**Modifying the *GSQ* for parent report**

First, the prefix to the original items; ‘Do you…’ was replaced with ‘Does your child…’, and any other cases of ‘you’ were replaced with male/female third person singular pronouns (i.e., ‘he/she’). In total, 15 items required only these minimal changes and no others. In addition, 24 items underwent minor text revisions, with either the addition of wording or removal of excessive text. For example, the adult item “*Do bright lights ever hurt your eyes…?*” became “*Does your child ever complain that bright lights hurt his/her eyes…?*”; and the relatively long adult item “*Do you stand very close (for example, less than 1 metre/3 feet away) or very far (for example, more than 3 metres/9 feet away) when you are talking to someone?*” became “*Does your child stand very close or very far when he/she is talking to someone?*”. The remaining three items underwent more substantive revisions. The adult item “*Are you ever told by others you wear too much perfume, after-shave?*” became “*Does your child ‘borrow’ your perfume, after-shave?*”; The adult item “*Do you enjoy wearing very strong perfumes/after-shaves?*” became “*Does your child seek out strong smells like perfumes, plastics, paints etc.?*”. Lastly the proprioceptive adult item “*Do you like to wear something/hold something (for example, a hat or a pencil) so that you know where your body ‘ends’?*’ was replaced with one that caregivers could more easily assess: “*Does your child turn his/her whole body (rather than only the head) when looking at something or someone?*’ (i.e., on the assumption that a parent cannot know the internal thought-motivation for a child holding something). This latter item was taken from a larger pool of 70 *GSQ* items, used in the development of the original *GSQ* adult scale (Robertson & Simmons, 2013) and was chosenas the item not already included which had the highest factor loading in the original PCA analysis for hyper-sensitivity in proprioception (i.e., the relevant category which required replacement).

**Factor structure of the *GSQ-P* and *rGSQ-P*or rs?sitivity yu, measured by Cronbachs alpha was excellent for the whole GSQ scale, as well as for hyper and hypo-sensitiv**

*Table SI1*

Factor loadings for the full scale (*GSQ-P*). Each item (column 1) is a question prefaced by “Does your child…”. Column 2 (Q) indicates the question number as presented to participants in our validation study. Column 3 (Domain) indicates the sensitivity domain ( + Hyper-sensitivity item; – Hypo-sensitivity items) and sense domain (A-Auditory; V-Visual; G-Gustatory; O-Olfactory;- T-Tactile; VE-Vestibular; P-Proprioception). Column 4 (F1) indicates factor loadings Hyper items, and column 5 (F2), indicates factor loadings Hypo items. Factor loadings are order by size within factor.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Q | Domain | F1 | F2 |
| find certain noises/pitches of sound annoying? | 6 | A + | 0.83 |   |
| dislike loud noises? | 25 | A + | 0.75 |   |
| complain about going into a strong smelling shop …? | 21 | O + | 0.72 |   |
| complain about going to restaurants because he/she can smell a certain odour? | 24 | O + | 0.64 |   |
| complain about feeling ill from smelling a certain odour? | 13 | O + | 0.63 |   |
| react strongly when he/she hears an unexpected sound? | 31 | A + | 0.62 |  |
| ever complain of bright lights hurting his/her eyes or causing a headache? | 8 | V + | 0.59 |  |
| dislike having a haircut ? | 15 | T + | 0.55 |   |
| ever seem bothered by fluorescent or flickering lights? | 18 | V + | 0.54 |  |
| hate the feeling or texture of certain foods in his/her mouth? | 23 | G + | 0.53 |  |
| gag when eating certain foods, perhaps feeling as if he/she is going to be sick? | 2 | G + | 0.51 |   |
| use the tip of his/her tongue to taste food before eating it? | 26 | G + | 0.40 |   |
| ever smell food before eating it? | 7 | O - | 0.39 |   |
| complain about feeling dizzy or ill when playing fast-paced sports..? | 30 | VE + | 0.38 |   |
| complain about the labels in clothes and ask for them to be taken out? | 22 | T + | 0.37 |   |
| dislike the physical sensation from when people hug him/her? | 1 | T + | 0.34 |   |
| like to eat the same foods most of the time? | 40 | G - | 0.34 |   |
| find it more difficult than other children to tie up his/her shoelaces or button up clothes? | 38 | P + | 0.27 | 0.25 |
| ever seem ill, dizzy or peculiar if he/she has to reach up high or bend down low for something? | 10 | VE + | 0.26 | 0.24  |
| seem to find it difficult to manipulate his/her hands when completing a delicate task …? | 3 | P - | 0.25 | 0.21 |
| turn his/her whole body (rather than only the head) when looking at something or someone? | 41 | P + |  | 0.62 |
| like to run about more than the average child, perhaps up and down in straight lines or round in circles? | 34 | VE - |  | 0.58 |
| like to spin round and round? | 12 | VE - |  | 0.54 |
| seek out strong smells like perfumes, plastics, paints etc.? | 36 | O - |  | 0.53 |
| rock him/herself backwards and forwards? | 20 | VE - |  | 0.50 |
| sometimes hurt him/herself but not appear to feel pain? | 16 | T - |  | 0.50 |
| chew and lick objects that aren't food …because he/she likes the feel of them in the mouth? | 35 | G - |  | 0.50 |
| really like listening to certain sounds…? | 33 | A - |  | 0.46 |
| seem to position his/her body in a way that is different to most people…? | 37 | P + |  | 0.45 |
| seem to be able to go outside without a coat or jacket when other people think that it is too cold? | 39 | T - |  | 0.45 |
| flick his/her fingers in front of his/her eyes? | 42 | V - |  | 0.45 |
| seem to be fascinated by small particles …? | 11 | V + |  | 0.43 |
| ever complain of having a weak sense of taste?... | 28 | G - |  | 0.40 |
| ever say his/her body feels ‘numb’ - or act like he/she can’t feel anything against the skin? | 27 | T - |  | 0.40 |
| like lining objects up? | 19 | V - |  | 0.39 |
| like to listen to the same piece of music or part of a song over and over again? | 9 | A - |  | 0.33 |
| ever run his/her hand around the outside of an object before picking it up? | 4 | V - |  | 0.33 |
| seem to find it difficult to hear what people are saying? | 14 | A - |  | 0.33 |
| complain about walking on uneven surfaces? | 32 | VE + |  | 0.33 |
| 'borrow' your perfume, after-shave etc.? | 17 | O - |   | 0.29 |
| stand very close or very far when he/she is talking to someone? | 5 | P - | 0.26 | 0.28 |
| seem to be unaware of his/her body's signals (for example, doesn't complain about being hungry, tired or thirsty)? | 29 | P - | 0.23 | 0.26 |

*Table SI2.*

Factor loadings for the short form (“reduced”) scale (*rGSQ-P*). See Table SI3. for column descriptors.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Q | Domain | F1 | F2 |
| find certain noises/pitches of sound annoying? | 6 | A + | 0.75 |   |
| dislike loud noises? | 25 | A + | 0.69 |   |
| complain about going into a strong smelling shop …? | 21 | O + | 0.69 |   |
| complain about going to restaurants because he/she can smell a certain odour? | 24 | O + | 0.64 |   |
| ever complain of bright lights hurting his/her eyes or causing a headache? | 8 | V + | 0.63 |  |
| ever seem bothered by fluorescent or flickering lights? | 18 | V + | 0.58 |  |
| dislike having a haircut …? | 15 | T + | 0.57 |  |
| hate the feeling or texture of certain foods in his/her mouth? | 23 | G + | 0.50 |  |
| gag when eating certain foods, perhaps feeling as if he/she is going to be sick? | 2 | G + | 0.49 |   |
| complain about feeling dizzy or ill when playing fast-paced sports..? | 30 | VE + | 0.42 |   |
| complain about the labels in clothes and ask for them to be taken out? | 22 | T + | 0.35 |   |
| ever seem ill, dizzy or peculiar if he/she has to reach up high or bend down low for something? | 10 | VE + | 0.34 |  |
| seek out strong smells like perfumes, plastics, paints etc.? | 36 | O - |  | 0.58 |
| like to run about more than the average child, perhaps up and down in straight lines or round in circles? | 34 | VE - |  | 0.54 |
| like to spin round and round? | 12 | VE - |  | 0.51 |
| seem to be able to go outside without a coat or jacket when other people think that it is too cold? | 39 | T - |  | 0.49 |
| really like listening to certain sounds…? | 33 | A - |  | 0.47 |
| chew and lick objects that aren't food …because he/she likes the feel of them in the mouth? | 35 | G - |  | 0.45 |
| sometimes hurt him/herself but not appear to feel pain? | 16 | T - |  | 0.41 |
| like to listen to the same piece of music or part of a song over and over again? | 9 | A - |  | 0.39 |
| like lining objects up? | 19 | V - |  | 0.37 |
| 'borrow' your perfume, after-shave etc.? | 17 | O - |   | 0.35 |
| ever complain of having a weak sense of taste?... | 28 | G - |  | 0.34 |
| flick his/her fingers in front of his/her eyes? | 42 | V - |  | 0.30 |

*Table SI3.*

Correlation between hyper and hypo-sensitivity scales of the GSQ-P, within each sense domain and for each participant cluster (All; Typically Developping TD; SEND). Related adult findings are shown from two other studies using the GSQ adult scale (Kuiper et al., 2018; Sapey-Triomphe et al., 2018a) where typical adults are compared to adults with confirmed or suspected ASD respectively

|  |  |  |
| --- | --- | --- |
|  | **Children** | **Adults** |
|  | **Current Study** | **Kuiper et al.** | **Sapey-Triomphe et al.**  |
| **Correlation between hyper- & hypo-Sensitivity** | **All** | **TD** | **SEND** | **TD** | **ASD** | **All** | **Low AQ** | **High AQ** |
| Collapsed across senses | .78 | .74 | .83 | .73 | .60 | .82 | .60 | .73 |
| **Within sense domains** |  |  |  |  |  |  |  |  |
| Visual | *.48* | *.46* | *.61* | *.48*  | *.57* | .60 | .31 | .54 |
| Auditory | *.49* | *.47* | *.44* | *.35* | *.15* | .57 | .23 | .30 |
| Gustatory | *.51* | *.51* | *.41* | *.41* | *.24* | .36 | .23 | .45 |
| Olfactory | *.39* | *.37* | *.53* | *.19* | *.27* | .25 | .09 | .21 |
| Tactile | *.34* | *.28* | *.44* | *.21* | *.02* | .57 | .15 | .33 |
| Vestibular | *.33* | *.28* | *.60* | *.22* | *.39* | .54 | .18 | .46 |
| Proprioception | *.49* | *.44* | *.64* | .37 | *.57* | .63 | .38 | .45 |
| N | 601 | 509 | 31 | 68 | 79 | 245 | 143 | 102 |

*Note.* Spearmans Rho shown in italics. All other associations are Pearson r All correlations from the current study shown in Tbale 1 were significant at the p < .001 level

*Table SI4.*

Internal consistency expressed as Cronbach’s alpha for children in the current study (using *GSQ-P*) in comparison to two other adults studies using the GSQ adult scale (Kuiper et al., 2018; Sapey-Triomphe et al., 2018a) where typical adults are compared to adults with confirmed or suspected ASD respectively (this latter from scores ≥26 on the AQ) and a third study testing typical adults (Ujiie & Wakabayashi, 2015)

|  |  |  |
| --- | --- | --- |
| **Internal consistency expressed as Cronbach’s alpha** | Children | Adults |
| **Current Study** | **Kuiper et al.** | **Ujie & Wakabayashi** | **Sapey-Triomphe et al.** |
|  | All | TD | SEND | TD | ASD | TD | Low AQ | High AQ |
| **Collapsed across senses** |  |  |  |  |  |  |  |  |
| Hyper-sensitivity | .88 | .88 | .93 | .85 | .87 | -- |  |  |
| Hypo-sensitivity | .83 | .83 | .87 | .81 | .85 | -- |  |  |
| Total sensitivity | .93 | .93 | .95 | .90 | .91 | .84 | .84 | .91 |
| **Within sense domains** |  |  |  |  |  |  |  |  |
| Visual | .66 | .66 | .80 | .67 | .75 | .51 |  |  |
| Auditory | .77 | .77 | .79 | .71 | .61 | .56 |  |  |
| Gustatory | .69 | .69 | .73 | .64 | .57 | .43 |  |  |
| Olfactory | .68 | .68 | .77 | .44 | .59 | .42 |  |  |
| Tactile | .53 | .53 | .65 | .44 | .42 | .32 |  |  |
| Vestibular | .65 | .65 | .74 | .50 | .73 | .53 |  |  |
| Proprioception | .67 | .67 | .76 | .53 | .67 | .49 |  |  |

**Domain validations and scale validations for the rGSQ-P**

**Scale validation**

*Table SI5.*

Scale reliability (Cronbach’s alpha) for *rGSQ-P*.

|  |  |  |  |
| --- | --- | --- | --- |
|  | *Cronbachs**All* | *Cronbachs**TD* | *Cronbachs**SEND* |
| Visual | .60 | .54 | .73 |
| Auditory | .70 | .67 | .78 |
| Gustatory | .51 | .51 | .46 |
| Olfactory | .51 | .50 | .56 |
| Tactile | .54 | .49 | .48 |
| Vestibular | .53  | .42  | .63  |
| Hypo | .77 | .75 | .79 |
| Hyper | .85 | .83 | .90 |
| Total  | .87 | .85 | .91 |

Note: Spearmans Rho shown in itaics. All other associations are Pearson r

**Group differences (gender, age) for the rGSQ-P**

There were no significant gender differences in *Total Sensitivity (rGSQ-P)*, *t*(599) = -0.730, *p* = .466, *Bootstrapped* *p* = .470, nor *Hyper-Sensitivity, t*(599) = 0.256, *p* = .798; *Bootstrapped* *p* = .801, nor *Hypo-Sensitivity*, *t*(599) = -1.704, *p* = .0.089, *Bootstrapped p* = 0.073. We also found that there were no age effects in sensitivity scores across the range of children tested here (6-11 years). This was the true for *Total Sensitivity (rGSQ-P)* score, *F*(6, 594), = 0.242, *p* = .962), and *Hypo-Sensitivity, F*(6, 594) = 1.263 *p* = .272) and *Hyper-F*(6,594) = 1.239, *p* = .284.

**Group differences (gender, age) for the GSQ-P**

There were no significant gender differences for *total sensitivity*, *t*(599) = -0.662, *p* = .508 , *Bootstrapped p* = .493. Similarly there were no significant age differences in the *GSQ-P* for *total sensitivity, F*(6, 594) = .141 *p* = .991. This pattern held for *hyper-Sensitivity,* gender *t*(599) = -0.604, *p* = .508, *Bootstrapped p* = .551, age *F*(6, 594) = .607, *p* = .725 and *hypo-Sensitivity*, gender *t*(599) = -0.648, *p* = .517, *Bootstrapped p* = .514, age *F*(6, 594) = .414 *p* = .870.

We also found that there were no age effects in sensitivity scores across the range of children tested here (6-11 years). This was the true for *total sensitivity, GSQ-P* score, *F*(6, 594) = .141 *p* = .991, *hypo-sensitivity, GSQ-P*, *F*(6, 594) = .414, *p* = .870, and *hyper-sensitivity GSQ-P*, *F*(6, 594) = .607 *p* = .725.