gave their informed consent prior to the beginning of their participation.

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