

# Feasibility of Using Q-Sort to Map Conditional Participation in Physical Activity in Adolescents With Autism Spectrum Disorder

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**Background:** Participation in physical activity among adolescents with autism is often conditional. However, there is a lack of methods for identifying these specific conditions. Therefore, the purpose of this study was to develop and investigate the feasibility of a Q-sort tool to map individual-specific conditions for participation in physical activity among adolescents with autism and to identify different viewpoints regarding conditions for such participation. **Method:** An exploratory mixed-methods design was employed to investigate the feasibility of using Q methodology and the Q-sort procedure to identify what individual-specific conditions are important for participation in physical activity for adolescents with autism. **Results:** The adolescents ranked the statements with varying levels of ease. Two viewpoints were identified: *Autonomous participation without surprises* and *Enjoyment of activity in a safe social context*. **Conclusion:** Q-sort is a feasible method for mapping conditions for participation, which can guide the development of tailored physical activity interventions.

**Keywords:** viewpoint, subjectivity, tool, Q methodology


Adolescents with autism spectrum disorder (ASD) are generally less physically active, less fit, and participate in fewer physical activities compared to typically developing peers (Borremans et al., 2010; Jones et al., 2017; McCoy et al., 2016;

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Menear & Ernest, 2020; Potvin et al., 2013). Younger adolescents with ASD (<16 years of age), in particular, engage in significantly less moderate to vigorous levels of physical activity (about 25 min/day less) and engage in fewer regular activities compared with typically developing adolescents (Stanish et al., 2017). The low levels of participation in physical activity indicate that current interventions for increased physical activity, or the activities themselves, may not be sufficiently adapted to the adolescents' needs. The reasons for this are still unclear, but often, reported factors are lack of appropriate training among staff members and physical education teachers or lack of accessible activities (Blagrove & Colombo-Dougovito, 2019; Krieger et al., 2018; Obrusnikova & Miccinello, 2012). Therefore, these adolescents' own viewpoints on participation in physical activity need to be better identified and recognized. Hitherto, the attitudes of adolescents with ASD toward participation in physical activity have not been studied in detail. Furthermore, participation is an ambiguous concept, especially in research, due to its multidimensionality (Granlund, 2013; Stallinga et al., 2014). Imms et al. (2017) presented a thorough analysis of the ambiguity of the concept and proposed in their model "family of participation-related constructs" that attendance and involvement are two important elements, with attendance being a prerequisite to involvement and engagement in activities. Other important aspects of participation are choice and the meaningfulness of the activity (Maxwell et al., 2012). Despite an awareness of the multidimensionality of the concept, participation in an activity is still most commonly assessed based on attendance, frequency, and activity competence (Adair et al., 2018). Consequently, participation in physical activity among children and adolescents with ASD is often assessed in terms of levels of physical activity, mainly by using accelerometers and questionnaires (López-Valverde et al., 2021). Thus, other aspects of the participation concept remain unassessed in detail, particularly the adolescents' own perspective, due to the subjective aspect being difficult to capture in a mapping instrument (Adair et al., 2018).

Previous research eliciting the perspectives of adolescents with ASD on participation in physical activity shows that a common answer they give is *but it depends on . . .*, illustrating their need to know what kind of activity it is; who else is attending; when, where, and how it is offered; and so on (Arnell et al., 2018). This need for more detailed information before being able to make a decision about whether to participate or not demonstrates the conditional participation behavior of adolescents with ASD in regard to physical activity (Arnell et al., 2018). The conditions they describe for participation in physical activity include aspects of motivation, predictability, freedom of choice, perceived competence, and confidence related to the demands in the physical activity contexts; if the conditions are not met, this may lead to reluctance to participate in physical activity at all (Arnell et al., 2018, 2020). Some barriers to physical activity such as a lack of available activities and resources may be common to adolescents in general, with or without a disability (King et al., 2014; Somerset & Hoare, 2018). Other barriers, however, may be specifically linked to ASD such as difficulties with social interaction, sensory issues, and limited interests (American Psychiatric Association, 2013). Consequently, proper recognition of individual-specific conditions for participation is a prerequisite for being able to successfully tailor physical activity interventions to the needs of adolescents with ASD. However, exactly what these barriers are for the individual adolescent is poorly understood. Thus, we need better methods for identifying these individual-specific conditions for participation.

One method that has been used successfully to identify individual-specific viewpoints is the Q methodology (Watts & Stenner, 2012). In Q methodology, a number of statements concerning a phenomenon are ranked, for example, from “most disagree” to “most agree” or from “most unimportant” to “most important,” according to a predetermined normally distributed sorting grid; this ranking of statements is known as a *Q-sort* (Watts & Stenner, 2012). Each statement is ranked in comparison to the other statements, thus providing detailed information on the respondent’s viewpoints on the subject. The detailed individual-specific information gained from a Q-sort can therefore more easily be transferred into practice compared with data gained from, for example, Likert scale questionnaires (Ho, 2017). Q-sort has been used in research with children and adolescents (Ellingsen et al., 2014; Lundberg et al., 2020), as well as with people with ASD (Falkmer et al., 2015; Thompson et al., 2019). It is considered to be a suitable method for identifying subjective beliefs and opinions because it enables these views to be mapped without great demands on communication and social interaction, which can be difficult for adolescents with ASD. Given the lack of methods for identifying individual-specific conditions for participation, the purpose of this study was to develop and investigate the feasibility of a Q-sort tool to map individual-specific conditions for participation in physical activity among adolescents with ASD and to identify different viewpoints regarding conditions for such participation.

## Method

### Design

The study has an exploratory mixed-methods design to investigate the feasibility of using Q methodology and the Q-sort procedure to identify what individual-specific conditions are important for participation in physical activity for adolescents with ASD. The Q-sort tool used in this study consists of a Q-sample (a set of statements), developed to cover different aspects of influencing factors that may affect participation in physical activity, and an additional option for participants to formulate and rank their own additional statements describing person-specific conditions for participation. The overarching question when it comes to a feasibility study is, according to Orsmond and Cohn (2015), “Can it work?” The different aspects of feasibility suggested by Orsmond and Cohn, are therefore observed, documented using field notes and described throughout the “Method,” “Results,” and “Discussion” sections. The different feasibility aspects include evaluation of how appropriate the study is with regard to recruitment of participants, the data collection procedure and outcomes measures, the acceptability and suitability of the method, resources needed, and what does the preliminary responses of the participants indicate. In order to transparently report the findings of the brief qualitative interviews, the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist was used (Tong et al., 2007).

### Q Methodology

The Q methodology is referred to as a mixed-methods research approach (Lim et al., 2021; Ramlo, 2016) for the investigation of phenomena where subjective

views are of great importance. William Stephenson developed the method in the 1930s for capturing individuals' subjective values, attitudes, and perceptions in relation to a phenomenon (Watts & Stenner, 2005, 2012). This methodology involves systematic assessment of qualitative data, because both qualitative (statements) and quantitative (degree of concurrence) data are combined (Dziopa & Ahern, 2011). This enables the range of interpretations of the phenomenon within a study population to be identified and subsequently described in detail. In the Q-sort procedure, the participant has to compare and rank different statements against each other, which clarifies the participant's personal choices and opinions; these are then compiled and analyzed with other participants' sorts (Paige & Morin, 2016). By identifying what is specific to the individual and at the same time emphasizing common values in a population (Watts & Stenner, 2005, 2012), Q-methodology can be useful for mapping individual-specific conditions for participation in physical activity among adolescents with ASD.

The Q methodology is performed in the following four steps: (a) identification of views on the phenomenon being studied to generate a *concourse*, a comprehensive set of opinion statements about the phenomenon; (b) design of the *Q-sample*, a selection of statements from the concourse representing the key concepts and ideas; (c) administering the Q-sort, in which study participants sort and rank the statements in the Q-sample; and (d) the Q-sort is analyzed with inverse (by person) factor analysis and is then interpreted with the aid of background information obtained from the participants.

## The Concourse and Development of the Q-Sample

The first step of the study involved the identification of a concourse of opinion statements about conditions for participation or factors affecting participation in physical activity. In this study, the concourse was generated using information obtained in earlier studies eliciting views on participation in physical activity from adolescents with ASD, parents of adolescents with ASD and professionals engaged in the promotion of physical activity in adolescents with an ASD (Arnell et al., 2018, 2020, 2022). In addition to these previous studies, a review of articles found in the databases PubMed, CINAHL, SPORTDiscus, and ERIC (the key search terms used: autism, physical activity, physical education, and adolescent), describing factors affecting participation in physical activity among adolescents with ASD, provided further statements for inclusion in the concourse. Five statements were added to the concourse, which all were linked to aspects regarding availability of activities, competence, bullying, and fear of injury (Ayvazoglu et al., 2015; Healy et al., 2013; Memari et al., 2015; Obrusnikova & Miccinello, 2012).

Statements about conditions for participation in physical activity were then formulated for inclusion in the Q-sample. This is an important step because these statements should represent a breadth and depth of views that concern the phenomenon being studied (Paige & Morin, 2016) and be formulated in a way that can be understood without difficulty by the group who will sort the statements. By including a variety of aspects, the researcher can attempt to cover the range of subjective viewpoints of the participants; in this study, the International Classification of Functioning, Disability and Health core set for ASD (Bölte et al., 2019), as well as known influencing factors at different socioecological levels such as

intra- and interpersonal factors (age, gender, attitudes, etc.), community (availability of activities), and societal-level factors (public policies, laws, and regulation; [McLeroy et al., 1988](#); [Sallis & Owen, 2015](#)), guided the development of the Q-sample statements. The statements thus represent a range of independent and interacting factors that influence participation in physical activity by adolescents with ASD. In order to review which statements to include in the final Q-sample, a statement review group was formed, consisting of a parent of a person with ASD and professionals at a child and youth habilitation center. The group scrutinized the statements and provided feedback regarding the content of each statement, as well as the comprehensibility and suitability of the language used in the statements. The authors then revised the statements, which included reducing the number of statements and reformulating statements to make them more explicit or concrete. Statements were excluded from the Q-sample if they were considered nonrelevant or ambiguous. The development process is shown in Figure 1. In addition, readability was tested using an online software tool ([lix.se](#)) to ensure that the level was appropriate for the participants' age and educational level. On the readability index, 46% of the statements were very easy to read, 41% easy to read, and 13% moderately difficult to read (comparable with newspaper text).

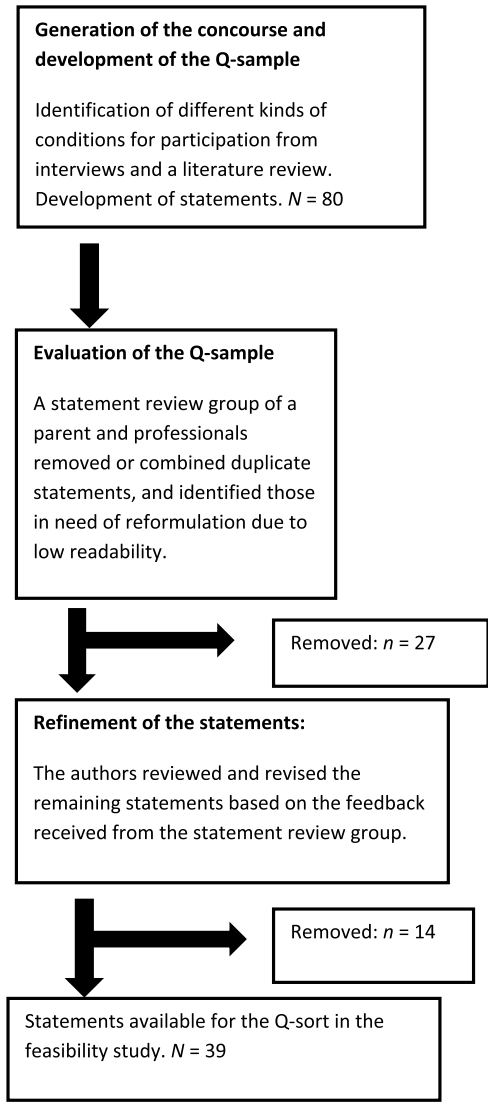
The final Q-sample, to be used in the data collection tool, consisted of 39 statements spanning the different components of the International Classification of Functioning, Disability and Health model and different levels of McLeroy's socioecological model (intrapersonal, interpersonal, organizational, or environmental level; [McLeroy et al., 1988](#); [Sallis & Owen, 2015](#); [World Health Organization, 2001](#)). The statements were printed on separate laminated cards.

A sorting grid with 39 boxes to place the statements in was created (Figure 2). The boxes were quasi-normally distributed across a scale from  $-5$  (*most disagree*) to  $+5$  (*most agree*), with the columns in the middle of the sorting grid defined as *indifferent*.

Clear verbal instructions were then developed to explain the Q-sort procedure to the adolescent participants. The question to be answered was: *What is important for wanting to participate in physical activities?* It needs though to be realized that this question incorporates elements not only about wanting to participate but also about being able to participate. The sorting procedure, including the instructions and questions, was pilot tested with one neurotypical adolescent at the same age and level of education as adolescents included in the study. The results showed that the instructions were easy to comprehend and the structure easy to follow. In order to further enhance the clarity of the sorting procedure, image support (smiley cards) was developed for the provisional ranking categories. The result from the pilot test is not included in the study results.

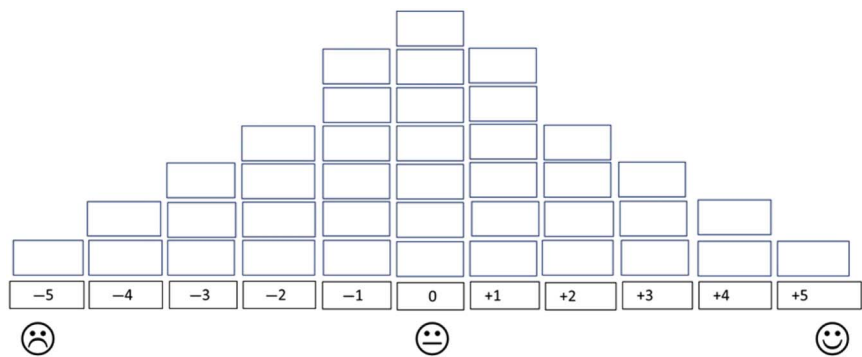
## Recruitment Procedure and Participants

We sought to recruit a diverse set of participants to reveal different views about conditions for participation in physical activity. Both boys and girls with ASD with a range of physical activity habits and preferences were recruited in order to avoid an unduly homogeneous group of participants ([Watts & Stenner, 2012](#)). In addition, the number of participants required in the Q methodology is much lower compared with traditional R methodology studies, and the suggested number of



**Figure 1** — The Q-sample construction process.

participants should be less than the number of statements in the Q-sample (Watts & Stenner, 2012). Thus, a purposeful sample of adolescents aged 12–16 years with ASD (DSM-5 299.00) without a co-occurring intellectual disability and registered at a child and youth habilitation center in a central region of Sweden received an age-appropriate information letter of invitation ( $N=355$ ). Thirteen agreed to participate, and written informed consent was obtained from the adolescents



**Figure 2** — The sorting grid.

and their parents or legal guardians. One adolescent chose to discontinue participation prior to data collection, giving 12 participants in the final sample. Despite the low response rate that may have been due to the ongoing pandemic, we believe that the number of participants were acceptable in a feasibility study. The participants’ demographic characteristics and physical activity habits are shown in Table 1.

**Administering the Q-Sort**

Due to the COVID-19 pandemic, the data collection were conducted as an online face-to-face meeting (the participant and the researcher could see each other throughout the data collection). The statements and the sorting grid were sent to the participant by ordinary mail prior to the meeting.

All participants were able to read the Q-sort statements themselves. If needed, support from the administrating researcher (Arnell, an experienced physiotherapist) was offered to clarify the meaning of any statement. Before the sorting procedure began, the researcher defined the concept *participation in physical activity* and discussed it with the participant. Physical activity was defined as “any kind of physical activity counts” and it can include activities such as physical education; leisure-time physical activities; formally organized or informal physical activities; sports, recreation, and active transportation. The adolescents were informed that there was no right or wrong way of sorting and that the finished Q-sorting would be seen as a snapshot of the adolescent’s opinion or viewpoint right now. The adolescents were thereafter asked to carefully read each statement (six of the adolescents preferred to have the statements read aloud to them) and to consider how important each statement was in relation to their willingness to participate in physical activity. They then evaluated and ranked the statements. First, they sorted the statements into three provisional ranking categories (negative, neutral, or positive) and thereafter into the quasi-normally distributed sorting grid (Figure 2) to answer the previously mentioned question. Throughout the sorting procedure, the adolescents had the opportunity to receive further verbal instructions if they seemed confused on the task.

Table 1 Participant Demographics, Self-Reported PA Habits, and Factor Loadings

| Participant | Age | Gender | Living area | School form                    | Participation in physical education | Leisure-time PA                          | Social context during PA       | Viewpoint                |                          |
|-------------|-----|--------|-------------|--------------------------------|-------------------------------------|--|--------------------------------|--------------------------|--------------------------|
|             |     |        |             |                                |                                     |  |                                | 1                        | 2                        |
| 1           | 15  | M      | Urban       | Adapted school form            | Always 2x/week                      | Solitary activity once per week          | Other                          | -0.034                   | <b>0.771</b>             |
| 2           | 14  | F      | Rural       | Adapted                        | Twice per week                      | Solitary activity several times per week | Alone                          | <b>0.732</b>             | -0.074                   |
| 3           | 12  | F      | Rural       | Mainstream classroom education | Twice per week                      | Group activity once per week             | Friend(s)                      | 0.252                    | <b>0.467</b>             |
| 4           | 14  | F      | Urban       | Mainstream classroom education | Three times per week                | Occasionally                             | Friend(s)                      | 0.362                    | 0.262                    |
| 5           | 14  | M      | Urban       | Adapted                        | Occasionally                        | No regular PA                            |                                | <b>0.553</b>             | 0.333                    |
| 6           | 14  | M      | Urban       | Adapted                        | Never                               | Solitary activity several times per week | Alone                          | <b>0.521<sup>a</sup></b> | <b>0.474<sup>a</sup></b> |
| 7           | 16  | M      | Urban       | Mainstream classroom education | Twice per week                      | No regular PA                            |                                | 0.136                    | <b>0.416</b>             |
| 8           | 13  | M      | Urban       | Mainstream classroom education | Twice per week                      | Team sport three times per week          | Team, parent(s), and friend(s) | <b>0.500</b>             | 0.201                    |
| 9           | 13  | F      | Urban       | Mainstream classroom education | Twice per week                      | Occasionally                             | Parent(s) and friend(s)        | <b>0.710</b>             | 0.160                    |

(continued)



Table 1 (continued)

| Participant | Age | Gender | Living area | School form                    | Participation in physical education | Leisure-time PA                             | Social context during PA | Viewpoint    |              |
|-------------|-----|--------|-------------|--------------------------------|-------------------------------------|---|--------------------------|--------------|--------------|
|             |     |        |             |                                |                                     |   |                          | 1            | 2            |
| 10          | 16  | M      | Urban       | Adapted                        | Twice per week                      | Group activity three to four times per week | Team and friend(s)       | <b>0.687</b> | -0.048       |
| 11          | 15  | M      | Rural       | Mainstream classroom education | Twice per week                      | No regular PA                               |                          | 0.231        | <b>0.692</b> |
| 12          | 14  | M      | Rural       | Mainstream classroom education | Occasionally                        | Occasionally                                | Parent(s)                | -0.088       | <b>0.734</b> |

*Note.* Bold numbers indicate significant factor loadings. F = female; M = male; PA = physical activity; other = escort or contact person.

<sup>a</sup>Confounded sort (significant factor loading in relation to more than one factor).

After the Q-sort had been completed, the adolescents were asked to briefly reflect on why they placed various statements within each column. The focus of the reflection interviews was primarily on the statements placed at the outer edges of the grid pattern to reveal the adolescent's rationale for ranking the statements in that specific order on the sorting grid (Gallagher & Porock, 2010). The adolescents were then invited to comment on conditions that they perceived were missing among the statements in the Q-sample and then formulate and rank their own statements on factors that affected their participation in physical activity: These statements were not included in the by-person factor analysis. The adolescents' reflections and reasoning after the sorting process were audio-recorded to be used later as support in the analysis process when the emerging factors were interpreted.

### Feasibility Observations

The *process* of developing and implementing a new intervention is central in a feasibility study (Orsmond & Cohn, 2015), and therefore the adolescents' responses to using Q-sort were important. The adolescents were observed throughout the sorting procedure, and their actions and comments were documented using field notes. Comprehension of the sorting procedure, comprehension of the included statements, and time required for sorting were documented. The data collection ended with interview questions regarding the sorting procedure and how the participant perceived this kind of data collection. The brief interviews were audio-recorded and then transcribed verbatim.

### Data Analysis and Interpretation of the Q-Sorts

The PQMethod software package (version 2.35; Schmolck, 2014) was used to perform the by-person factor analysis. This analysis is used to identify patterns in how different statements are sorted by the adolescents. The analysis program generated a correlation matrix and thereafter, a principal component analysis was used to extract underlying factors, which were then rotated using varimax rotation (Watts & Stenner, 2012). To decide the number of factors to be retained for further analysis the number of Q sorts need to be considered. According to Watts and Stenner (2012) when you have <12 Q-sorts, one or two factors is/are a reasonable starting point. We also considered the five criteria described by Watts and Stenner (2012): (a) the recommendation of seven factors (Brown, 1980), which is the default number for extraction in PQ Method; (b) the "Kaiser–Guttman criterion," proposing that only factors with an eigenvalue larger than 1.00 should be considered for inclusion (Guttman, 1954; Kaiser, 1960, 1970); (c) factors must have two or more significantly loading Q-sorts (Watts & Stenner, 2012); (d) "Humphrey's rule," specifying that a factor is only significant if the sum is greater than twice the *SE* when the two highest absolute loadings are multiplied (Brown, 1980); and (e) the "scree test" (Cattell, 1966), which identifies the number of factors prior to the plot line leveling out (Watts & Stenner, 2012).

The analysis software program enables the identification of viewpoints at a group level, and the analysis identifies *distinguishing statements*, which are statements that distinguish one factor from another, and *consensus statements*, which are statements that do not distinguish between any pair of factors, thus

showing what the participants agree on, which can be positive, negative, or neutral views about the issue (Watts & Stenner, 2012). To support the interpretation of each viewpoint, a *factor array* was computed, which is a single idealized model Q-sort configured to represent the viewpoint of a particular factor (Watts & Stenner, 2012). In order to get a sense of the whole viewpoint, the factor arrays were interpreted using a crib sheet, revealing the interrelationship of the statements within each viewpoint. The postsorting interviews regarding the participants' reasons for placing the various statements within each column were analyzed using card content analysis, which is a series of logical steps to further aid the analysis and interpretation (Gallagher & Porock, 2010). During this process, distinguishing statements are analyzed and compared with consensus statements.

## Analysis of Interviews

Since the purpose of the present study was to test the feasibility of using Q-sort, the brief interviews regarding the sorting procedure were deductively analyzed using qualitative content analysis (Elo & Kyngäs, 2008). The content was analyzed by Arnell into three categories: the sorting procedure, statement comprehension, and preferred mapping procedure. Observations and field notes supplemented this analysis. The NVivo software program (version 12; QSR International, 2018) was used in both the qualitative content analysis and in the card content analysis.

## Ethical Considerations

The study was approved by the Swedish Ethical Review Authority (approval nos. 2020-00938 and 2020-06568) and carried out in accordance with the Declaration of Helsinki (World Medical Association, 2013). The information about the study and invitation to participate were sent by letter, which gave the adolescents and their parents the opportunity to consider carefully whether to participate. The information in the letter followed current ethical standards for research. Because the participants in this study were adolescents with a disability, it was important that they should feel safe and comfortable during the data collection, which is why we allowed them to choose whether to participate via an online or physical meeting. The prevailing (COVID-19) restrictions were taken into account during data collection and all participants chose to participate online.

## Results

### Feasibility of Q-Sort as a Method to Support Mapping of Conditions for Participation

The set of 39 randomly numbered statements included in the final Q-sample, were ranked by 12 adolescents with ASD. The completion time ranged from 34 to 56 min (mean 47 min), one-third was spent familiarizing the participant with the task and about two-thirds of the time was spent on the sorting procedure, reporting of the results and the interview.

Most of the adolescents sorted the statements without much difficulty, although one adolescent needed substantial parental support in order to

comprehend and focus on the sorting procedure. Comments from the adolescents that were related to the sorting of statements were diverse, including wordings such as *a bit tricky* (Participant 10), *difficult to choose where to place it* (Participant 6), *too many questions* (Participant 12), and *easy* (Participant 11). Their comments were reflected in the observations and field notes during the sorting procedure. For some adolescents, choosing the “right” column for each statement was a time-consuming process while others did not hesitate at all when placing the card in the grid. Most of the adolescents reported that they fully understood the sorting procedure. One commented on the sorting procedure and the sorting grid as follows:

Sorting was not that much of a problem but I think the system was a bit . . . “half-messy.” . . . There are many things that are important. So I think it might have been much harder to sort but I think you would have gotten more accurate results if you could also choose how high the bars would be. (Participant 11)

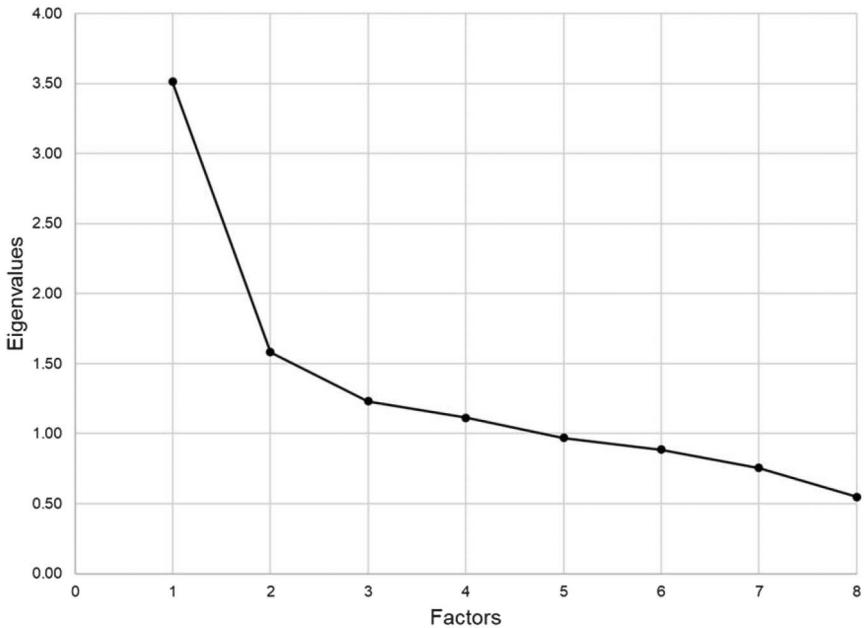
Comprehension of some statements, on the other hand, was more difficult, and clarifications were frequently needed. Statements that contained the word “not” were perceived as especially difficult to sort by some of the adolescents. Four of the adolescents added in total five statements of their own to the Q-sample. These spontaneous statements covered aspects such as environmental factors (. . . *it is important that there are no insects*), predictability (*it is important that I have time to prepare myself*), competence (. . . *it is important that the others are at the same level*), and engagement in an activity (*it is important that the other engage equally in the activity*), and were all ranked high (about +4).

Asking the adolescents for their reasons for placing the statements in a specific order was a necessary additional step, since the results of the sorting of statements did not offer enough detailed information. When they were asked what type of mapping process they preferred—either conversations linked to sorting statements or just conversations—most of them preferred the former. They pointed out that it reduces the requirement to formulate oneself, *because sometimes when they ask I need . . . time to think* (Participant 10). Other reflections were that. . . . *It was quite fun to sort* (Participant 2) and *It felt easier to sort cards [than to talk]* . . . (Participant 5). However, some adolescents would have preferred conversations only: *just answering questions . . . . I thought it was a bit hard . . . because it was hard to keep everything in place* (Participant 4).

## Different Viewpoints Concerning Conditions for Participation in Physical Activity

The analysis of the Q-sorts indicated that Factors 1, 2, 3, and 4 met the Kaiser–Guttman criterion of eigenvalues larger than 1.00 as well as the criterion of at least two significant loadings per factor. With a *SE* of 0.16 in this study, the Factors 1, 2, 3, and 4 also met the criterion “Humphreys’ rule.” However, the scree plot indicated only two factors (Figure 3).

Based on the results of the iterative analysis process, two factors were finally accepted that represent underlying (latent) patterns regarding the adolescents’ views of conditions for participation in physical activity, hereafter referred to as



**Figure 3** — Scree plot of eigenvalues of the first eight factors.

*viewpoints*. The two viewpoints explained 42% of the total variance. The viewpoints were labeled as Viewpoint 1 *Autonomous participation without surprises* and Viewpoint 2 *Enjoyment of activity in a safe social context*. The two viewpoints were defined by 11 participants with one participant not loading significantly on either viewpoint. Factor loadings represent the degree to which a Q-sort corresponds to each viewpoint, and these are shown for each participant in Table 1. For each viewpoint, an idealized “model Q-sort” or *factor array* was computed to illustrate how a participant with a factor loading 1 would have ranked the statements. An overview of the typical arrangement of statements within each viewpoint is provided in Table 2. In the descriptions of the salient features for each viewpoint, the statement number and the position of the column in the sorting grid are shown.

### Viewpoint 1—Autonomous Participation Without Surprises

Viewpoint 1 was expressed by six adolescents. They considered it important that the activity was performed as planned and did not change (#38, +4) and that the rules were followed by everyone (#8, +4). This viewpoint was, however, also characterized by the somewhat contradictory and positively ranked statements representing autonomy and freedom of choice (#1, +2 and #39, +3) when it came to their own participation. They also agreed more strongly than the other group that the activity had to be meaningful, and they wanted to know why they should participate (#5, +2), which was related to perceived level of motivation: . . . *if you*

**Table 2 Statements and Factor Arrays (z Scores in Parentheses)**

| Statements (For me, . . .)   | Viewpoint  |            |
|--|------------|------------|
|  | 1          | 2          |
| 1. . . . it is important to be able to choose which physical activity I participate in*                            | 2 (0.80)   | -2 (-0.84) |
| 2. . . . it is important that I know who I can ask*  | 2 (0.70)   | 4 (1.55)   |
| 3. . . . it is important that I am good at the activity#   | -2 (-0.86) | -3 (-1.14) |
| 4. . . . it is important to know who else will participate*  | -1 (-0.50) | 1 (0.50)   |
| 5. . . . it is important to know why I should participate*   | 2 (0.82)   | -2 (-0.97) |
| 6. . . . it is important that someone I know comes with me*  | -3 (-0.96) | 3 (1.40)   |
| 7. . . . it is important that others do not make demands on me during the activity*                                | 0 (-0.29)  | 2 (0.91)   |
| 8. . . . it is important that everyone follows the rules*  | 4 (1.76)   | 3 (1.01)   |
| 9. . . . it is important that no one touches me (physical contact)*  | -1 (-0.56) | -3 (-1.33) |
| 10. . . . it is important that others do not look at me during the activity#                                       | -4 (-1.56) | -4 (-1.90) |
| 11. . . . it is important that it is calm and quiet*   | 1 (0.50)   | -1 (-0.28) |
| 12. . . . it is important to be able to perform the activity alone*  | -3 (-1.16) | 2 (0.76)   |
| 13. . . . it is important to get a ride to the activity#   | 0 (0.02)   | 0 (0.16)   |
| 14. . . . it is important to know where the activity will take place#  | 2 (0.68)   | 1 (0.26)   |
| 15. . . . it is important that the activity is fun*  | 3 (0.84)   | 4 (1.94)   |
| 16. . . . it is important to win*  | -5 (-2.15) | 0 (-0.18)  |
| 17. . . . it is important that it is a team sport  | -3 (-0.96) | -4 (-1.52) |
| 18. . . . it is important that someone else in the family (mother, father, siblings) participates in the activity* | -4 (-1.88) | 2 (0.90)   |
| 19. . . . it is important that it is not too cold/hot*   | -1 (-0.57) | 0 (0.22)   |
| 20. . . . it is important that the same teacher/trainer is involved in the activity                                | 0 (0.42)   | 0 (-0.23)  |
| 21. . . . it is important that the activity is indoors*  | -2 (-0.95) | 2 (0.79)   |
| 22. . . . it is important that I have enough energy to perform the activity*                                       | 3 (1.64)   | 1 (0.51)   |
| 23. . . . it is important that it is a ball sport*   | -1 (-0.54) | -5 (-1.95) |
| 24. . . . it is important that I do not have to shower*  | 1 (-0.42)  | -3 (-1.25) |
| 25. . . . it is important that I do not have to get changed with others#   | -1 (-0.45) | -2 (-0.69) |
| 26. . . . it is important that I have tested the activity before#  | 0 (-0.01)  | 1 (0.43)   |
| 27. . . . it is important that it is not too expensive#  | -1 (-0.60) | -2 (-0.93) |
| 28. . . . it is important that the activity is close to home#  | -2 (-0.86) | -1 (-0.63) |
| 29. . . . it is important that I can be physically active with my friends*   | 0 (-0.24)  | 1 (0.54)   |
| 30. . . . it is important that the leader/teacher is knowledgeable and knows a lot about autism*                   | 1 (0.44)   | -1 (-0.48) |
| 31. . . . it is important that physical activity does not take time away from other important activities           | 1 (0.45)   | -1 (-0.26) |

*(continued)*

**Table 2 (continued)**

| Statements (For me, . . .)   | Viewpoint  |            |
|--|------------|------------|
|  | 1          | 2          |
| 32. . . . it is important that I get clear instructions on how to do it#   | 5 (1.87)   | 5 (2.18)   |
| 33. . . . it is important that I do not injure myself during the activity#                                       | 1 (0.48)   | 0 (0.11)   |
| 34. . . . it is important that I have the right equipment (clothes, shoes, ball, racket, etc.)*                  | 0 (0.37)   | -1 (-0.46) |
| 35. . . . it is important that it is a small group/few who participate in the physical activity at the same time | 1(0.48)    | 0 (-0.10)  |
| 36. . . . it is important that I do not have to consider other participants during physical activity#            | -2 (-0.62) | 0 (-0.22)  |
| 37. . . . it is important to get help from someone else to get started with physical activity                    | 0 (-0.35)  | 1 (0.34)   |
| 38. . . . it is important that the activity is performed as planned and does not change#                         | 4 (1.71)   | 3 (1.18)   |
| 39. . . . it is important to be able to get away if needed*  | 3 (1.63)   | -1 (0.34)  |

*Note.* Distinguishing statements are statements that distinguish one factor from another. Consensus statements do not distinguish between any pair of factors, thus showing what the participants agree on.

\*Distinguishing statements significant at  $p < .01$ . #Consensus statements (nonsignificant at  $p > .05$ ).

*have no reason to participate, then you get no motivation and if you have no motivation then you will perform poorly* (Participant 8). The competitive element (#16, -5) was, however, considered to be the least important motivation, which was expressed by one adolescent as follows: *So I'm not that interested in who wins . . . . I usually joke that I'm sad when I lose but I never am really* (Participant 2).

## **Viewpoint 2—Enjoyment of Activity in a Safe Social Context**

Viewpoint 2 was expressed by six adolescents. This viewpoint was characterized by the high rankings of the statements . . . *I know who I can ask* (#2, +4) and . . . *it is important that the activity is fun* (#15, +4), in addition to clusters of highly ranked statements representing confidence and control over social demands (#6, #7, #18, #12, ranging from +4 to +2). The distinguishing statement describing the influence of family (#18, +2) became evident in this viewpoint and was addressed as important by some adolescents because the family offers both structure and social support in connection with physical activity. In contrast, these six adolescents all felt strongly that team sports, especially ball sports and demands linked to this kind of activities, gave them neither control over social demands nor enjoyment, thus lowering their willingness to participate (#17, -4, and #23, -5). Their negative rankings mirrored their comments in the interviews, for example, *I don't like ball sports . . . so it's unimportant. It's more important to me that it's not a ball sport* (Participant 11).

## Consensus Statements

Out of the 39 statements, 17 were identified as consensus statements, of which 12 were nonsignificant ( $p > .05$ ; Table 2), meaning that they were ranked in a similar way across the viewpoints or did not distinguish between the factors. The highest ranked statement in both viewpoints was . . . *it is important that I get clear instructions on how to do it* (#32, +5 and +5) meaning that knowing what to do and how to perform it, thus ensuring predictability, was considered the most important condition for participation. Likewise, the statement . . . *it is important that the activity is performed as planned and does not change* (#38, +4 and +3), were highly ranked and indicates the importance of predictability. This was also addressed in the adolescents' comments, for example, *It stresses me out a lot when things that are planned change* (Participant 2). In contrast, issues regarding availability or accessibility (#13, #27, and #28, ranked between 0 and -2) were considered less important. Some of the adolescents commented that they had never reflected on costs linked to participation in physical activities. Statements related to interaction with peers during physical activity were likewise generally assigned low or relatively low importance (#10, #17, and #36, ranging from 0 to -4). Statements ranked between +1 and -1 were considered "neutral;" however, placing the statements in these columns did not mean that these conditions were unimportant, but merely that other conditions were perceived as more or less important.

## Discussion

The purpose of this study was to develop and describe the feasibility of a Q-sort tool to map individual-specific conditions for participation in physical activity and to identify different viewpoints regarding such participation among adolescents with ASD. Q-sort was found to be a feasible method for this purpose; however, the additional questions regarding the adolescents' rationale for their Q-sorts were necessary in order to thoroughly understand their conditions for participation.

The Q-sort allowed the adolescents to express their own views, as well as requiring them to make fine discriminations between different conditions for participation. Their comments showed that the sorting was not always easy for them. Therefore, the number of statements and the instructions on how to sort them have to be carefully considered. It is crucial to explain the research question clearly (Dennis, 1986). In the present study, it was presented in written form for correct comprehension of the ranking task. Another crucial point when mapping the conditions for participation is that the Q-sample must contain the variety needed to elicit the different conditions for participation and the statements must be appropriate for each individual. In order to capture missing conditions, the adolescents were offered the possibility to formulate their own statements and rank them in relation to the other statements. Only five spontaneous statements were formulated, which suggests that the Q-sample adequately covers different conditions for participation. However, it is more likely that so few spontaneous statements were formulated due to the difficulty of formulating them on demand during the interview. Furthermore, the phrasing of the statements included in the



Q-sample may have had an impact on the results because different concepts can be attributed different meanings. When using Q-methodology, the participants are allowed to inject their own meaning to each statement thus mirroring their own experiences (Watts & Stenner, 2012). Likewise, sorting a large number of statements can be tiring, leading to the sorting being based on mechanical rather than conceptual choices (Dennis, 1986). To reduce this, we assumed that an adolescent who ranked a statement such as . . . *it's important to win* as high (+5, +4), would have ranked a contrasting statement (such as . . . *winning is not important*) low, although this cannot be taken for granted. In order to minimize any ambiguity during the Q-sorting procedure, a researcher was present to clarify the wording of statements or the sorting routine.

The result of the Q-sort identified two viewpoints: *Autonomous participation without surprises* and *Enjoyment of activity in a safe social context*. The first viewpoint indicates a need for a certain degree of freedom of choice but still with a desire to know the purpose and demands of the physical activity. In relation to such demands and possible demand avoidance, the statement referring to the competitive element (#16) was ranked lowest in this viewpoint; this indicates that the adolescents viewed competing against their peers as challenging, especially when they had no choice during physical education. The role of competition in physical education and its effect on willingness to participate has been discussed by Aggerholm et al. (2018), who suggest that a competitive element may exclude those with less skill in the activity. The second viewpoint was distinguished by statements that focused on the importance of an activity being fun (#15) and of being in control of social demands in the physical activity context. This finding is supported by previous research highlighting the importance of enjoyment of an activity, which is positively associated with participation in physical activity (Burns et al., 2017; Jin et al., 2018; Stanish et al., 2015). It is also in line with research showing that walking/hiking and swimming are the most commonly reported activities among adolescents with ASD, which are activities that also enable to have control over social demands (Stanish et al., 2017). Statements concerning a safe social context were ranked high, but the importance of friends was surprisingly neutral, especially since previous research has shown that young people's physical activity habits are largely influenced by social support provided by friends (Mendonça et al., 2014). However, in this viewpoint the importance of family or parental involvement was clearly addressed, which previous research confirms (Askari et al., 2015; Brown et al., 2020; Obrusnikova & Miccinello, 2012).

The consensus statements revealed that the circumstances around the physical activity such as being prepared for the activity were generally considered important. This preference for predictability was likewise addressed in the brief interviews with the adolescents. But participation in physical activities in various contexts often includes meeting different kinds of demands, some of which may be difficult to predict. In the individual Q-sorts, the highly ranked statements regarding predictability thus indicate a link between perceived stress or anxiety, intolerance of uncertainty, and willingness to participate. This is not surprising, since both anxiety and intolerance of uncertainty are known to be elevated in people with ASD and related to avoidance of demands, leading to refusal to attend (Jenkinson et al., 2020; Stuart et al., 2020).

The two viewpoints and the consensus statements offer guidance on perspectives that need to be recognized when initiatives to enhance physical activity are planned and offered. In each of the viewpoints, both physically active and inactive boys and girls with ASD, living in urban and rural areas were represented. This highlights the need to map the individual-specific conditions for participation in physical activity regardless of their previous physical activity habits or preferences, living area, and gender. This feasibility study can be seen as a measure to refine and reduce the number of statements in a Q-sample (Watts & Stenner, 2012), which can then be developed into a tool (“the Conditional Participation in Physical Activity q-sort”) and used to support the mapping of conditions for participation.

## Methodological Strengths and Limitations

A methodological strength of the Q methodology and Q-sort procedure is that it offers an opportunity to explore, in a structured manner, how adolescents with ASD perceive participation in physical activity. A strength in this study was the concurrence, derived from scientific literature regarding participation in physical activity and from interviews with adolescents with autism, parents, and professionals. This concurrence constituted a robust foundation for this exploratory study in which subjective viewpoints were measured in a less threatening way compared to methods that require the participants to talk to strangers about their perceptions (Ellingsen et al., 2014).

Nonetheless, Q methodology has its limitations. The transferability of the results to the population of adolescents with ASD may be limited, since only 12 adolescents participated in our study. Given that the aim of this study was to test the feasibility of the Q-sort procedure to map individual-specific conditions for participation, it should be noted that neither feasibility studies (Orsmond & Cohn, 2015) nor Q methodology in general require a large number of participants. Instead, a sample of individuals who are expected to have various viewpoints regarding the issues relevant for the study is required (Watts & Stenner, 2005). In fact, a two-factor solution fitted the sample well, though it is possible that more viewpoints could be revealed with more participants.

## Implications

To individually tailor physical activities to adolescents with ASD, and to be able to offer adequate support, it is essential to know how they experience participation in physical activity and what specific conditions they have for participation. In order to map these individual-specific conditions, professionals working in schools or in a clinical setting need an easy-to-use and convenient tool. An adapted and further developed version of this Q-sort tool (“Conditional Participation in Physical Activity q-sort”) may respond to this need and serve as a basis for structural discussions with adolescents, since it allows detailed information to be gathered without great demands on communication. Thus, the participation Q-sort (without conducting an inverted factor analysis) can be used as a means to more accurately develop and support interventions to promote participation in physical activity in adolescents with ASD.

## Conclusion

The Q-sort is a feasible method for clarifying individual-specific conditions for participation in physical activity and for identifying what detailed person-specific adaptations of physical activities are needed. The Q methodology with inverted factor analysis can be used to inform and guide the development of interventions directed to adolescents with ASD to enhance their physical activity in the future. The viewpoints *Autonomous participation without surprises* and *Enjoyment of activity in a safe social context* were identified as important, but should be replicated in new studies to determine their significance for participation in physical activity among adolescents with ASD.

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