

The impact of coping behaviors on perceived competence and social anxiety in the everyday social engagement of autistic adolescents

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Community involvement statement

Recruitment of participants involved support from the autistic community in Taiwan. No autistic people were involved in designing or conducting this research, and none of the authors are autistic. We acknowledged these as limitations of this study. However, the authors have valuable expertise, clinical experience, practical knowledge, and personal connections to autism.

Lay Abstract

Individuals who cope well with challenges may engage in social situations more successfully. We examined how well autistic adolescents coped, depending on how competent they felt and how much anxiety they experienced during social activities. We included 133 individuals (82 autistic, 51 neurotypical) between the ages of 10 and 16 years. Participants carried a mobile device that prompted them seven times a day for seven days to record what they were doing, how competent they felt and how much anxiety they experienced. We used the Coping Inventory to understand how well participants coped with environmental challenges and met their needs for growth. Autistic adolescents were more likely than neurotypical peers to feel anxious while doing activities with adults. Autistic adolescents who had more difficulty coping with challenges were more likely to feel anxious when doing leisure activities with peers. Interestingly, autistic adolescents who coped better with challenges tended to feel less competent in social situations. However, those better able to meet their needs for growth tended to perceive their social competence positively. These findings can help practitioners develop strategies and programs to reduce the negative social experiences of autistic adolescents by helping them cope better.

The impact of coping behaviors on perceived competence and social anxiety in the everyday social engagement of autistic adolescents

Abstract

Individuals who cope well with challenges may engage in social situations more successfully. We examined the association between coping behaviors, self-perceived competence and social anxiety in everyday social situations. A total of 133 participants between the ages of 10 and 16 years (82 autistic, 51 neurotypical) carried a mobile device that prompted them seven times each day for seven days to record what they were doing and their perceived competence and social anxiety in that situation. We used the Coping Inventory to measure overall coping abilities (i.e., coping with the self and the environment). Multilevel analyses found that autistic adolescents were more likely than neurotypical peers to experience social anxiety while engaged in maintenance or productive activities with adults. While their ability to cope with the self was positively associated with perceived social competence, it was negatively associated with the ability to cope with environmental challenges. Further, autistic adolescents with poor ability to cope with environmental challenges were more likely than those who coped well to be socially anxious when engaged in leisure activities with peers. Findings from this study can guide evaluation and intervention to improve the social experiences of autistic adolescents by helping them increase coping skills.

Keywords

Autism, real-life experience, social competence, experience sampling method, ecological momentary assessment

Introduction

Autistic adolescents often experience social interaction and behavioral challenges that restrict their social participation (American Psychiatric Association, 2013). While intellectually able individuals may have better social functioning than those with intellectual disabilities, autistic adolescents predominantly engage in solitary/parallel activities (Bauminger et al., 2008; Shattuck et al., 2011). Further, increased social anxiety may lead to avoidance of social situations with unfamiliar people (Kuusikko et al., 2008; Muller et al., 2008; Pickard et al., 2017). Nonetheless, many researchers (Barendse et al., 2018; Chen et al., 2015; Deckers et al., 2014; Jaswal & Akhtar, 2019; Muller et al., 2008) have found that autistic people desire social interactions.

While social interactions of autistic individuals may differ from those of neurotypical peers, their importance should not be devalued (Milton, 2012). Understanding factors that underlie social engagement may enable researchers and practitioners to gain insight into the social experiences of autistic adolescents. Further, appreciating their unique social dynamics can guide the development of strategies to promote social participation and the overall well-being of autistic adolescents as they extend their social networks from families and into the wider community.

A combination of social challenges and perceived social incompetence likely contributes to limited social engagement and negative social experiences common for autistic young people (Usher et al., 2015). Specifically, intellectually able autistic adolescents aware of their social limitations may be concerned about negative evaluations from others. (Anderson et al., 2011; Capps et al., 1995; Vickerstaff et al., 2007). In comparing themselves to peers, they become anxious in the context of social engagement (Johnston & Iarocci, 2017; Kuusikko et al., 2008; Stichter et al., 2010; Verhoeven et al., 2012). For these and other reasons, many autistic individuals attempt to conceal their autism by "masking" (Cook et al.,

2021), with the result that they may encounter elevated mental health challenges and a decreased sense of identity (Cook et al., 2021).

Effective coping behaviors may enhance perceptions of social competence and decrease social anxiety for autistic adolescents. Previous researchers (Zeitlin, 1980; Zeitlin & Williamson, 1990) suggested that adaptive coping skills facilitate meeting personal needs and responding to environmental demands. Thus, individuals with effective coping skills may be more resilient and able to interact socially (Hess & Bundy, 2003; Reijntjes et al., 2006). When individuals cope effectively in social situations, they perceive themselves as competent to solve problems and seek help, despite feeling frightened in social situations (Kochenderfer-Ladd & Skinner, 2002; Zimmer-Gembeck et al., 2011). Further, people with more adaptive coping skills may better accept their social limitations and, consequently, experience less social anxiety (Hofmann, 2007; Ştefan, 2019).

While several researchers (Jahromi et al., 2012; Khor et al., 2014; Williams et al., 2018) have examined the coping strategies autistic adolescents use to respond to stress in general and their links with behavioral or emotional problems, little is known about the impact of their coping skills on social participation. To our knowledge, only one study (Chin et al., 2017) examined coping behaviors in social situations. Through semi-structured interviews, they found that intellectually able autistic adolescents said that they used various strategies to cope with the stressors of engaging or disengaging in social interactions. However, Chin et al. (2017) noted that participants had difficulty communicating about emotions and stress in the interviews. Further, the researchers did not investigate the impact of coping skills on perceived social competence or social anxiety in everyday social contexts.

This study aimed to investigate the association of coping skills with perceived competence and social anxiety in the context of everyday social engagement. We compared differences in coping skills between autistic adolescents and neurotypical peers. Zeitlin

(1980) divided coping skills into two categories of behaviors: managing needs for survival and growth (i.e., ‘coping with self’) and adapting to opportunities, challenges or threats in the environment (i.e., ‘coping with the environment’). We examined both categories of coping behaviors. Second, we explored the perceived competence and social anxiety of autistic and neurotypical groups in the context of everyday social activities. Finally, we investigated whether coping behaviors moderated relationships between everyday social engagement, perceived social competence, and social anxiety in autistic adolescents.

Since social experiences are context-specific (Chen et al., 2015), we used experience sampling methodology (ESM; Hektner et al., 2007), which allows participants to report their actions, thoughts, and feelings in real-time across daily contexts (Shiffman et al., 2008). Compared with retrospective approaches commonly used in previous studies to explore social experiences in autistic individuals (Chin et al., 2019; Myers et al., 2015; Rankin et al., 2016), data collected through ESM have greater ecological validity and are less contaminated by memory bias or socially desirable reporting (Hektner et al., 2007; Shiffman et al., 2008).

Methods

This study is part of a larger project led by the first and third authors to investigate the everyday social experiences of autistic adolescents. The study has ethical approval from the Research Ethics Committee of National Taiwan University Hospital, Taiwan. Caregivers who were interested in this study were provided with Participant Information Sheet regarding the aim of the study, the eligibility criteria and the study procedure. Written informed consent was obtained from caregivers of all adolescent participants who satisfied the eligibility criteria before data collection.

Participants

Intellectually able autistic participants were recruited via research flyers distributed through autism-related organizations, social support groups, relevant clinics, schools, and

social media in Taiwan. In contrast, neurotypical participants were a convenient sample from the siblings, classmates, neighbors, or friends of the autistic participants. The inclusion criteria for autistic participants consisted of (1) being between 10 and 16 years of age; (2) having a formal diagnosis of autism spectrum disorder (ASD) made by a psychiatrist using the DSM-IV-TR (American Psychiatric Association, 2000) or DSM-5 (American Psychiatric Association, 2013); (3) attending mainstream classes without special education support; and (4) having passed their Chinese subject, as per school records to ensure adequate reading comprehension for completing the ESM surveys. We included autistic participants with co-occurring mental health conditions (e.g., attention-deficit/hyperactivity disorder (ADHD) and/or anxiety).

Inclusion criteria for the neurotypical group comprised: (1) being between 10 and 16 years of age; (2) no formal diagnosis of ASD or any other major neurological, intellectual or behavioral disorders; and (3) having passed their Chinese subject, as per school records.

We recruited 82 intellectually able autistic adolescents and 51 neurotypical adolescents; all were of Taiwanese/Chinese ethnicity and race. All participants in both groups met the inclusion criteria, and no one was excluded. The sample size is sufficient to ensure adequate power for accurately estimating fixed effects (Hox et al., 2018). For multilevel analysis, Hox et al. (2018) suggested a minimum of 50 participants and at least 20 ESM surveys completed by each participant.

Of the 133 participants, approximately half attended elementary school. Fewer than half of autistic participants took medications for attention or behavior management (e.g., Ritalin, Concerta or Aripiprazole). However, more than half of autistic participants received occupational therapy, physical therapy, speech therapy, and/or psychotherapy services. Autistic participants had significantly more ASD symptoms as measured by Social Communication Questionnaire (SCQ) (Gau et al., 2011; Rutter et al., 2003) than their

neurotypical counterparts. Please see Table 1 for the comparison of participant characteristics between the autistic and neurotypical groups.

[Insert Table 1 here]

Instruments

Experience Sampling Method (ESM) Survey

We adapted an ESM survey from a previous study (Cordier et al., 2016) to explore perceived social competence and social anxiety in participants' everyday social participation. Questions about activity engagement (i.e., what were you doing?) and social interaction conditions (i.e., who were you talking with?) utilized a multiple-choice format. We categorized activity engagement into three categories: non-activity (nothing or resting, observing people or activity), maintenance/productive activities (e.g., self-care, home chores, schoolwork, studying) and leisure (e.g., reading, TV, electronic and other games, chatting, sports). We grouped responses to social interaction conditions into three categories: interacting with 'peers' (e.g., siblings, friends, classmates), interacting with 'adults' (i.e., parents, teachers), or 'being alone.' Participants used a visual analogue scale ranging from 0 (not at all) to 1 (very much) to respond to the social experience questions, including perceived competence (i.e., how capable did you feel?) and momentary social anxiety (i.e., how worried or anxious were you about what others were thinking?).

We uploaded the ESM survey into the Participation in Everyday Life Survey Application (PIEL App), an ESM platform designed for iOS devices (Jessup et al., 2012). The PIEL app prompted participants to complete the survey at random times and stored the time-stamped data for analysis.

Coping Inventory

We used the Coping Inventory (CI) (Zeitlin, 1980), a proxy-report instrument with 48 items, to investigate participants' coping behaviors. CI items are scored on a scale of 1 to 5,

with higher scores indicating more adaptive behavior. CI yields a summary mean score for 'coping with self' and 'coping with the environment' and an overall score – the Adaptive Behavior Index (ABI). Potential total scores range between 1 and 5. Zeitlin (1980) defined ABI scores ≥ 4 as reflecting functional coping competence. Several researchers (Beetham et al., 2019; Zeitlin, 1985) have found good evidence for psychometric properties of data gathered with the CI.

Social Communication Questionnaire (SCQ)

The Social Communication Questionnaire – Current Form (SCQ) is a 40-item, parent-report measure designed to evaluate the severity of autism symptoms (Gau et al., 2011; Rutter et al., 2003). The SCQ measures social interaction, communication and the presence of repetitive behaviors in the past three months. Total scores range from 0 to 39, with higher scores indicating more ASD symptoms. The SCQ has evidence of sound psychometric properties (Chandler et al., 2007; Gau et al., 2011).

Procedure

Participants and their caregivers attended an individual face-to-face assessment and training session (up to 60 minutes). This session included: (1) provision with an iPhone in which the PIEL App was installed for the completion of ESM surveys, and (2) instruction for using the PIEL App. To ensure participants comprehended ESM survey requirements, they read out questions and chose responses during the training session. At the same time, the caregivers completed the CI and the SCQ.

After training, participants carried the iPhone with the PIEL App installed for seven consecutive days. The App signaled them to respond to ESM survey questions seven times randomly daily during waking hours. Signals were at least 30 minutes apart (Hektner et al., 2007). If permitted, on weekdays, participants received two survey prompts during breaks at school and five prompts after school. Otherwise, participants received prompts outside of

school hours. On weekends, participants received seven prompts each day during free time. Although they were instructed to complete as many surveys as possible, participants were advised to skip signals at inconvenient times (e.g., during class, when bathing and toileting). The App became silent if participants did not respond within 2 minutes. Participants contacted the researchers for assistance during the data collection period if needed. To ensure sufficient data were collected for analysis, all participants were required to complete at least 17 of 49 surveys (>33%) over seven days (Chen et al., 2016).

Over the 7-day period, all participants completed an average of 37 of the possible 49 surveys ($M = 76.5\%$, $SD = 15.6\%$, range = 34.7-100.0%). Autistic participants completed an average of 36 of a possible 49 ESM surveys ($M = 74.1\%$, $SD = 14.9\%$, range = 34.7-100.0%). Neurotypical participants completed an average of 39 surveys ($M = 80.4\%$, $SD = 13.8\%$, range = 36.7-100.0%). The final sample included a total of 4,984 surveys.

Data Analysis

To compare individual characteristics of autistic and neurotypical groups, Chi-square or Fisher's exact tests were conducted for categorical variables (e.g., gender, education status). Independent sample *t*-tests were used for continuous variables (e.g., age, SCQ scores). A Kolomogorov-Smirnov test of normality indicated that the CI scores were not normally distributed. Therefore, Mann-Whitney *U* tests were implemented to compare the coping behaviors of the two groups. Statistical analyses were performed using IBM SPSS v.23.0 (SPSS Inc., Chicago, IL, USA).

Before investigating everyday experiences of social engagement, we explored time spent in daily life represented by the proportion of responses in ESM surveys during which the participants were engaged in everyday activities and social interactions. Based on participants' responses to activity engagement and social interaction conditions, we defined six categories of time spent: leisure with adults, leisure with peers, maintenance/productive activities with

adults, maintenance/productive activities with peers, non-activity involving interactions, and doing things alone.

To compare the ‘perceived competence’ and ‘momentary social anxiety’ of autistic and neurotypical participants (i.e., social engagement experience), we plotted each response into one of five categories: ‘leisure with adults’, ‘leisure with peers’, ‘maintenance/ productive activities with adults,’ ‘maintenance/productive activities with peers’ and ‘non-activity involving interactions.’ Prior to plotting the relationships, we centered the ratings of ‘perceived competence’ and ‘momentary social anxiety’ at each participant’s mean to account for individual differences (Hox et al., 2018).

Because ESM survey data have a hierarchical structure with multiple surveys (Level 1) nested within each participant’s data (Level 2), we used multilevel analysis to (1) compare ‘perceived competence’ and ‘momentary social anxiety’ in everyday social engagement between groups, and (2) examine how coping behaviors influenced these two social experiences within the autistic group in different social engagement conditions (Hox et al., 2018). Multilevel analysis is well-suited for analyzing this hierarchical dataset as it accommodates the dependency among Level 1 ESM data that violates the assumptions of traditional ordinal least-squares (OLS) regression. Moreover, multilevel analysis can effectively handle uneven time intervals between responses and variations in the number of responses from participants (Hektner et al., 2007). Another advantage of multilevel analysis is its capability to manage missing data, given that it does not require participants to have data for every ESM survey (Hox et al., 2018).

To identify whether social experiences for different types of everyday social engagement differed between groups, we performed two steps of multilevel analysis. In the first step, we examined overall relationships between social experiences and everyday social engagement across participants. We performed two multilevel linear analyses with ‘perceived

competence' and 'momentary social anxiety' as the dependent variables. Four dummy variables represented five categories of social engagement as the Level 1 independent variables: 'leisure with adults', 'leisure with peers', 'maintenance/productive activities with adults,' and 'maintenance/productive activities with peers;' 'non-activity involving interactions' was the reference. Confounding factors (i.e., age and sex) and an autism diagnosis were included as the Level 2 independent variables. To identify whether age, gender, and autism diagnosis moderated the relationships between experience and social engagement, in the second step, we included interactions between Level 1 and Level 2 independent variables in each multilevel analysis.

To examine how coping behaviors influenced social experiences in the everyday social engagement of autistic adolescents, we performed two steps of multilevel analysis with ESM data from the autistic group only. In the first step, we performed two multilevel linear analyses with 'perceived competence' and 'momentary social anxiety' as dependent variables. We included four dummy variables of social engagement as Level 1 independent variables; 'non-activity involving interactions' was the reference. We included confounding factors (i.e., age and sex) and summary CI mean scores of 'coping with self' and 'coping with the environment' as Level 2 independent variables. We grand mean-centered data from the CI for comparison across participants (Hox et al., 2018). In the second step, we added interactions between Level 1 and Level 2 (i.e., 'coping with self' and 'coping with the environment') independent variables to each multilevel analysis, as the first step, to examine moderating effects of coping behaviors on 'perceived competence' and 'momentary social anxiety' in social engagement.

We used Hierarchical Linear Modeling (HLM) 7 software (Raudenbush et al., 2011) for the multilevel analyses. We evaluated the magnitude of associations between independent and dependent variables by estimating a fixed regression coefficient (β) and standard errors (SE). The interaction term revealed a significant moderating effect of the Level 2

independent variable on the association between Level 1 independent and dependent variables.

Community involvement statement

Recruitment of participants involved support from the autistic community in Taiwan. No autistic people were involved in designing or conducting this research, and none of the authors are autistic. We acknowledged these as limitations of this study. However, the authors have valuable expertise, clinical experience, practical knowledge, and personal connections to autism.

Results

Comparison of coping behaviors between groups

Autistic participants had significantly fewer adaptive coping behaviors, as evaluated by the CI, than the neurotypical group ($p < 0.001$). Specifically, autistic participants had significantly lower mean scores than neurotypical counterparts in ‘coping with self’ (autistic: $M = 2.91$, $SD = 0.56$, range = 1.5-4.5; neurotypical: $M = 3.91$, $SD = 0.72$, range = 1.9-5.0; $p < 0.001$), ‘coping with the environment’ (autistic: $M = 2.97$, $SD = 0.58$, range = 1.3-4.4; neurotypical: $M = 4.13$, $SD = 0.56$, range = 2.1-5.0; $p < 0.001$), and ABI (autistic: $M = 2.93$, $SD = 0.54$, range = 1.4-4.4; neurotypical: $M = 4.02$, $SD = 0.62$, range = 2.0-5.0; $p < 0.001$). Further, 96.3% ($n = 79$) of autistic participants and 27.5% ($n = 14$) of neurotypical participants scored lower than the cutoff ABI, showing that autistic participants had significantly lower levels of overall adaptive coping than the neurotypical group ($\chi^2 = 71.69$; $p < 0.001$).

Time spent in everyday life

Figure 1 summarizes the participants’ time spent. Overall, all participants were most frequently alone. When engaging socially, they spent more time engaging in non-activity followed by maintenance/productive activities and less time in leisure activities. Peers

(including siblings, friends and classmates) were the primary people with whom they engaged, while parents were the primary adults with whom they interacted.

[Insert Figure 1 here]

Perceived competence and momentary social anxiety in social engagement

Among 133 participants, 17 (autistic: $n = 10$; neurotypical: $n = 7$) indicated they did not engage in social interaction at all during the 7-day ESM trial. Thus, their data were not included in the analyses of social experiences in everyday social engagement.

Figure 2 illustrates ‘perceived competence’ and ‘momentary social anxiety’ associated with the five categories of social engagement. Overall, both groups reported high levels of competence in ‘leisure activities with peers.’ Autistic participants experienced elevated levels of social anxiety when engaging in ‘maintenance/productive activities with adults’, whereas neurotypical participants reported less momentary social anxiety in this category.

Multilevel analyses showed that, after controlling for an autism diagnosis, sex and age, ‘perceived competence’ was positively associated only with ‘leisure activities with adults’ and ‘leisure activities with peers’ (Table 2). No moderation effect of an autism diagnosis was found on the relationship between ‘perceived competence’ and everyday social engagement. However, autistic participants were more likely than neurotypical counterparts to experience greater ‘momentary social anxiety’ when participating in ‘maintenance/productive activities with adults’ ($\beta = 1.036$, $SE = 0.443$, $p < 0.05$). Neither gender nor age had a moderating effect.

[Insert Table 2 here]

Impacts of coping behaviors on perceived competence and momentary social anxiety in the everyday social engagement of autistic adolescents

The first step of the multilevel analysis showed that, after controlling for sex, age and coping behaviors, ‘perceived competence’ was positively associated with ‘leisure activities

with peers'. In contrast, 'momentary social anxiety' was positively associated with 'maintenance/productive activities with adults' (see Table 3). Further, 'perceived competence' was positively associated with 'coping with self' but negatively associated with 'coping with the environment'.

[Insert Table 3 here]

The second step of the multilevel analysis showed that coping behaviors moderated the relationship between social experiences and everyday social engagement in the autistic group. Specifically, participants with lower levels of 'coping with the environment' were more likely than those with higher levels of 'coping with the environment' to experience 'momentary social anxiety' when engaging in 'leisure activities with peers' ($\beta = -1.512$, $SE = 0.585$, $p < 0.05$). 'Coping with self' did not moderate the relationships between social experiences and everyday social engagement.

DISCUSSION

We explored the impact of coping abilities on the everyday social experiences of autistic adolescents finding that coping behaviors play a critical role in influencing social experiences in the everyday social engagement of autistic adolescents. Consistent with previous researchers (Chang et al., 2019; Khor et al., 2014), we found that autistic adolescents had less adaptive coping ability and more negative everyday social experiences than neurotypical peers.

Our findings revealed that autistic adolescents who were better able to cope with the environment perceived less social anxiety while engaging in leisure activities with peers. This might be because those with better coping behaviors are increasingly aware of, and therefore respond to, social cues and interactions from peers (Zeitlin & Williamson, 1990). That is, they may more effectively meet the demands of social contexts (Tse et al., 2021). This finding is

supported by Schohl et al. (2014), who found that teaching autistic adolescents to respond in social situations reduced social anxiety. In contrast, coping effectively with the environment may encourage engagement in social activities that, in turn, increase awareness of social limitations (Huang et al., 2017; Locke et al., 2010) and decrease perceived competence. This may explain why we found that autistic adolescents who coped better with the environment also perceived themselves to be less competent in social engagement.

We also found that a better ability for self-coping was associated with perceived increases in social competence. This might be because individuals with better self-coping have mastered regulating their behaviours for effective peer interactions (Zeitlin, 1980; Zeitlin & Williamson, 1990). The successful experiences may thus increase their perceived competence in social engagement (Zeitlin & Williamson, 1990).

In addition to the impact of coping behaviors, parenting may also be a critical factor associated with the negative social experiences of autistic adolescents. The finding that autistic adolescents were more likely than neurotypical peers to experience social anxiety in maintenance/productive activities with adults is perhaps due to pressure from adults, particularly parents, who were the primary adults with whom they interacted in this study. Because of difficulties with academic performance and increased support needs in everyday activities (Affrunti & Ginsburg, 2012; Hsu et al., 2014), parents of autistic adolescents frequently report higher levels of parenting stress than parents of neurotypical adolescents (Keenan et al., 2016; McStay et al., 2013). Parents' overinvolvement in their children's daily life may occasionally contribute to children experiencing anxiety in trying to meet their parents' expectations (Chin et al., 2017; Affrunti & Ginsburg, 2012; Platt et al., 2016). This is an important cultural consideration. Lim et al. (2021) also found that parents' emotional distress in response to the stigma associated with having a disability may heighten anxiety in autistic adolescents when interacting with their parents. Another possible explanation is that, although

intellectually able, these autistic adolescents may have experienced communication difficulties, contributing to heightened anxiety (Davis et al., 2011).

Contrary to previous findings (Capps et al., 1995; Stichter et al., 2010; Vickerstaff et al., 2007), we found no significant difference in self-perceived social competence between autistic adolescents and neurotypical peers. These findings may be the result of differences in assessing self-perceived competence at different stages of social interactions. Previous researchers (Capps et al., 1995; Stichter et al., 2010; Vickerstaff et al., 2007) reported lower overall self-perceived competence, indicating challenges initiating and maintaining social interactions. This finding may reflect a gap between social demands and individuals' beliefs about their own social competence. In our study, participants responded to prompts on a mobile device and described their engagement *following* the interaction. Participants may have expressed different experiences had they responded at different stages of the interaction. In addition, previous researchers (Capps et al., 1995; Usher et al., 2015; Vickerstaff et al., 2007; Zeedyk et al., 2016) used retrospective global questionnaires to identify a sense of competence. However, many people overestimate negative experiences when completing amalgamated retrospective reports (Levine et al., 2006; Scollon et al., 2003). In particular, autistic adolescents report more negative experiences than neurotypical peers (Chang et al., 2019). In contrast, we captured in-the-moment perceptions immediately after the adolescents had engaged socially. Hence, our findings underscore the significance of collecting contextually valid information to understand adolescents' self-perceived social competence.

In addition, our findings demonstrated the situation-specific nature of social experiences, which is well captured by ESM (Chen et al., 2016). Similar to neurotypical peers, autistic adolescents reported higher self-competence when engaging in leisure activities compared with other activities. Leisure activities are a prime context for adolescents to discover interests, formulate a personal identity, and build their competence in establishing interpersonal

relationships in multiple environments (Coatsworth et al., 2005; Schreuer et al., 2014). Leisure activities are recreational in nature and commonly occur at home or after school, allowing individuals to engage spontaneously and have fun (Caldwell, 2008; Sivan et al., 2019). Taken together, adolescents perceived higher competence when participating in chosen, enjoyable activities as they have more autonomy and exert more will compared with self-care or productive activities (Coatsworth et al., 2005; Shikako-Thomas et al., 2012).

Several limitations were noted in this study. First, we used a parent-report CI, rather than a self-report CI to measure adolescents' coping. This is because young people's coping behavior, compared to subjective experience, is observable and can be easily reported by parents. However, future researchers may identify a self-report measure of coping behaviors to evaluate whether adolescents report coping behaviors differently than their parents. Second, many participants did not frequently interact with others when responding to the ESM surveys. We aimed to gain insight into their real-life experiences without intervening to increase social engagement artificially. Conducting the study in this manner allowed us to capture a more authentic representation of social experiences. However, future researchers could consider extending the duration of ESM data collection to gather more comprehensive data on social experiences. Third, the findings cannot be generalized to the autistic adolescent population as we only investigated those with no intellectual disability (i.e., we recruited only participants who attended mainstream classes). However, future researchers should consider administering a norm-referenced intelligence test (e.g., Wechsler Intelligence Scale for Children) (Wechsler, 2014). Finally, all participants were of Taiwanese/Chinese origin. Future studies of participants from diverse cultural backgrounds would be valuable to understand how coping behaviors influence social experiences across cultures. While we addressed the imbalance of males and females in both groups in our analyses, we recommend that future researchers strive for equal gender distribution across groups to enable more accurate comparisons. This was a cross-

sectional study; a longitudinal study is needed to understand changes in coping behaviors and their influence on everyday social engagement as children mature.

CONCLUSION

This study provides new insights into the critical role of coping behaviors in the social experiences of autistic adolescents. In addition, the study highlights the importance of understanding real-time subjective social experiences. Our findings suggest that intervention should target enhancing self-perceived competence during social engagement in addition to improving skills to cope with social demands in everyday situations. For example, contemporary interventions have increasingly adopted a strength-based approach that focuses on improving self-perceptions and creating the potential to reshape how individuals view and cope with personal traits, strengths, and weaknesses (Ullenhag et al., 2020; Zager, 2013). This may enhance adolescents' 'coping with self' behaviors (i.e., managing needs for survival and growth). To alleviate anxiety during interactions with individuals, such as parents, autistic adolescents could learn to use specific coping strategies (e.g., diaphragmatic breathing). While parenting may be another factor influencing adolescents' social experiences, practitioners may help reframe parents' expectations of their children's performance in everyday life. Parent support groups may also be beneficial for reducing parenting stress and enhancing relationships with their autistic adolescent.

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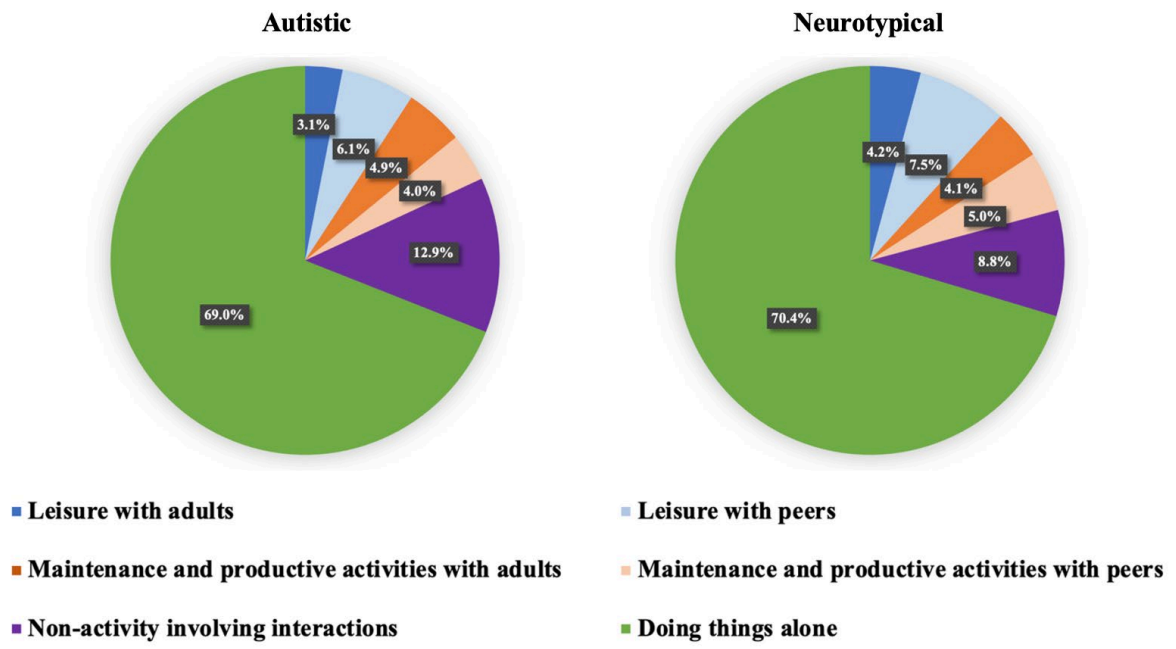


Figure 1. Time spent in everyday life

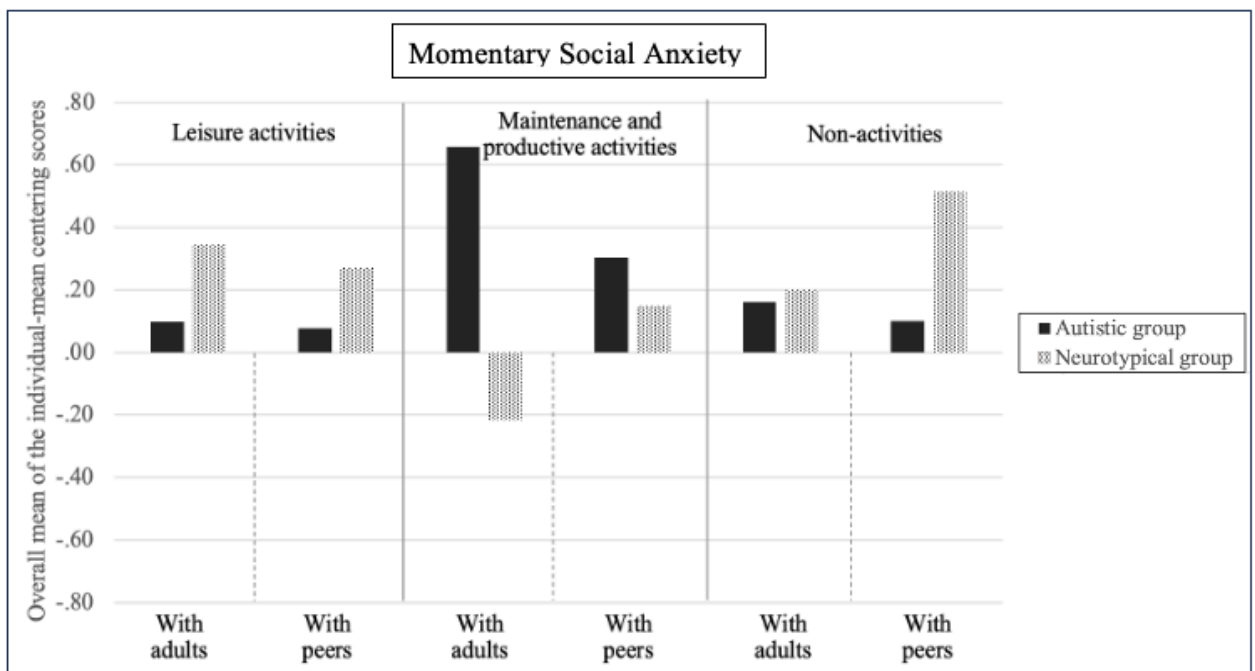
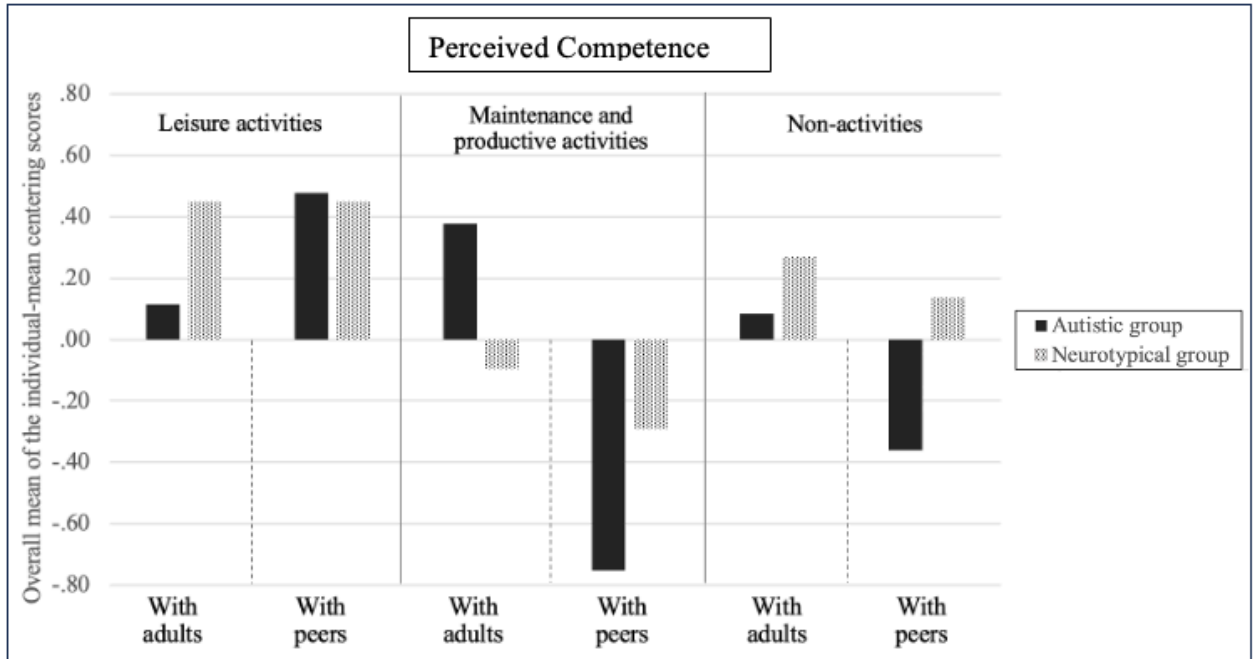


Figure 2. Self-perceived competence and social anxiety in everyday social engagement

Table 1

Characteristics of the participants (N = 133)

Characteristics	Autistic (<i>n</i> = 82)	Neurotypical (<i>n</i> = 51)	Statistics
Gender, <i>n</i> (%)			$\chi^2 = 44.52, p < 0.001^{***}$
Male	74 (90.2)	18 (35.3)	
Female	8 (9.8)	33 (64.7)	
Age (year), <i>Mean</i> \pm <i>SD</i>	12.5 \pm 2.1	12.5 \pm 1.9	$t = -0.18, p = 0.86$
School, <i>n</i> (%)			$\chi^2 = 0.73, p = 0.48$
Elementary school	42 (51.2)	30 (58.8)	
High school	40 (48.8)	21 (41.2)	
Total scores of SCQ ^a , <i>Mean</i> \pm <i>SD</i>	16.4 \pm 6.0	6.4 \pm 3.4	$t = -10.87, p < 0.001^{***}$
Comorbid diagnosis, <i>n</i> (%)			
Attention Deficit/Hyperactivity Disorder (ADHD)	29 (35.4)	-	
Emotional disorders	16 (19.5)	-	
Obsessive-compulsive disorder (OCD)	1 (1.2)	-	
Medication, <i>n</i> (%)	37 (45.1)	-	
Services, <i>n</i> (%)	53 (64.6)	-	
Mother's occupation			$\chi^2 = 2.16, p = 0.34$
Housewife	31 (37.8)	13 (25.5)	
Other (e.g., business, teacher, or other occupation)	44 (53.7)	33 (64.7)	
Not reported	7 (8.5)	5 (9.8)	

^aSCQ: Social Communication Questionnaire. Higher scores indicate the presence of more symptoms of ASD.

*** $p < 0.001$; Independent *t*-tests were used for continuous data, Chi-square or Fisher's exact tests for categorical proportions.

Table 2

Results of multilevel analysis for self-perceived competence and momentary social anxiety in everyday social engagement of both groups (N = 116, number of surveys = 1,396)

Level and Variable	Perceived competence		Momentary social anxiety	
	β (SE)	<i>p</i> value	β (SE)	<i>p</i> value
<i>Survey level (Level 1) (vs. Non-activity involving interaction)</i>				
Leisure activities with adults	0.47 (0.21)	0.03*	0.36 (0.26)	0.17
Leisure activities with peers	0.59 (0.14)	<0.001**	0.31 (0.19)	0.11
Maintenance/ productive activities with adults	0.28 (0.37)	0.77	0.39 (0.23)	0.09
Maintenance/productive activities with peers	-0.51 (0.26)	0.06	0.38 (0.21)	0.07
<i>Participant level (Level 2)</i>				
Autism diagnosis	0.10 (0.36)	0.78	-0.64 (0.67)	0.34
Boys (vs. Girls)	-0.56 (0.35)	0.11	0.67 (0.70)	0.34
Age	0.03 (0.07)	0.72	0.08 (0.13)	0.55

Note. β : fixed regression coefficient; SE: standard errors. * p <0.05; ** p <0.01.

Table 3

Results of multilevel analysis for self-perceived competence and momentary social anxiety in everyday social engagement among autistic adolescents ($n = 72$, number of surveys = 834)

Level and Variable	Perceived competence		Momentary social anxiety	
	β (SE)	p value	β (SE)	p value
<i>Survey level (Level 1) (vs. Non-activity involving interaction)</i>				
Leisure activities with adults	0.20 (0.28)	0.72	0.15 (0.32)	0.66
Leisure activities with peers	0.59 (0.18)	0.001**	-0.03 (0.31)	0.53
Maintenance/ productive activities with adults	0.40 (0.53)	0.45	0.66 (0.32)	0.04*
Maintenance/ productive activities with peers	-0.77 (0.41)	0.06	0.44 (0.35)	0.20
<i>Participant level (Level 2)</i>				
Boy (vs. Girls)	-0.55 (0.40)	0.18	-0.20 (1.12)	0.86
Age	0.02 (0.09)	0.79	0.07 (0.14)	0.63
Coping with Self	1.10 (0.49)	0.03*	-0.83 (0.72)	0.25
Coping with the Environment	-1.19 (0.42)	0.006**	0.80 (0.67)	0.24

Note. β : fixed regression coefficient; SE: standard errors. * $p < 0.05$; ** $p < 0.01$.